ICMAI
THE INSTITUTE OF COST ACCOUNTANTS OF INDIA
भारतीय लागत लेखाकार संस्थान
Statutory Body under an Act of Parliament
(Under the jurisdiction of Ministry of Corporate Affairs)

Handbook On Central Bank Digital Currency (CBDC)

Banking, Financial Services & Insurance (BFSI)

THE INSTITUTE OF COST ACCOUNTANTS OF INDIA (ICMAI)
(Statutory Body under an Act of Parliament)
www.icmai.in

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Mission Statement

"The CMA professionals would ethically drive enterprise globally by creating value to stakeholders in the socio-economic context through competencies drawn from the integration of strategy, management and accounting."

Vision Statement

"The Institute of Cost Accountants of India would be the preferred source of resources and professionals for the financial leadership of enterprise globally."

About The Institute

The Institute of Cost Accountants of India is a statutory body set up under an Act of Parliament in the year 1959. The Institute as a part of its obligation, regulates the profession of Cost and Management Accountancy, enrolls students for its courses, provides coaching facilities to the students, organises professional development programmes for the members and undertakes research programmes in the field of Cost and Management Accountancy. The Institute pursues the vision of cost competitiveness, cost management, efficient use of resources and structured approach to cost accounting as the key drivers of the profession. In today's world, the profession of conventional accounting and auditing has taken a back seat and cost and management accountants are increasingly contributing toward the management of scarce resources and apply strategic decisions. This has opened up further scope and tremendous opportunities for cost accountants in India and abroad.

After an amendment passed by Parliament of India, the Institute is now renamed as ***"The Institute of Cost Accountants of India"*** from ***"The Institute of Cost and Works Accountants of India"***. This step is aimed towards synergising with the global management accounting bodies, sharing the best practices which will be useful to large number of transnational Indian companies operating from India and abroad to remain competitive. With the current emphasis on management of resources, the specialized knowledge of evaluating operating efficiency and strategic management the professionals are known as ***"Cost and Management Accountants (CMAs)"***. The Institute is the largest Cost & Management Accounting body in the world, having approximately 5,00,000 students and 1,00,000 members all over the globe. The Institution headquartered at New Delhi operates through four regional councils at Kolkata, Delhi, Mumbai and Chennai and 112 Chapters situated at important cities in the country as well as 11 Overseas Centres. It is under the administrative control of Ministry of Corporate Affairs, Government of India.

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THE INSTITUTE OF COST ACCOUNTANTS OF INDIA

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Foreword by President, ICMAI

The concept of Central Bank Digital Currency (CBDC) holds immense significance in today's rapidly evolving digital financial landscape. With its potential to fundamentally transform financial infrastructure, CBDC is poised to redefine the way economies function and financial systems operate.

The Reserve Bank of India's role in this journey is both holistic and multifaceted, serving as issuer, regulator, technology architect, policy maker and guardian of financial stability, to ensure that India's CBDC rollout remains safe, efficient, and future-ready. Recognized as legal tender backed by the RBI, CBDC carries with it the assurance of trust, credibility, and stability.

This publication, "CBDC Handbook: Navigating the Digital Currency Landscape," offers a comprehensive overview of CBDCs. It presents insightful perspectives and practical recommendations to help professionals, policymakers, and stakeholders address the opportunities and challenges posed by digital currency. More than a knowledge resource, this handbook stands as a guide for informed decision-making and strategic planning in this emerging domain.

Deep appreciation is extended to all who contributed their expertise, commitment, and collaborative efforts in bringing this publication to fruition. Special congratulations are due to CMA Chittaranjan Chattopadhyay, Chairman, BFSIB, whose relentless efforts have made this publication a true storehouse of knowledge for all stakeholders. Sincere appreciation is also recorded for the author, reviewer, and contributors, whose dedication has resulted in the creation of a timely and authoritative resource that will undoubtedly benefit both the professional community and academia.

Gratitude is also conveyed to Dr. Utpal Chakraborty, AI & Quantum Scientist, for providing a thoughtful and inspiring Foreword to the publication.

All members are encouraged to make full use of this valuable resource on CBDC and to leverage its insights for a deeper understanding of digital currencies and better preparedness for the future of finance in the digital era.

Jai Hind!

With warm regards,

CMA TCA Srinivasa Prasad
President, ICMAI

Foreword by Vice-President, ICMAI

It is with immense pride and delight that I share the momentous occasion of the release of our latest publication, "CBDC Handbook: Navigating the Digital Currency Landscape," brought out under the aegis of the BFSI Board of the Institute.

The introduction of Central Bank Digital Currencies (CBDCs) marks a transformational milestone in the global financial ecosystem, bringing forth both unprecedented opportunities and formidable challenges. As these digital currencies begin to play a pivotal role in our economic systems, it becomes imperative for professionals to gain a holistic understanding of their theoretical foundations, practical applications, and future prospects.

The "CBDC Handbook" presents a comprehensive analysis of this evolving domain—covering implementation frameworks, potential impacts, and the broader implications for the financial sector. Beyond being an academic reference, the publication seeks to foster innovative thinking and forward-looking practices within our professional community.

As we continue to embrace digital transformation in finance, let us leverage this handbook as a guiding resource to strengthen our preparedness for the future. I am confident that this publication will stand as a cornerstone for our collective learning, adaptation, and leadership in the domain of digital currency.

I extend my heartfelt congratulations to CMA TCA Srinivasa Prasad, President of the Institute, for his personal initiative in ensuring that this publication comes to fruition. My deepest appreciation also goes to CMA Chittaranjan Chattopadhyay, Chairman, BFSI Board, and all Board Members for their timely and valuable contributions in bringing out this important work.

The dedication and tireless efforts of the resource person, reviewer, and the BFSI Department have culminated in the creation of this essential guide. Their contribution has not only enriched our profession but also fortified our collective ability to confidently navigate the future of finance.

With warm regards,

CMA Neeraj D. Joshi
Vice-President, ICMAI

Preface

It is my pleasure to commend the "Handbook on CBDC: Navigating the Digital Currency Landscape," authored by CMA Soumen Dutta. This comprehensive and insightful work provides a thorough exploration of the evolving domain of Central Bank Digital Currencies, making it an invaluable resource for policymakers, financial professionals, and technology experts alike.

In an era where digital transformation is reshaping the financial ecosystem, this handbook adeptly bridges the gap between complex technological concepts and practical policy frameworks. The author's deep understanding, combined with a forward-looking perspective, offers a balanced view of the opportunities and challenges posed by CBDCs. The detailed analysis and clear guidance presented in this publication will undoubtedly serve as a foundational reference for navigating the future of digital currencies.

As an AI and Quantum Scientist, and an advocate for technology-driven financial innovation, I am impressed by the depth of research and the clarity with which intricate topics are articulated. This book will play a crucial role in informing and shaping the ongoing discussions on digital currencies and their integration into the global financial infrastructure.

Congratulations to the entire BFSIBB Committee members, the Chairman, and all Central Council members of the Institute of Cost Accountants of India for bringing out this noteworthy publication. Your collective efforts and dedication in disseminating valuable knowledge on the evolving landscape of CBDC and digital currencies are truly commendable. This initiative reflects your unwavering commitment to advancing professional excellence and ensuring that the fraternity remains at the forefront of financial innovation and technological progress.

Dr. Utpal Chakraborty
AI & Quantum Scientist
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Building SLM (GAHNA)
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Top Generative AI Expert
Professor of Practice @VIPS-TC
Ex-Head of AI @YES BANK
Author of 8 Books
TEDx Speaker

Message by Chairman, BFSIB

Dear Readers,

I am pleased to present this timely publication, "Handbook on CBDC: Navigating the Digital Currency Landscape," at a defining moment in the evolution of Indian banking. As the Reserve Bank of India advances the Central Bank Digital Currency initiative, the financial system is entering a new phase marked by digital trust, payment efficiency, and financial inclusion and enhanced monetary transmission. In this new-age banking environment, a clear and practical understanding of CBDC is essential for bankers, policymakers, professionals and institutions alike.

This handbook assumes particular significance as it goes beyond conceptual discussion to examine the operational, regulatory and strategic dimensions of CBDC. It enables readers to appreciate how digital sovereign currency will interact with existing banking systems, payment infrastructure, risk management frameworks and governance standards. The publication serves as a practical guide for navigating the opportunities and challenges that CBDC presents for the Indian financial ecosystem.

I place on record my appreciation for the scholarly and professional efforts that have gone into this work. The handbook has been authored by CMA Soumen Dutta (DGM – Claims & BOC Reliance retail, CGMA, ACPA, Fintech & Blockchain specialist), whose analytical depth and domain expertise are clearly reflected throughout the publication. The book has been meticulously reviewed by Shri Biplab Chakraborty (Former GM of RBI) and Mr. Butchi Babu Burra (IT advisory board Punjab & Sind Bank; IFTAS (RBI) CAC member), whose critical insights have strengthened its technical soundness and practical relevance.

I am confident that this handbook will serve as a valuable reference for bankers, finance professionals, regulators, academicians and CMAs, supporting informed decision-making in the era of digital currency. It reinforces ICMAI's continued commitment to thought leadership, capacity building and professional excellence in the BFSI domain.

Warm regards,

CMA Chittaranjan Chattopadhyay
Chairman,
Banking, Financial Services and Insurance Board
The Institute of Cost Accountants of India

Preface

Dear Members and Esteemed Colleagues,

It is with immense pride that I address you today on the significant occasion of the publication of our latest endeavours, the "CBDC Handbook: Navigating the Digital Currency Landscape." The distinguished CMA Soumen Dutta authored this valuable resource, with CMA Biplab Chakraborty providing a critical review and CMA Dibbendu Roy, Additional Director, Secretary & HoD, BFSIB, providing expert coordination. The introduction of Central Bank digital currencies (CBDCs) marks a monumental shift in the financial landscape, heralding new opportunities and challenges alike.

As these digital currencies begin to play a pivotal role in our economic systems, it becomes essential for our professionals to gain a comprehensive understanding of both the theoretical and practical aspects of CBDCs. The "CBDC Handbook" offers an exhaustive analysis and insight into the world of digital currencies, their implementation, impact, and future prospects.

Our esteemed members not only authored and reviewed the book, but also aimed to inspire innovative thought and practices within our esteemed community. As we continue to embrace the digital transformation in finance, let us utilize this handbook to better equip ourselves to navigate this emerging landscape. I am confident that this publication will serve as a cornerstone for our continued learning and adaptation in the field of digital currency. Please join me in congratulating all those involved in creating this essential guide. Your tireless efforts have culminated in a work that will undoubtedly enhance our understanding and engagement with digital currencies. Thank you for your dedication to our profession and commitment to advancing our knowledge in this cutting-edge area.

Warm regards,

CMA M K Anand
Chairman, PD Committee, ICMAI

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Chapter 1

Introduction

The introduction of Central Bank Digital Currency (CBDC) has revolutionised the financial landscape of India, offering unique prospects to reform financial management processes and systems. The ongoing progress in technology is reshaping how we handle and interact with money. The central bank's issuance and support of a digital currency is one idea that has gained momentum as a potential catalyst for change in the Indian economy.

The implementation of Central Bank Digital Currency (CBDC) in India represents more than just a transition to digital transactions; it entails a complete revaluation of the fundamental principles underlying monetary exchange. CBDC inter alia has the potential to improve financial inclusion, enhance payment efficiency, and increase transparency in financial transactions by combining traditional currency with digital innovation.

Cost and Management Accountants are at the forefront of the digital transformation. They have the unique ability to utilise their experience and insights to effectively navigate and maximise the advantages of implementing Central Bank Digital Currency (CBDC). Cost and Management Accountants, equipped with their expertise in financial management, cost accounting, and strategic decision-making, are well-positioned to effectively leverage the potential of CBDC towards attainment of organisational success, to facilitate strategic financial planning and ensure regulatory compliance.

This monograph seeks to examine the intricacies of Central Bank digital currency in the Indian context, examining its capacity to enhance financial management methods in different sectors and businesses. Through an analysis of the consequences, difficulties, and possibilities that Central Bank Digital Currency (CBDC) presents, our aim is to provide financial experts with the information and foresight necessary to succeed in an ever-evolving digital and dynamic financial environment.

This examination of CBDC in India aims to engage cost and management accountants and financial stakeholders in a voyage of discovery, creativity, and adaptation to the changing landscape of financial management in the digital age. We invite our readers to participate in our exploration of the potential of CBDC to transform financial systems, enhance decision-making, and facilitate a more inclusive and technology-driven financial future in India.

1.1 The reason for the study:

Members of the Institute of Cost Accountants of India (ICMAI) have various significant reasons for studying various facets and nuances of Central Bank Digital Currency (CBDC). Several primary factors include:

1. **Professional Development:** A comprehensive appreciation of CBDC and its ramifications has the potential to expand and sharpen the knowledge and skills of cost and management accountant professional in the areas of financial management, cost accounting, and strategic decision-making in the evolving digital financial landscape

2. **Strategic Insight**: Familiarity with CBDC equips Cost and Management Accountants with a valuable understanding of how digital currencies might influence financial systems, financial reporting, and organisational management. This can help individuals to prepare for changes and adjust their financial strategies properly.

3. **Regulatory Compliance**: With the emergence of Central Bank Digital Currency (CBDC), it is crucial for cost and management accountants to remain updated with the consequential changes in financial rules/ regulations. A comprehensive understanding of CBDC framework can facilitate adherence to changing financial regulations and reporting obligations.

4. **Innovation Potential:** The introduction of CBDC opens up new possibilities for innovation in financial services and management processes. Proficient cost and management accountants with a deep understanding of CBDC framework would be better equipped to recognise the emerging opportunities and exploit them to enhance organisational expansion and effectiveness.

5. **Improved Decision-making**: Familiarity with CBDC can aid cost and management accountants in making well-informed financial decisions that are in line with the evolving dynamics of the financial sector. This can result in enhanced financial performance and more effective risk management.

6. **Technological Adaptation**: CBDC represents a significant technological advancement in the financial

industry. In order to optimise financial management, reporting, and analysis, it is imperative for cost and management accountants to comprehend these modifications and effectively utilise the evolving technology.

7. Enhancing Thought Leadership: By conducting research on CBDC, cost and management accountants may enhance their thought leadership within their profession and the wider financial community. Individuals have the opportunity to engage in discussions, conduct research, and contribute to publications that influence the future of financial management in the digital era.

Appreciation of various facets of CBDC framework is essential for members of the Institute of Cost Accountants of India to remain relevant and contemporary in their capacities as financial professionals. It provides them with the necessary knowledge and abilities to effectively navigate the changing economic environment and make valuable contributions to their organisations and the field.

1.2 Introduction to the Role of Cost and Management Accountants in the Financial Landscape:

Cost and Management Accountants (CMA)have important role to play in influencing and guiding the organisation in fast changing financial environments in different sectors. CMAs play a crucial role in enhancing operational efficiency, maximising profitability, and fostering sustainable growth in firms by leveraging their financial proficiency, strategic acumen, and cost-effective decision-making abilities.

In the current dynamic global economy, the responsibilities of cost and management accountants go beyond the conventional tasks of bookkeeping and financial reporting. These experts serve as strategic partners, collaborators, and catalysts for good change within organisations. They provide vital insights and analysis that guide crucial choices and affect financial outcomes.

Cost accountants are experts in overseeing expenses, analysing financial information, and improving the allocation of resources to enhance operational efficiency and profitability. By examining the complexities of cost structures, budgeting, and variance analysis, they offer vital inputs to strategic planning and resource allocation.

Management accountants primarily concentrate on wider financial management tasks, which include financial planning, forecasting, performance evaluation, and risk management. They possess a high level of strategic insight that enables them to analyse financial information, evaluate the cost effectiveness of the organisation, and synchronise financial goals with broader business objectives.

Cost and Management Accountants work together as a powerful team of financial experts, utilising their strong analytical abilities and strategic thinking promote efficient and effective financial practices and enable well-informed decision-making. Their work encompasses a wide range of responsibilities, including budgeting, financial analysis, cost control, risk management, and compliance with regulatory standards.

Cost and Management Accountants play a crucial role in helping organisations navigate the dynamic financial landscape by managing costs, mitigating risks, and seizing opportunities for development and innovation. Businesses are required to be equipped with the necessary tools to succeed in today's competitive climate through their capacity to synthesise financial information, recognise trends, and offer practical recommendations.

As we explore the intricacies of financial management, the significance of cost and management accountants becomes evident as a fundamental element of organisational achievement. Their extensive knowledge, ability to anticipate future trends, and dedication to maintaining financial honesty establish them as crucial catalysts for achieving strong financial results and generating values, making them essential collaborators in the quest for long-term economic success.

Chapter 2

Historical Background

2.1 Evaluation of Currency in India:

The currency evolution in India is a complex and intricate representation of the nation's extensive history of trade, business, and cultural interactions. Throughout history, India has utilised several types of currency, which have had a profound impact on the economic development of the region. The historical background of currency in India can be summarised by the following important points:
Ancient Times: During ancient times in India, barter systems were commonly used, whereby commodities and services were directly transferred without the use of a standardised medium of exchange. Over the course of time, many commodities, such as grains, textiles, metal objects, and cattle, were utilised as means of exchange in local trade.

- ✓ **The Mauryan Empire:** The Mauryan Empire, which existed from approximately 322-185 BCE, implemented a system of organised coinage in India by introducing punch-marked coins composed of silver, copper, and lead. This represented one of the earliest occurrences of such a system in the region. The coins displayed emblems and inscriptions that represented the authority that issued them.

- ✓ **The Gupta Empire:** spanning from the 4th to the 6th centuries CE, introduced gold coins known as dinars. These coins were a symbol of the empire's economic wealth and stability. The meticulously crafted coins symbolized the power of the reigning dynasty.

- ✓ **Medieval Era:** During the medieva era, different monarchs in different regions of India minted their own coins, which showcased the rich variety of cultures and traditions in the country. Trade and commerce often used gold, silver, and copper coins as a medium of exchange.

- ✓ **Colonial Period:** The entry of European colonial powers in India brought about the introduction of standardised money. The British East India Company introduced its own currency, which subsequently developed into standardised monetary systems during British colonial governance. The Indian rupee was designated as the official currency.

- ✓ **Independence and Modern India:** After India gained independence in 1947, the Reserve Bank of India (RBI), which was established in 1935, continued to serve as the central banking institution responsible for monetary policy, currency issuance, and regulation of the banking system in India.

- ✓ **The Indian rupee is maintained as the designated currency, and multiple denominations of coins and banknotes were produced to cater to the requirements of an expanding economy**.

- ✓ **"Digital Transformation":** India has experienced a swift transition towards digital transactions and cashless payments in recent years. The implementation of measures like demonetization and the promotion of digital wallets and online banking have accelerated the adoption of digital payment methods, along with increasing concerns over the challenges posed by the rising popularity of cryptocurrencies. In this context, discussions around Central Bank Digital Currency (CBDC) have gained prominence as a strategic response to address issues related to payment efficiency, financial stability, and regulatory control in the evolving financial landscape.

2.1.2 What exactly is the Central Bank Money?

Money is a valuable resource that enables individuals to acquire goods and services. For an asset to qualify as money, entities other than the issuer must widely accept it as a medium of exchange, store of value and a unit of account. Vouchers, for instance, do not qualify as currency for this reason. For genuine currency, a universally accepted medium of exchange is essential. Money serves various purposes, including being a unit of account and a store of value. However, its most notable role is as a medium of exchange. Typically, the unit of account aligns with the medium of exchange due to its convenience. If the medium of exchange lacks stability relative to the goods and services traded, a divergence between the recorded value and the economic reality may occur. Money must maintain its purchasing power from the moment of receipt until its expenditure to serve as a medium of exchange. However, there are several other assets that can be considered as stores of value, including equities, bonds, precious metals, and real estate. Being a store of value is not an exclusive characteristic of money.

In a modern economy, there are two distinct forms of money: state money and private money. The central bank, acting on behalf of the government, typically issues state money. Central bank money is accessible to specific financial institutions through deposits at the central bank,

known as reserves. It is also available to the public in the form of currency, such as banknotes and coins, commonly referred to as "cash." Such currency holds no inherent value in a contemporary fiat money economy. Even though the central bank cannot exchange it for value, it bears legal responsibility.

Most countries consider central bank money as legal tender, requiring acceptance for the repayment of monetary debts like taxes and legal fines. Although it is important for central bank money to have legal tender status, this alone does not guarantee a stable value. Instead, it is the central banks' monetary policy that upholds the value of money. Ensuring price stability, which refers to maintaining a steady value of money in relation to the goods and services exchanged, is a key responsibility of central banks.

Commercial banks primarily issue private money in the form of demand deposits, which individuals and businesses hold for transactions and payments in a modern economy. This money consists of bank balances accessible through various instruments like cheques, debit cards, credit cards, or other transfer methods. While convenient, these deposit claims can pose risks to the banks, as they guarantee convertibility of deposits into central bank money at a fixed 1:1 rate, maintaining the value of deposits equivalent to central bank money. Depositors have the option to withdraw cash or transfer funds at any time, with the bank pegging the deposit value to the central bank's money to ensure stability.

In a fractional reserve banking system, even a financially stable commercial bank may face liquidity shortages during periods of stress, such as a bank run, making it unable to meet its commitment to convert deposits into central bank money. Like any business, a bank can face insolvency and potentially go bankrupt, leading to losses for depositors. Therefore, commercial banks are regulated to mitigate these risks and protect the financial system.

There is a notable distinction between central bank money and private (or privately issued) commercial bank money; the latter involves counterparty risk. A central bank can fulfil its obligations by using its own non-redeemable currency. Central bank money is the sole monetary asset in a domestic economy that is free from credit and liquidity risk. Consequently, it is typically the preferred asset for settling payments in financial market infrastructures (see CPMI-IOSCO Principles for Financial Market Infrastructures, 2012).

In addition, central bank money plays a crucial role in stabilizing the domestic monetary system, serving as a benchmark for private commercial bank currencies to maintain their value.

Various private entities occasionally attempt to introduce their own currencies; cryptocurrencies are just the latest example of this trend. However, unlike bank deposits, this type of money does not enjoy widespread recognition as a formal or official currency. Bitcoin, the most widely accepted cryptocurrency, follows the same principle of **voluntary and decentralized acceptance**. The high volatility of their values poses a challenge to their effectiveness as a medium of exchange. The rise of stablecoins has emerged as a solution to address this problem. Stablecoins generally aim to maintain a stable value relative to a specific asset or a pool of assets. To achieve this stability (or "maintain their peg"), they typically employ one of four primary mechanisms:

1. Fiat-Collateralised Stablecoins These stablecoins maintain a reserve of fiat currency (such as the US Dollar or Euro) or cash equivalents to back every token issued. The reserve is typically held by a central custodian.

- *Examples:* USDC (USD Coin), USDP (Pax Dollar), and Tether (USDT).

2. Crypto-Collateralised Stablecoins These are backed by other cryptocurrencies as collateral. Because the underlying collateral is volatile, these stablecoins are often "over-collateralised" to ensure the peg is maintained even if the value of the collateral drops.

- *Example:* DAI (from the MakerDAO protocol).

3. Algorithmic Stablecoins These stablecoins do not rely on reserves of fiat or physical assets. Instead, they use algorithms and smart contracts to manage the supply of tokens—minting or burning them in response to market demand—to keep the price stable.

- *Examples:* Frax Protocol (FRAX), which utilizes a hybrid model. A notable historical example is TerraUSD (UST), which collapsed in 2022 due to a failure in its stabilizing mechanism.

4. Commodity-Collateralised Stablecoins These are backed by physical assets such as precious metals, oil, or real estate. The stablecoin represents a specific unit of the underlying physical commodity.

- *Example:* PAX Gold (PAXG), where each token is

pegged to one fine troy ounce of gold.

Algorithmic stable coins use algorithms to regulate their supply. Put simply, they strive to maintain price stability through their own "algorithmic monetary policy." There are examples of stable coins, such as **Nubits**, *(Stablecoins use algorithms to regulate their supply. Put simply, they strive to maintain price stability through their own "algorithmic monetary policy." While there have been attempts to create purely algorithmic stablecoins, they face significant risks.*

A notable example is NuBits. NuBits is now considered a historic case study and a cautionary tale in the cryptocurrency world. It demonstrated the extreme difficulty of maintaining a stable peg through pure algorithms and market incentives alone, especially in the face of a sustained loss of confidence. NuBits were de-pegged permanently in 2016.

In contrast, stablecoins that are "asset-backed" operate differently, varying based on the type of assets involved and the legal rights obtained by stablecoin holders.)

But none have managed to maintain a stable value over an extended period. Stable coins that are "asset-backed" can vary depending on the type of assets involved and the legal rights obtained by stable coin holders. Commonly used assets include money (such as central bank reserves, banknotes, or commercial bank deposits), commodities (like gold), securities, and occasionally other cryptocurrencies. The effectiveness of such a scheme in stabilising the value of the coins in relation to the underlying asset(s) is highly dependent on the legal rights obtained by stable coin holders. Theoretically, we can achieve stability if we can redeem a stable coin at a fixed price, like 1 coin equalling 1 USD or 1 ounce of gold. The scheme essentially replicates the function of issuing and backing currency by maintaining reserves that can be exchanged on demand, just as an economist would explain. However, stablecoins typically fully rely on the reserves of the underlying asset to mitigate liquidity risk. This is because, unlike bank deposits, stablecoins lack the protections provided by regulation, such as deposit insurance and access to central bank lender-of-last-resort support.. We commonly refer to stable coins backed by fiat currency, such as central bank-issued banknotes or bank deposits, as fiat-currency stable coins. Investing solely in physical cash or bank deposits is generally not highly profitable. Therefore, stable coin providers aim to optimize their holdings by adopting a fractional reserve approach, similar to the operations of commercial banks. They aim to reduce their low-yielding asset holdings to the minimum required for convertibility while increasing their investment in higher-yielding liquid assets, such as government bonds. This enhances their profitability while also raising their level of risk. However, even when a stable coin receives full backing from commercial bank deposits, the underlying bank's credit and liquidity risks still pose a threat. One possible solution to mitigate this risk is to have the central bank hold the deposits, thereby ensuring the stability of the stable coin through central bank reserves. Adrian and Mancini-Griffoli 2019 have referred to these stable coins as **"synthetic CBDCs"**. Although not classified as central bank digital currency (CBDC), stable coins lack the same level of security due to their lack of central bank backing. As a result, there is still a risk involved, namely the possibility that the stable coin issuer may go bankrupt. There is no guarantee of stability in relation to the underlying asset if a stable coin lacks the ability to redeem at a fixed price. If the stable coin still represents an ownership share of the underlying asset, the scheme is similar to a closed-end mutual fund or exchange-traded fund (ETF), and the associated risks come into play. The net asset value of the fund will influence the theoretical or reference value of the stable coin, but its market price may fluctuate due to supply and demand, causing deviations from this value. If individuals are allowed to create and redeem stable coins freely—similar to ETFs or the proposed Diem (formerly Libra) model—we expect such deviations to remain minimal. Overall, stable coins are more likely to become a widely accepted form of currency than cryptocurrencies, especially when supported by appropriate regulations. However, the existence of CBDCs would significantly limit their utility as a medium of exchange.

2.1.3 Progression towards Digital Transactions:

The transition to digital transactions represents a significant shift in the conduct of global financial transactions. This progress has been propelled by advancements in technology, changing consumer preferences, and the increasing demand for more efficient, secure, and convenient payment methods. Below is a concise summary of the evolution toward digital transactions:

- ✓ **Rise of Electronic Payments:** In the initial phases of digital transactions, electronic payment mechanisms like credit and debit cards emerged. These cards facilitated electronic payments, eliminating the need for physical cash and enhancing the convenience and efficiency of transactions.

✓ **Online Banking:** The emergence of the internet resulted in the proliferation of online banking services, enabling users to conduct banking transactions, such as transferring funds, paying bills, and managing accounts, electronically. Online banking provides greater accessibility and flexibility, enabling users to manage their finances more effectively.

✓ **E-Commerce and Mobile Payments:** The expansion of e-commerce platforms has enabled the convenience of online shopping and the use of digital payments. Consumers have the option to make online purchases via digital wallets, payment gateways, and mobile payment apps. The transition to mobile payments has enhanced the ease and convenience of transactions.

✓ **Contactless Payments:** Contactless payment technologies, such as Near Field Communication (NFC) and RFID, QR code allowed users to securely make payments by just tapping , waving or scanning their cards or devices near a point-of-sale terminal. Contactless payments offer expedited transactions, enhanced convenience, and mitigate the necessity for physical interaction.

✓ **Digital wallets and peer-to-peer (P2P)** payments have fundamentally transformed the way people send money to each other. Platforms such as PayPal, Venmo, and other mobile payment applications have facilitated the swift and secure transfer of funds through cell phones.

✓ **Cryptocurrencies and Blockchain Technology:** The emergence of cryptocurrencies, such as Bitcoin and Ethereum, alongside blockchain technology, signaled a new age in digital commerce. Cryptocurrencies enable decentralized, secure, and tamper-evident transactions, posing a challenge to conventional financial institutions and offering innovative alternatives for payments and financial activities.

✓ **Central Bank Digital Currency (CBDC)** refers to the most recent advancement in digital transactions, wherein central banks issue digital currencies that hold the status of legal money. The objective of CBDC is to enhance the efficiency of payment processes, improve financial accessibility, and provide a reliable and effective payment system supported by the central bank.

The advancement towards digital transactions continues to reshape the financial terrain, providing fresh prospects for effectiveness, availability, and ingenuity. In response to the advancements in technology and changing consumer tastes, the financial industry needs to adjust its strategies in order to take advantage of the advantages offered by digital transactions while still guaranteeing security, privacy, and adherence to regulatory requirements.

2.1.4 Relevance of CBDC in the Contemporary Financial System:

Central Bank Digital Currency (CBDC) is highly relevant in today's financial system, presenting various implications and opportunities for financial institutions, governments, businesses, and consumers. *Here are some important factors that emphasise the significance of CBDC in today's financial landscape:*

✓ **Improved Efficiency and Speed:** CBDC has the potential to streamline payment processes, resulting in faster and more efficient transactions compared to traditional banking systems. By implementing CBDC, one can minimize transaction costs, improve the management and utilization of available funds, and significantly enhance the overall effectiveness of payment systems.

✓ **Financial Inclusion:** CBDC has the potential to enhance financial service accessibility for individuals who currently lack access to banking services or have limited access. With the introduction of a digital form of currency supported by the central bank, CBDC has the potential to enhance financial inclusion and bridge the gap in access to banking services.

✓ **Reduced Dependency on Cash:** With the decline in physical cash usage in many economies, CBDC offers a digital alternative that is backed and issued directly by the central bank, ensuring its safety, trustworthiness, and stability. This can contribute to a decrease in the use of

physical currency and promote the adoption of a digital economy, while benefiting from the central bank's oversight and the secure nature of central bank backing.

✓ **Enhanced Security and Transparency: :** Enhancing security in financial transactions and improving trust in the financial system are crucial. With enhanced security and transparency, CBDC transactions are recorded on a tamper-proof distributed ledger, guaranteeing transparency and minimising the chances of fraud or corruption. Enhancing security in financial transactions and improving trust in the financial system are crucial.

✓ **Monetary Policy Tools:** CBDC provides central banks with innovative tools to directly influence the money supply and transaction flows in real time. Central banks can effectively manage interest rates, inflation, and overall economic stability by monitoring and controlling the circulation of digital currency. They can achieve this through adjustments in interest rates, issuance policies, and transaction limits. This approach allows for more precise and rapid implementation of monetary policy compared to traditional cash-based methods

✓ **Cross-Border Transactions:** CBDC has the potential to streamline cross-border transactions by eliminating the need for intermediary banks and currency conversion. By implementing this solution, transaction costs can be minimised, speed can be enhanced, and transparency in international payments can be improved.

✓ **Technological Innovation:** The development and adoption of CBDC foster technological innovation in the financial sector. Central banks are delving into blockchain and other cutting-edge technologies to issue and manage digital currencies, opening up exciting possibilities for innovation in the realm of financial services.

✓ **Embracing Digital Trends:** In today's digital economy, CBDC serves as a connection between traditional currencies and digital transactions. It demonstrates the changing payment preferences of consumers and businesses, promoting a smoother and more interconnected financial ecosystem.

✓ **Regulatory Compliance and Oversight:** CBDC provides central banks with enhanced regulatory compliance and oversight, granting them increased control over the financial system. With the digitization of currency issuance and real-time transaction monitoring, central banks can enhance regulatory compliance and more effectively combat illicit financial activities.

In the modern financial system, CBDC holds great significance as it has the power to transform payment systems , promote financial inclusion, foster innovation, and keep up with the digital revolution that is reshaping the global economy. Given the current exploration of CBDC by central banks, the financial industry remains highly interested in and concerned about the potential impact thereof on financial systems and structures.

Chapter 3

Understanding CBDC

3.1 Definition and types of CBDC:

A central bank issues Central Bank Digital Currency (CBDC), a digital version of fiat currency that functions as a sovereign representation in the digital sphere. CBDC projects are typically built on systems that are centralized in their governance and control, even if they use a distributed ledger for resilience among trusted partners. The ledger system itself is under the maintenance of the central bank. CBDC operates on a blockchain, or centralised digital ledger, that is under the maintenance of the central bank. It offers individuals, businesses, and financial institutions a secure and dependable medium of exchange. CBDC is governed by the central bank in regards to issuance, administration, and regulation, which sets it apart from decentralised cryptocurrencies such as Bitcoin.

Principally, two varieties of CBDCs exist, distinguished by their accessibility and architectural design:

1. **Wholesale CBDC (W-CBDC):** Wholesale CBDC usage is limited to authorised wholesale market participants, including government entities, financial institutions, and others. It is designed for high-volume, high-value financial system transactions, including wholesale payments, securities trading, and interbank settlements. Wholesale CBDC is designed to enhance the security, speed, and efficiency of inter-institutional financial transactions, thereby reducing systemic risks and improving the management of funds across the financial system to ensure liquidity is available where needed and operational risks are minimized.

2. **Retail CBDC (R-CBDC):** The central bank issues R-CBDC, which the general public, businesses, and individuals can purchase to hold and conduct transactions. It functions as a substitute for tangible currency and commercial bank deposits, offering a safe and practical means of transaction for routine affairs. R-CBDC facilitates the expansion of digital payment accessibility, specifically targeting unbanked and underbanked communities. It is compatible with established payment systems, such as mobile wallets and credit cards.

Each of these categories has additional variations, which include:

✓ The term ***"Account-Based CBDC"*** describes a system where both individuals and institutions maintain digital accounts with the central bank to document transactions. In the Indian context, a more applicable approach to introducing a CBDC would be for individuals to hold digital currency accounts directly with authorized intermediaries, such as commercial banks or designated payment service providers, under the oversight of the central bank. This ensures integration with the existing banking infrastructure while maintaining central bank backing and regulation. It is suggested that the central bank would have the duty of conducting know-your-customer (KYC) checks and ensuring AML/CFT compliance. This would involve not only managing the initial KYC process, but also verifying customers for bank transactions, handling fraud, and addressing instances of both false-positive and false-negative authentications. Considering the minimal involvement of central banks in society and their lack of readiness to authenticate citizens on a large scale, any account-based CBDC would necessitate the central bank to delegate these verification processes to external sources. Outsourcing the servicing and maintenance of these accounts to third-party providers is a potential option (Bindseil 2020).

Another approach could be to require commercial banks to open central bank accounts for their customers through legislation (Berentsen and Schär 2018).

3. **An account-based CBDC** would provide a central bank with a wealth of information. A potential concern is that this could enable governments to effortlessly conduct widespread surveillance over individual account holders. Their centralised nature allows for cost-effective and efficient enforcement of such interventions on individuals or groups. Surveillance targeting critics and political opponents is unfortunately not uncommon, even in democracies. It could be argued that independent central banks have the potential to protect such information from government scrutiny and political abuse. However, this could also create an opportunity for political pressure, which could undermine the independence of central banks. Furthermore, the central database would be a prime target for attackers. Even gaining read-only access to certain portions of the database could pose substantial risks for individuals whose data may be compromised.

4. **By offering bank accounts to the public**, a central

bank would also be directly competing with commercial banks. This competition involves two potential risks. First, it has the potential to impact the deposit base of banks and, in extreme cases, disrupt the banking sector. This could have a negative impact on the availability of credit to the private sector and, consequently, on economic activity (Agur et al. 2019). Disintermediation of banks may reduce their traditional role in credit allocation, potentially leading to a shift of financing activities toward capital markets. While this could enhance market-based funding and liquidity, it may also impact the productivity and overall growth of the economy if the banking sector's role in providing affordable and accessible credit diminishes, or if capital markets are not sufficiently developed to absorb these shifts. This transition could have mixed effects, depending on the strengths of the capital market infrastructure and regulatory environment. Additionally, the option for individuals to transfer their deposits to a secure central bank could potentially accelerate bank runs in times of financial turmoil.

On the other hand, there are opposing viewpoints. In their analysis, Brunnermeier and Niepelt (2019) suggest that if funds are transferred from deposit to CBDC accounts, it would result in a shift from deposit funding to central bank funding. This would essentially make the central bank's implicit lender-of-last-resort guarantee more explicit. According to Berentsen and Schär (2018), competition from central banks may have a positive impact on financial system stability. This is because commercial banks would be motivated to strengthen their business models in order to prevent bank runs. There are also suggestions to reduce the risk of disintermediation that seek to restrict or discourage the use of CBDC as a means of storing value. One suggestion is to limit the quantity of CBDC that individuals can possess. Another suggestion is to implement a flexible interest rate for CBDC accounts, ensuring that the compensation is consistently lower than what is offered by commercial bank accounts (potentially even resulting in a negative return). This would make CBDC less appealing as a means of storing value (Kumhof and Noone 2018, Bindseil 2020). In addition, Kumhof and Noone (2018) propose that CBDC should be issued solely against securities like government bonds, rather than bank deposits, in order to discourage bank runs. In general, a CBDC that is based on accounts would necessitate a more in-depth examination of these matters.

5. Hardware-dependent Token-Based CBDC: One form of CBDC is token-based, in which the central bank issues digital currencies, or tokens. This mechanism enables peer-to-peer transactions, eliminating the requirement for intermediary accounts. Central banks must determine the underlying architectural design of the CBDC, with the choice typically falling between two primary models: an account-based model, which tracks ownership via a central ledger and verified identity, or a token-based model, where the digital currency is issued as a bearer instrument. From a technical standpoint, it is necessary to establish a system that prevents easy duplication of the electronic tokens. There are two potential technologies for preventing unauthorized copying of digital content: physically unclonable functions (PUFs) and secure zones in hardware. However, PUFs cannot be transmitted online, which undermines the main goal of Central Bank Digital Currencies (CBDCs). Additionally, the security measures in copy-prevention hardware have been breached consistently in the past (as demonstrated by Wojtczuk and Rutkowska 2009, Johnston 2010, Lapid and Wool 2019). One advantage of token-based CBDCs compared to central bank accounts is their ability to function offline. This means that users can exchange tokens directly with each other, without the need for involvement from the central bank. This offline capability helps safeguard individuals' privacy and freedom. It is possible for users to trade electronic tokens without banks acting as middlemen and without doing KYC checks and adhering to AML/CFT procedures. This makes it harder to stop criminal activity. Secure hardware-based payment systems widely use SIM cards, despite their inherent risks. Various studies (e.g., Soukup and Muff 2007, Garcia et. al. 2008, Kasper et. al. 2010, CCC 2017) have observed that if a device can store tokens with monetary value and facilitate offline transactions, it becomes susceptible to theft through cloning. Successful forgery attacks often occur when the potential economic gain outweighs the risks involved. These attacks involve individuals who target their own hardware (refer to Allen et al. 2020). Previously implemented payment card systems rely on tamper resistance and fraud detection to mitigate the impact of a security breach. Nevertheless, in order to detect fraud, it is necessary to be able to recognise payers and monitor customers, which can be at odds with maintaining transaction privacy.

6. Hybrid CBDC: Hybrid CBDCs, which combine account-based and token-based systems, provide enhanced functionality and adaptability in the realm of digital currency transactions.

The implementation of CBDC signifies a substantial advancement in the financial industry, providing central banks with novel instruments to update payment systems, promote financial inclusion, and adjust to the digital revolution that is occurring throughout the economy. To get the most out of CBDC's potential to make financial systems more efficient and open to everyone, it needs to be carefully planned and designed with security, privacy, regulatory compliance, and cross-border interoperability in mind.

3.2.A Privacy-Focused Design for a Token-Based CBDC:

Creating a privacy-centric token-based CBDC involves incorporating features that prioritise user privacy and confidentiality while ensuring security, transparency, and regulatory compliance. The following are the components of a privacy-focused design for a token-based CBDC:

✓ **Anonymity Protection:** Creating a system that assigns unique, pseudonymous tokens to users helps preserve their privacy by preventing direct identification. These tokens allow users to conduct transactions anonymously, while still enabling the system to trace and verify transactions if necessary—such as for regulatory or security purposes—without linking the transactions directly to their real-world identities.

✓ **Enhanced Data Privacy:** Integrating zero-knowledge-proof protocols to validate transactions without revealing information other than the mere fact of the truth of the transaction. This feature enables users to validate transaction occurrences or information possession without revealing the underlying details.

✓ **Customised Privacy Settings:** Offering user's detailed privacy controls to manage the visibility of their transactions and personal data. Empowering users to adjust privacy preferences, such as restricting data sharing, setting transaction visibility levels, and controlling information disclosure.

✓ **Off-Chain Transactions:** To enable more private and scalable interactions, implement off-chain solutions for transactions. Execute off-chain transactions with privacy features to reduce the exposure of data on the blockchain.

✓ **Enhanced Multi** Signature Authentication: Enhanced multi-signature authentication involves requiring multiple secure signatures from different authorized parties to approve a transaction. This process adds an extra layer of security by ensuring that no single entity can unilaterally authorize transactions, thereby significantly safeguarding user identities and preventing unauthorized access. By integrating advanced authentication methods with multi-signature approval, transactions can be verified and authorized in a highly secure manner, while still maintaining user privacy and ensuring that sensitive information is protected.

✓ **Data Minimization Strategies:** Limit the collection and storage of user data to information essential for transactional purposes. To protect transaction metadata from individual user identification, store it in an aggregated and anonymized manner.

✓ **Controlled Information Sharing:** Provide users with the option to selectively disclose transaction details while upholding privacy. Enable users to share data on a need-to-know basis, allowing them to share information as needed.

✓ **Privacy Impact Assessment:** Use privacy impact assessments to evaluate the privacy risks associated with the token-based CBDC system. Recognize, evaluate, and address privacy vulnerabilities in order to maintain compliance with data protection laws and privacy norms.

✓ **Openness and Auditability:** Structure the CBDC system to offer transparency regarding governance, operations, and data handling practices. Introduce audit features for tracking and validating transactions while maintaining user data privacy and confidentiality. By incorporating these privacy design elements, central banks can create a token-based CBDC system that emphasizes user privacy, security, and anonymity while fostering trust, openness, and adherence to privacy regulations.

3.3 General Concepts about Digital Currency in India:

❋ In her Budget Speech for Fiscal Year 2022–2023, the Honourable Finance Minister of the Government of India announced the launch of the ***"Digital Rupee."*** "The introduction of Central Bank Digital Currency (CBDC) will give the digital economy a big boost," she declared. The use of digital currency will also result in a less expensive and more effective currency management system. It was indicated that the Reserve Bank of India would introduce the Digital Rupee, which would be issued beginning in 2022–2023, utilising blockchain and other technologies.

- Reserve/settlement accounts and hard currency are the two main types of central bank money that we typically encounter. The money we take out of ATMs is actual cash. Although the Reserve/Settlement accounts are digital in nature, only a limited number of financial organisations, such as banks, have access to them. The banking system produces digital money, an additional type of money, but central banks do not issue it. The Bank for International Settlements (BIS) has defined the CBDC as ***"a digital form of central bank money that is different from balances in traditional reserve or settlement accounts,"*** setting it apart from other kinds of money.

- CBDCs are a type of electronic currency that is exchangeable on an equal basis with similarly denominated cash and conventional central bank deposits. The RBI defines CBDCs as "a legal tender and a central bank liability in digital form denominated in sovereign currency and appearing on the central bank balance sheet." Token-based "general purpose" CBDCs, which are primarily available for retail transactions but may also be available for broader use; token-based "wholesale" CBDCs, whose availability is restricted and used for wholesale payment and settlement transactions; and/or account-based "general purpose" CBDCs, which are widely accessible, are some examples of the different types of CBDCs. The monetary and payments system's existing two-tier architecture permits private sector organisations to issue money or payment instruments, such as coins, to reflect their liabilities and then redeem those instruments using reserves held by central banks The introduction of synthetic CBDC (sCBDC) could re-establish a two-tier design system. However, the European Central Bank (ECB) and the Federal Reserve (Fed) explicitly reject sCBDCs and define CBDCs strictly as a digital payment instrument under the direct responsibility of the central bank, denominated in the national unit of account.

- Central bank digital currencies, or CBDCs, are now a major topic of conversation when it comes to the globalisation of economies. The method by which payments are made during a transaction has seen significant change in the last several years. The progression of money from precious metals to paper money is at a crossroads in the world, and the demise of fiat currency digital representations is imminent. Globally, central banks are investigating whether or not to implement CBDCs. the Bahamas made history in October 2020 by becoming the first nation in the world to introduce the "Sand Dollar" - for retail use. The blockchain-based digital counterpart of the Eastern Caribbean Dollar, DCash, was released by the Eastern Caribbean Currency Union in April 2021. China and Sweden are testing digital versions of their national currencies. India has also been investigating the matter; in a report to the Central Government, the Inter ministerial Committee suggested that consideration be given to the introduction of an Indian CBDC.

- The digital rupee could theoretically be designed as a "direct CBDC," in which the central bank maintains complete control over all aspects of the currency, from issuance to ledger maintenance and legal compliance, or as a "hybrid CBDC," in which the CBDC acts as a direct claim on the central bank, much like cash, with the private sector continuing to concentrate on providing customer-facing services like onboarding, KYC, payment execution, etc. These provisions are based on the central bank's authority to ensure financial stability and protect customer funds. In the event of insolvency or other failures, the central bank would retain copies of all retail CBDC holdings and be legally authorized to transfer customers between payment service providers (PSPs). Additionally, the central bank could Establish an "intermediated CBDC" model—an advanced form of the hybrid system—where the private sector would maintain full ownership of the retail ledger, with the central bank having no direct access, thus preserving its regulatory oversight while respecting the operational independence of private entities.

- When it comes to Central Bank Digital Currency (CBDC) there isn't global experience to rely on and the technology is constantly changing, mostly existing in theory rather than actual implementation. India has already implemented the initial phase of this infrastructure and is actively leveraging the country's significant technological expertise for its ongoing development and future scalability.

- The use of Central Bank Digital Currencies (CBDCs) is expected to bring about significant outcomes. Cryptocurrencies and stable coins have gained widespread popularity, yet they lack the support of a government agency, making them susceptible to risks. By introducing CBDCs backed by the Reserve Bank of India (RBI) as legal tender, India can maintain its monetary independence in the face of private digital currencies. The introduction of a CBDC such as the 'Digital Rupee' is expected to discourage

the adoption of foreign CBDCs, thereby mitigating potential risks linked to Indian citizens transacting with interest-bearing digital currencies issued by other countries, thereby averting potential risks associated with transactions in interest-bearing digital currencies from other countries put through by Indian citizens. This move would safeguard India's ability to regulate its policies independently and mitigate data security concerns linked to CBDC transactions. The players, particularly mobile payment systems, offer diverse payment services that incentivize public usage. These entities have gained prominence among consumers. These players have also integrated their services into their social media platforms. However, there are concerns about the risks associated with these technologies, including the potential for monopolies, barriers to entry, data misuse, and technology safety. Additionally, there is a possibility of interoperable services that could lead to market fragmentation, increased costs, and complexities that may impact consumers. CBDCs could potentially address these issues by ensuring access to bank money for retail purposes. They might also emerge as competitors to existing payment systems by offering transaction costs for cross-border payments. Furthermore, CBDCs could allow for interest rates to be assigned directly to the currency itself, a feature not found with cash. Issuing interest-bearing CBDCs directly to households could enhance the Reserve Bank of India's (RBI) ability to manage monetary policy effectively. CBDCs have the potential to improve payment system efficiency and safety, promote financial inclusion, and stimulate innovation and competition within the financial sector. They can also enhance integrity by improving transaction visibility and tracking while reducing illicit activities like money laundering. Moreover, they could enable targeted transfers of aid or stimulus packages to individuals or businesses during times of crisis.

- The Reserve Bank of India (RBI) has announced plans to introduce the digital rupee starting in 2023-24. In this phase of currency evolution in India, several challenges need to be addressed. Allowing households and businesses direct access to central bank liabilities could significantly expand the central bank's role. To accommodate a model that combines elements of intermediated and synthetic CBDC, given that the Digital Rupee combines elements of intermediated and synthetic CBDC, the RBI is continuously refining the necessary technological infrastructure and regulatory frameworks to ensure smooth implementation and effective management

- The design features of the CBDC should cater to diverse demographics, taking into consideration levels of literacy and user friendliness, to bridge the divide. To ensure adoption of the digital currency, an ecosystem with reliable internet connectivity, safe electronic devices at affordable prices, and adequate technological literacy will be essential. Balancing citizen preferences for privacy and accessibility is crucial. While cash remains popular due to its anonymity feature, replicating anonymity in the digital rupee may raise concerns about money laundering, tax evasion, or illicit activities. Policy responses could include implementing strong data privacy measures to protect user information and ensure transaction confidentiality, except in cases where disclosure is required for law enforcement or regulatory purposes. However, unlike cash, CBDCs would not provide complete anonymity, as certain transaction data may need to be accessible for oversight and compliance. CBDC can be designed to offer anonymity, or pseudonymity, in varying degrees relative to alternative payment methods.

- India has recently made strides in digitising processes, particularly in the realm of financial transactions. The Reserve Bank of India (RBI) has been actively supporting the growth of payment methods. In 2007, the National Payments Corporation of India (NPCI), a profit organisation supported by numerous private and public banks, recognised the diverse needs of the economy. They introduced products aimed at facilitating payments for a variety of transactions. A standout innovation in this field is the Universal Payment Interface (UPI), which functions as a real-time payment system enabling fund transfers between two banks via devices. Platforms like Google Pay, PayTm, and PhonePe have significantly popularised payments through this interface. While private sector-based payment systems may be effective within India, a currency backed by the government would be essential for trust and integration.

- There is still a pending decision regarding currency usage. Enforcing a ban on currencies could pose challenges due to the complexities involved in tracking them, as well as their decentralised and global nature. Although the Inter Ministerial Committee suggested prohibiting cryptocurrencies in its report, it acknowledges that there are ways to bypass these restrictions through unauthorised VPNs or by taking advantage of differing regulatory environments in more accommodating jurisdictions. Some argue that a ban

could drive these activities underground, making them harder to monitor for various purposes. The Honourable Finance Minister has mentioned that the government will determine the status of digital currencies, and a 30% tax has been imposed on profits from transactions involving digital assets falling under this category.

3.4 Design Decisions and Kind of CBDC that will be granted :

As CBDCs represent versions of currency, it is important for them to incorporate all the essential characteristics of physical money. The design of a CBDC is influenced by its intended functions and its potential impacts on payment systems, monetary policy, and the overall structure and stability of the financial system. It is crucial that the design features of CBDCs are implemented with possible disruptions in mind. When considering the issuance of CBDCs, key design decisions include determining the type of CBDC to issue (wholesale or retail), selecting models for issuance and management (direct, indirect, or hybrid), choosing between token-based or account-based forms, deciding on instrument design (remunerated or non-remunerated), and defining the level of anonymity. The two main categories for issuing CBDCs are purposeful retail (CBDC R) and wholesale (CBDC W). Retail CBDC would be accessible to a range of users, including individuals, the sector, and businesses, while wholesale CBDC would have limited access reserved for specific financial institutions. While Wholesale Central Bank Digital Currency (CBDC) is designed for facilitating interbank transfers and other wholesale transactions, Retail CBDC serves as a form of currency primarily aimed at retail transactions. The Central Bank directly backs Retail CBDC, making it a payment option. On the other hand, Wholesale CBDC has the capability to revolutionise financial transaction settlement systems by enhancing efficiency and security. Considering the advantages of both types, there could be value in introducing both CBDC W and CBDC R.

3.5 Model for managing and issuing CBDCs:

There are two approaches to issuing and overseeing CBDCs: the single-tier model and the two-tier (indirect) model. In the single-tier model, the central bank is responsible for all aspects of the CBDC system, including issuance, account management, and transaction verification. Conversely, in the two-tier (indirect) model, the central bank issues the CBDC but delegates the management and distribution to intermediaries such as commercial banks and payment service providers, with each entity playing its specific role in the system. In this setup, the central bank indirectly provides CBDC to consumers through intermediaries. Any consumer claims are handled by these intermediaries, while the central bank focuses on payments to them. The indirect model mirrors the management of currency, where banks oversee tasks like distributing notes to the public, managing accounts complying with KYC and AML/CFT regulations, combating money laundering and terrorism financing, and verifying transactions

3.6 Role of Various types of CBDC:

Central Bank Digital Currency (CBDC) can be categorised into two types: token-based and account-based systems. In a token-based CBDC setup, the currency functions like banknotes, where whoever holds the tokens is assumed to have ownership of them. On the other hand, an account-based system necessitates keeping records of balances and transactions for all CBDC holders to establish ownership of balances. In a token-based CBDC, the recipient must validate their ownership of the token, while in an account-based CBDC, an intermediary verifies the account holder's identity. When comparing the advantages of both forms, a token-based system is often seen as suitable for retail transactions (CBDC R) because it closely resembles physical cash. Conversely, an account-based CBDC may be more suitable for transactions (CBDC W).

3.7 Selecting Technology:

Since CBDCs are digital, it is essential to consider the underlying infrastructure. The two primary options for building this infrastructure are a centrally controlled database and distributed ledger technology (DLT). These two options differ significantly in terms of efficiency, scalability, and resilience against points of failure. When deploying CBDCs, it is crucial to prioritize technology factors such as cybersecurity, technical stability, system resilience, and robust governance standards to ensure long-term sustainability. During the design phase, it is advisable to keep the architecture flexible and adaptable to evolving technological needs and future innovations in CBDC development.

3.8 Instrument Construction:

Introducing a system where Central Bank Digital Currencies (CBDCs) generate interest could make them more appealing as a store of value. However, transforming CBDCs from resembling cash to behaving like deposits might lead to the risk of disintermediation in the system. This could potentially impact banks by reducing their ability to create credit in the economy. Given that cash does not accrue interest, it would seem reasonable to provide CBDCs without interest-bearing features.

3.9 Level of Confidentiality:

In order for CBDC to function effectively as a

medium of exchange, it must encompass the essential characteristics of physical currency, such as anonymity, universality, and finality. Maintaining privacy for a digital currency poses a significant challenge, as every digital transaction would inevitably leave behind a trace. When considering a Central Bank digital currency (CBDC), it is important to carefully evaluate the level of anonymity that should be incorporated into its design. From an economic standpoint, it may be beneficial to consider implementing a level of anonymity for low-value transactions with a central bank digital currency, similar to the anonymity provided by physical cash. It is critical to adopt a careful and thoughtful approach when issuing CBDC to understand its purpose and advantages. This approach should include the necessary precautions to address any potential challenges and risks. The goal is to establish a system that is accessible to all, promotes healthy competition, and can adapt to advancements in innovation and technology. CBDCs are currently in various stages of conceptualization, development, or pilot programs across the world, with countries like China (Digital yuan) conducting large-scale trials, the Bahamas (Sand Dollar) fully operational, and countries like Sweden and Uruguay exploring pilot projects for future implementation. Thus, without a previous example to follow, it may be necessary to engage in thorough stakeholder consultation and iterative technology design to create a solution that satisfies the needs of all parties involved. The goal of CBDC is to complement existing payment systems, not to replace them, by providing users with an additional payment option. Backed by advanced payment systems in India that are affordable, accessible, convenient, efficient, safe, and secaure, the Digital Rupee (e₹) system will strengthen India's digital economy, enhance the efficiency of monetary and payment systems, and promote financial inclusion.

Chapter 4

Key Drivers for Central Bank Digital Currencies

4.1 Examples of Various jurisdictions providing different justifications for adopting CBDCs.

India presents an interesting scenario where the amount of cash in circulation has increased, despite the rapid advancement of digital payment systems. The value of banknotes in circulation continued to increase, though the growth rate moderated in the most recent periods.

The growth of the currency in circulation (by value) recovered to 5.8 per cent during the fiscal year 2024–25, up from 4.1 per cent a year earlier, as the impact of the withdrawal of the ₹2,000 notes subsided. In terms of volume, banknotes in circulation registered an increase of 5.6 per cent during 2024–25. This trend highlights that despite the widespread popularity of electronic payment methods, the demand for physical cash remains robust in the Indian economy.

(Note: The data has been updated to reflect the growth rates for FY 2024-25 and the preceding year, which is the most current public information available.)

Here are a few examples:

- Central Banks are exploring ways to encourage the adoption of electronic currency, following the example of countries like Sweden.
- Jurisdictions that heavily rely on physical cash are looking for ways to streamline the issuance process, taking inspiration from countries like Denmark, Germany, Japan, and even the US.
- Countries with geographical barriers that make cash movement difficult are considering implementing Central Bank Digital Currencies (CBDCs), as seen in The Bahamas and the Caribbean, which consist of numerous spread-out islands.
- Central Banks are aiming to address the growing demand for digital currencies among the public, as evidenced by the increasing use of private virtual currencies. This way, they hope to prevent the potentially harmful consequences of such private currencies.

4.2 Advantages of CBC over other Digital Payment System:

Additionally, CBDCs offer distinct benefits compared to other digital payment systems. As a sovereign currency, it guarantees settlement finality, thereby mitigating settlement risk in the financial system. CBDCs have the potential to facilitate a faster and more efficient integration of cross-border payment systems. India has shown remarkable advancements in the field of digital payments, as highlighted in the RBI Annual Report 2021–22. The payment systems are accessible around the clock, every day of the year, for both retail and wholesale customers. They operate in real-time, with transaction costs that are among the lowest globally. Users have a diverse range of options for conducting transactions, and digital payments have experienced a remarkable compound annual growth rate of 55% over the past five years.

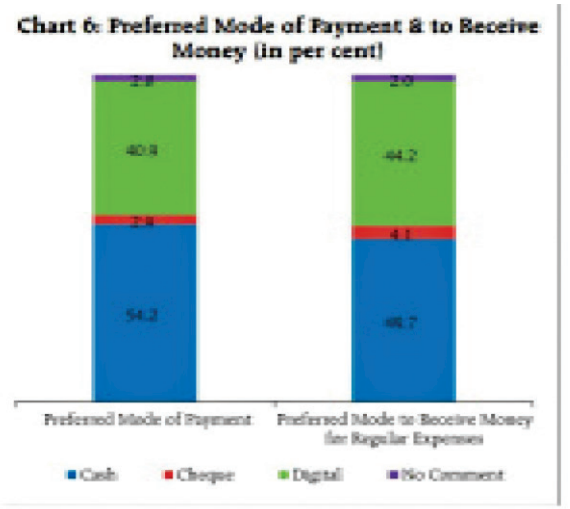
4.3 Decrease in Expenses entailed in handling of Physical Currency:

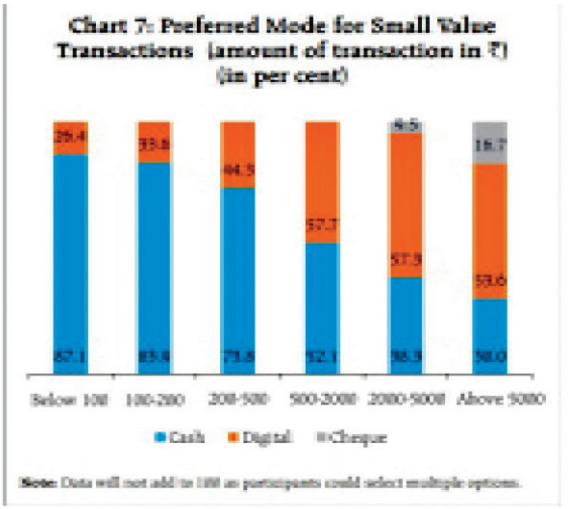
The cost of cash management in India remains substantial. The expenditure on security printing for the fiscal year 2021-22 (April 1, 2021, to March 31, 2022) amounted to ₹4,984.80 crore, representing an increase compared to the expenditure of ₹4,012.10 crore in the previous fiscal year 2020-21. *(The cost of cash management in India remains substantial. The financial outlay for security printing surged by almost 25 per cent in the fiscal year 2024-25, reaching ₹6,372.8 crore, compared to ₹5,101.4 crore in the previous year. This increase was primarily driven by a heightened demand for banknote printing, as detailed in the Reserve Bank of India's (RBI) annual report released on May 29)* This expense, which does not take into account the implicit environmental, social, and governance (ESG) cost entailed in printing money, is mainly shouldered by four stakeholders: the general public, businesses, banks, and the Central Bank. CBDC would have significant impact on the value of the money-issuing function economising on the operational costs. These expenses include cost of printing, storage, transportation, and replacement of banknotes, Setting up of a CBDC may involve sinking of lump sum initial costs, but would minimise the ongoing operating costs. The cost-effectiveness of cash management in using CBDC compared to that involved in management of physical currency is an additional incentive for its introduction. Besides, it is considered environmentally friendly. By implementing CBDC, the country can economise on costs by obviating the need for various processes involved in distributing physical currency. This

is in line with the country's higher cash requirement. Further , it is anticipated that CBDC will facilitate smooth transactions due to its wide distribution and areas where accessing physical currency is difficult.

4.4 Promote the Advancement of Digitisation in order to achieve a cashless Economy:

India presents an interesting scenario where the amount of cash in circulation has increased, despite the rapid advancement of digital payment systems. Despite the increasing popularity of electronic payment methods, there has been no decrease in the demand for cash. The value of banknotes in circulation registered 16.8% increase during 2020–21 and a 9.9% increase during 2021–22. In terms of volume, there was 7.2% increase in banknotes in circulation during 2020–21 and a 5.0% increase during 2021–22. (Source: RBI Annual Report for the year 2021-22)





Source: RBI Bulletin April 2021

In the fiscal year 2021–22, there was a significant rise in the number of banknotes in circulation. This was mainly driven by the public's cautious approach to holding cash as a precautionary measure during the second wave of the COVID-19 pandemic. A pilot survey conducted between December 2018 and January 2019 by the RBI on the retail payment habits of individuals in six cities revealed that cash continued to be the preferred mode of payment and receiving money for regular expenses, with digital mode coming in second. Small-value transactions, typically under ₹500, are primarily conducted using cash. In uncertain situations, such as during COVID-19 pandemic, CBDC can be a more favourable option for holding central bank money compared to cash. Furthermore, if individuals receive a reasonable level of anonymity, their preference may shift towards accepting Central Bank Digital Currency (CBDC). This is because cash transactions are often preferred for their ability to provide greater privacy and anonymity, particularly for routine expenses and small payments where individuals may wish to avoid digital tracking. This will contribute to the ongoing digitization efforts in the country.

The Reserve Bank Digital Payment Index (RBIDPI) shows a substantial increase in the adoption and expansion of digital payments throughout the country since it was introduced.

Period	RBI-DIP INDEX
March 2018 (Base)	100
March 2019	153.47
September 2019	173.47
March 2020	207.84
September 2020	217.74
March 2021	270.59
Sepetmber 2021	304.06
March 2022	349.30

Source: RBI DPI

This rise suggests that digital payments are continuing to grow and expand in the country, highlighting the increasing interest of Indian

citizens in utilising digital payment methods. Thus, the digital currency issued by the central bank would offers an additional option for advancing digital payments, alongside the various other digital payment methods available. Its user-friendly nature and government backing make it a convenient choice.

4.5 Promoting Competition, Efficiency and Innovation of payments:

The digital revolution has had a profound impact on payment and settlement systems, offering a wide range of digital options for everyday use. There are now a variety of options available to consumers when it comes to choosing a payment method for their transactions. They consider the value of a payment method in different situations, as each mode of payment serves a specific purpose. Transitioning from cash to electronic payments has a significant impact on the diversity and resilience of the payment landscape. This shift emphasises the growing reliance on electronic payment systems.

CBDC has the potential to strengthen payment resilience and offer essential payment services beyond the realm of the commercial banking system. It offers a fresh approach to facilitate transactions and broaden the choice for selection of payment methods, especially for online shopping (where cash is not viable, except for Cash on Delivery (COD) orders). The CBDC-based payment system is not anticipated to replace other existing payment options. Instead, it will complement them by offering an additional avenue for the general public to make payments. Just like an economist would predict, the introduction of CBDC would lead to an expansion of choices and increased healthy competition among financial service providers, payment system operators, and commercial banks. This, in turn, would lead to increased cost and time efficiencies, as we have seen with the emergence of many payment products in the past. Commercial banks hold the majority of private money in a modern economy. This money takes the form of demand deposits, which are the banks' liabilities. One important aspect of bank demand deposits is that commercial banks ensure that they can be converted into central bank money at any time and at a fixed price. This statement means that deposits or digital claims held with commercial banks or other entities can be exchanged for official central bank-issued currency whenever the depositor chooses, and this exchange occurs at a predetermined, stable rate—usually one-to-one (1:1). Essentially, the value of these claims remains directly linked to the central bank's currency, providing confidence that the funds can be converted into official money without loss or fluctuation in value.This helps to preserve the value of the money. However, in a fractional reserve system, a commercial bank, even if financially stable, may encounter difficulties in quickly fulfilling a sudden increase in requests to convert a significant amount of bank deposits into central bank money.

There is a notable distinction between central bank money and commercial bank money. The central bank has the ability to fulfil its obligations using its own nonredeemable money, Non-redeemable money" refers to currency issued by the central bank that cannot be exchanged or redeemed for a physical commodity or other assets. Essentially, it means the currency has no backing by gold, silver, or other tangible assets—it's a fiat money. The value is based on the trust and authority of the issuing central bank and government, rather than being convertible into a specific underlying material. In most modern economies, central bank-issued currency (like banknotes and digital currency) is considered non-redeemable because it is fiat money that derives its value from government decree and monetary policy rather than physical backing. Whereas commercial bank money carries the risk of relying on another party. The central bank's money is the only monetary asset in a domestic economy that is free from credit and liquidity risk. Thus, settling payments in financial market infrastructures is considered the preferred asset, as outlined in the CPMI-IOSCO Principles for Financial Market Infrastructures (2012). Thus, an economist would argue that an e₹ would provide the general public with widespread access to digital currency, eliminating concerns about credit risk and liquidity risk. Therefore, it could serve as a stable foundation for private-sector innovations to meet current and future payment service requirements, as well as the evolving preferences and demands of consumers and businesses for faster, more secure, and convenient payment options. This will also contribute to creating a fairer environment for companies of all sizes to engage in payment innovation. For smaller firms, the costs and potential risks involved in issuing their own secure and trustworthy forms of private digital currency or payment tokens may be prohibitively high. A CBDC could address this obstacle and enable private sector innovators to concentrate on developing new access services, distribution methods, and associated service offerings. Ultimately, a CBDC has the potential to enhance the capabilities needed to keep up with the ever-changing demands of the digital economy.

In addition, payments made with CBDCs are considered final, which helps to minimise settlement risk within the financial system. CBDC has the potential to

revolutionise interbank settlement by providing market participants with a range of options. These options include settling in Central Bank or commercial bank accounts, with or without the involvement of clearing corporations. Alternatively, settlement can be done on a bilateral basis, bypassing the need for a central counterparty by directly utilising CBDC accounts. It can be likened to a transaction based on cash, where instead of using physical money, CBDC is exchanged, resulting in an immediate settlement. This is expected to bring further efficiency to the payment system.

4.6 Examine the potential of CBDCs to enhance cross-border Transaction:

The current payment systems in India are affordable, accessible, convenient, efficient, safe, and secure, which is a source of national pride. However, the 'Cross Border Payments' sector is particularly poised for transformation and has the potential to benefit from new technologies. According to the World Bank, India received a staggering ***Facilitating Global Remittance Flows and Reducing Costs.*** According to the Reserve Bank of India (RBI) and World Bank data, India remains the world's top recipient of remittances, hitting a new milestone recently.

India received a record-high $135.46 billion in inward remittances in the fiscal year FY25, marking a 14% increase over the previous year. This massive inflow, which contributes over 10% to India's total current account receipts, underscores the critical importance of a stable and cost-effective remittance infrastructure.

Crucially, the remittance landscape has shifted:

- ***Top Contributor*:** The United States has surpassed the Gulf nations, emerging as the largest single source of remittances, accounting for 27.7 per cent of the total in FY24 (up from 23.4% in 2020-21).

- ***Source Shift:*** Advanced Economies (AEs), including the US, UK, and Singapore, now collectively contribute over half of the remittances, driven by a surge in high-skilled Indian migration.

The cost of ***sending remittances*** to India is of utmost importance, considering the significant Indian diaspora worldwide and the potential risks associated with informal or illegal channels. While the cost of sending remittances to India is generally lower than the global average, it remains a burden on expatriate workers.

CBDCs, especially when designed for cross-border use (Interoperable CBDC), have the potential to disrupt traditional, high-cost remittance channels. By enabling direct, real-time, peer-to-peer transfers between countries, CBDC can:

- ***Drastically Reduce Costs:*** By bypassing multiple intermediary banks and complex correspondent banking systems, the transaction costs can be minimized, helping India meet the Sustainable Development Goal (SDG) target of reducing remittance costs to 3% or less.

- ***Mitigate Risks:*** Formal CBDC channels offer a secure, sovereign-backed alternative, thereby reducing the reliance on informal or illegal channels, which carry potential risks related to money laundering and security.

CBDC is thus a vital tool for leveraging India's diaspora strength while ensuring the transfer of funds remains efficient, secure, and affordable.

Source the News : India Gets Record $135.46B in FY25 Remittances, Up 14%. This video discusses the record high remittances India has received in the latest fiscal year. Source: https://www.youtube.com/watch?v=-1xPh0vjSAo&start=5

The United States emerged as the largest contributor, accounting for more than 20 percent of these funds. The cost of sending remittances to India is of utmost importance, considering the significant Indian diaspora worldwide and the potential risks associated with informal or illegal channels.

Enhancing cross-border payments has been a top priority for the G20. They have endorsed a comprehensive programme to tackle the main challenges associated with cross-border payments, including high costs, slow speed, limited access, and lack of transparency. We need to address the frictions these challenges have created. An economist would argue that the implementation of faster, cheaper, more transparent, and more inclusive cross-border payment services would have far-reaching advantages for individuals and economies across the globe. These benefits would include supporting economic growth, facilitating international trade, promoting global development, and enhancing financial inclusion. BIS published the results of a survey it conducted in June 2021. The survey highlights the potential of CBDCs to address existing challenges in cross-border payments. Central banks can further enhance this potential by considering the international aspect in the design of CBDCs from the outset.

According to the BIS, it will be challenging to realise the potential benefits unless central banks prioritise cross-border considerations and international coordination in their CBDC design right from the beginning. Central banks are currently examining the risks, benefits, and different designs of CBDC, primarily with a strong emphasis on meeting domestic needs. Considering the potential impact of CBDCs, even when limited to domestic use, it becomes essential to collaborate and establish consensus among CBDCs from different jurisdictions. If properly coordinated, the potential of CBDCs to improve cross-border payments could be maximised. The efficiency of cross-border payments, particularly in relation to wholesale CBDC projects, is a significant factor driving the issuance of central bank digital currencies (CBDCs), according to a BIS survey among central banks in late 2020. CBDCs have the potential to drive innovation in cross border payments, enabling transactions to be completed instantly and addressing various challenges such as time zone differences, exchange rate fluctuations, and legal and regulatory requirements across different jurisdictions. In addition, the interoperability of CBDCs offers ways to reduce risks and obstacles in cross-border and cross-currency transactions while strengthening the position of central bank money as a foundation for the payment system. Thus, the exploration of issuing CBDC is largely motivated by the potential benefits it could bring in addressing challenges in cross-border payments.

4.7 Advocate for greater access to financial services for all individuals:

In March 2022, India's annual FI-Index stood at 56.4, compared to 53.9 in March 2021. This highlights the need for policymakers to make further coordinated efforts in order to achieve the desired goal of strengthening financial inclusion in the country, despite the various measures already taken by different stakeholders. There are several obstacles to achieving financial inclusion. These include inadequate physical infrastructure, particularly in remote areas, unreliable connectivity, a lack of tailored financial products, sociocultural barriers, and a failure to integrate credit with other financial services such as insurance and pensions. Through appropriate design choices, CBDC has the potential to offer the public a secure form of digital currency that can meet a wide range of transaction requirements. It aims to increase accessibility to financial services for those who are currently unbanked or underbanked. Having offline functionality as an option will make it possible to transact CBDCs without relying on the internet. This will provide access to regions with limited or no internet connectivity. It will also generate digital records of the unbanked population in the financial system, making it easier for them to access credit. The universal access features of a CBDC, such as offline functionality, compatibility across multiple devices, and the provision of universal access devices, have the potential to revolutionise the CBDC system. These features will enhance the system's resilience, reach, and financial inclusion, making it a game changer.

4.8 Maintain Public Trust in the national currency despite the rise of Digital Assets:

Christine Lagarde, President of the European Central Bank (ECB), chaired the group of central bank governors responsible for the report titled 'Central bank digital currencies: foundational principles and core features'. In releasing the report, Lagarde emphasised the importance of central banks in maintaining public trust in our currency. Central banks should enhance their domestic efforts by closely collaborating to facilitate the exploration of central bank digital currencies. This collaboration will help establish reliable principles and foster innovation. The widespread use of cryptographic assets can present substantial risks concerning money laundering and the financing of terrorism. In addition, the continued use of crypto assets poses a potential risk to the objectives of monetary policy. It has the potential to create a separate economy and may undermine the transmission and stability of the domestic currency. This will also have a negative impact on the enforcement of foreign exchange regulations, particularly in terms of evading capital flow measures. Furthermore, the development of CBDC could provide the public with a secure virtual currency that offers genuine benefits without the uncertainties associated with private virtual currencies. It can potentially meet the demand for secure digital currency while also safeguarding the public from the excessive volatility that certain virtual digital assets can exhibit. Therefore, ensuring the confidence of the general public in the Indian rupee in light of the increasing popularity of crypto assets is another significant reason for the introduction of CBDC.

Chapter 5

Introduction to Central Bank Digital Currency (CBDC)

5.1 Introduction

Designing a currency for RBI ,the central bank of India necessitates careful consideration to ensure its effectiveness, security, and seamless integration into the country's financial system. Following key factors may be considered when introducing CBDC in India:

- **Selecting the Appropriate Technology:** Select a technology system that is capable of securely and efficiently processing transactions on a large scale. Ensure compatibility with payment systems and networks to facilitate seamless integration for banks and other financial services.

- **Ensuring Accessibility for all:** Create a currency that is user-friendly and accessible to individuals with limited technology resources. Ensure that all individuals have equal access to and can effectively utilise the digital currency, thereby promoting inclusivity and participation in various activities.

- **Ensuring Security:** Implement safeguards to protect individuals' personal information and transaction data. Implementing encryption authentication methods and adhering to secure storage rules ensure the confidentiality and security of transactions.

- **Ensuring Regulatory Compliance:** Ensure that the design of CBDC aligns with the existing relevant laws/ regulations / rules and monetary policies in India. Establishing regulations to verify identities, combat money laundering, and ensure a thorough understanding of customers is crucial in order to prevent any possible misuse of CBDC.

Ensuring Scalability and Performance: Create a CBDC that can effectively handle high transaction volumes during peak periods, ensuring A seamless and dependable system can be supported through various strategies, such as sharding and Layer 2 solutions.

☛ **Sharding** is a technique used in blockchain technology that involves splitting the network into smaller, manageable segments called "shards." Each shard processes its own transactions in parallel, significantly improving the system's scalability and transaction speed by reducing congestion on the main network.

☛ **Layer 2 solutions** refer to protocols built on top of the main blockchain (Layer 1) to handle transactions off-chain or in a separate layer. These solutions aim to increase transaction throughput, reduce costs, and enhance speed while maintaining the security and decentralization provided by the main blockchain. Incorporating these strategies helps ensure that a CBDC system remains efficient, scalable, and resilient under high demand. or off-chain protocols to enhance transaction speed and network capacity.

☛ **Emphasising the importance of interoperability standards:** Establishing standards for interoperability is crucial to ensure the smooth integration of CBDC with payment systems both domestically and internationally. Supporting cross-border compatibility and facilitating international transactions is crucial for adhering to international norms.

☛ **Establish a framework for governing how CBDC is issued, distributed, and managed, while outlining the roles of stakeholders**. Implementing robust oversight measures is crucial to ensure accountability, integrity, and adherence to regulations.

☛ **Promoting Education and Awareness:** Develop initiatives and awareness campaigns to educate the public, businesses, and financial institutions about the benefits and practical uses of CBDC. Highlight the potential benefits of CBDC in improving financial transactions, fostering innovation, and promoting economic inclusivity in India.

By following these principles, India can create a comprehensive CBDC framework that would effectively utilise the evolving technologies, promote financial inclusivity, prioritise security measures, and align with regulatory requirements. This approach will help maximise the advantages of currency for India's financial landscape.

5.2 Types of CBDC and How they Works:

We can categorize CBDC's usages and tasks into two types: general-purpose (retail) CBDC R and wholesale CBDC W.

All private individuals and businesses outside the financial sector can access CBDC R. Conversely, institutions with restricted access, such as certain financial intermediaries or specialized entities, primarily use wholesale CBDCs for their specific operational needs, such as interbank settlements and large-value transactions.

CBDC W has been utilised in projects like Project Jasper in Canada and Ubin in Singapore to enhance the efficiency of interbank payments and securities settlements.

Inclusions are likely to lean towards issuing CBDC R. Implementing CBDC Wholesale (CBDC W) has the potential to transform the way financial transactions are settled across various banking sectors. It could significantly improve the efficiency, security, and speed of settlement processes in areas such as the government securities (G-Sec) segment, the interbank market, and the broader capital markets. This is because it would make operations safer and more efficient in terms of managing liquidity and cost collateral. "Cost collateral" refers to the assets or guarantees that parties provide to secure or back transactions, ensuring that the value exchanged is protected and risks are minimized. Managing cost collateral involves optimizing the assets used to collateralize transactions to reduce associated costs, such as funding expenses, storage, or regulatory compliance fees. Effective management of cost collateral can lower overall transaction costs and improve liquidity efficiency. Additionally to benefits like eliminating the need for settlement guarantee infrastructure or collateral requirements to mitigate settlement risks.

The primary purpose of CBDCWs is to facilitate interbank transfers and other wholesale transactions. They essentially serve the same function as bank reserves, but come with added features.

One example pertains to the concept of payments, which process a payment only upon meeting specific conditions. Delivery Versus Payment (DVP) is a settlement mechanism that ensures securities or assets are transferred only if the corresponding payment is made, thereby reducing settlement risk. Real-Time Gross Settlement (RTGS) systems provide the infrastructure for immediate, irrevocable transfer of funds between banks on a gross (transaction-by-transaction) basis.

The connection between the two lies in the fact that RTGS systems are designed to support DVP arrangements, enabling the simultaneous and secure settlement of payments and securities in real time. This integration helps to minimize systemic risk and enhances the safety and efficiency of large-value transactions, such as securities trades and interbank payments.

Essentially, CBDC wholesale (CBDC Ws) have the potential to be programmed using smart contract technology, enabling automation of transactions and enhanced risk mitigation through predefined rules and self-executing agreements. Additionally, the implementation of CBDCs would rely on advanced technological platforms such as blockchain, distributed ledger technology (DLT), or other secure digital infrastructure.

This new approach—focusing on standardized, interoperable platforms—would facilitate the development of CBDC systems that support seamless integration across different financial networks and payment systems, thereby promoting interoperability and ensuring compatibility with existing and future financial infrastructures.

Furthermore, exploring CBDC W could include:

1. Establishing a market for asset classes that are over the counter (OTC) and settled bilaterally or outside of central counterparty clearing arrangements, such as commercial papers (CPs), certificates of deposits (CDs), etc.

2. Providing access for purchasing assets, like government securities (G-sec) CPs and CDs, participating in auctions, etc., without going through traditional bank accounts.

3. Tokenizing government securities (G-secs) could potentially enable non-residents to invest in these asset classes.

The adoption of these initiatives will depend on upgrading exchanges and trading infrastructure, as well as integrating CBDC W with real-time gross settlement systems.

The acceptance of the CBDC W settlement will depend on whether it costs less than existing settlement methods, such as liquidity savings, guarantees, margin funding, and more.

Consumers primarily use CBDC R as a form of cash. India already possesses a comprehensive payment

infrastructure, including options such as RTGS, NEFT, and UPI, coupled with a substantial growth in digital transactions. Introducing CBDC R would offer a bank-backed tool for direct access to central bank funds for payments and settlements. Advocates suggest that it could enhance the resilience of a country's consumer payment systems. In times of technical issues disrupting payment infrastructures, CBDC can serve as an alternative means for digital transactions. Additionally, CBDC has the potential to decrease liquidity and credit risks within payment systems (Dyson and Hodgson, 2016). Considering the benefits of CBDC W and CBDC R, there could be value in introducing both forms.

5.3 Role of Central Bank and Other Entities: Who oversees the administration of the CBDC:

When designing a CBDC, one critical aspect to consider is the roles played by both the bank and the private sector in enabling access to and utilization of a CBDC. There exist three models for issuing and managing CBDCs, each distinguished by the legal claim structure and record-keeping methods employed by the central bank

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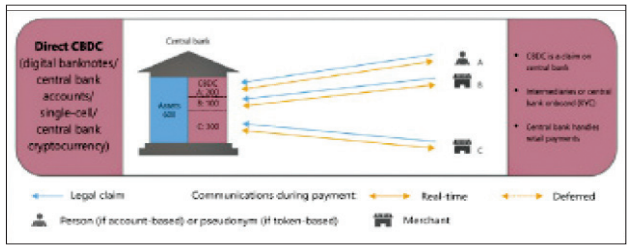
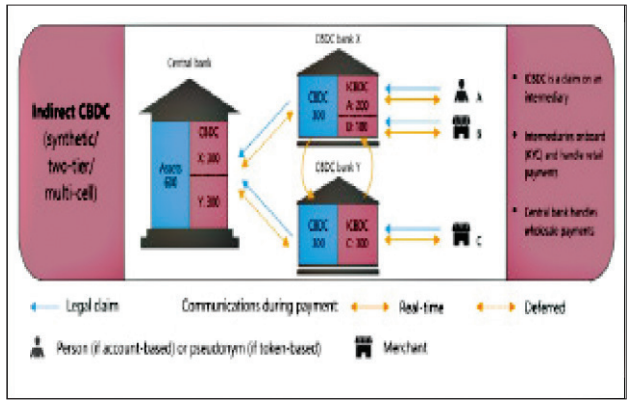
(A) Single-tier model : This model, also known as the "Direct CBDC Model," entails the central bank taking on responsibility for overseeing all aspects of the CBDC system, including issuance, account management, transaction verification, and more. In this setup, the central bank itself maintains the ledger, and its servers process and record all payment transactions. Under this model, CBDC holders have a claim on the central bank, which keeps detailed records of all balances and updates them after each transaction. The main advantage of this approach is its robustness; as the central bank possesses information about account balances, it can easily fulfil claims since all necessary verification data is readily accessible. However, a significant drawback of this model is that it limits sector involvement and impedes innovation within the payment ecosystem. This design intends to eliminate or reduce the role of intermediaries by enabling direct interactions between the central bank and end users, allowing customers to hold and transact CBDC directly with the central bank rather than through commercial banks or other intermediaries. This new technology has the potential to shake up the system and increase the workload for central banks when it comes to handling customer registrations, KYC, and AML verifications, which could pose challenges and incur additional expenses for the central bank.



Source: Direct Model, Source: Bank for International Settlements (BIS))

B) Two-Tier Model (Intermediate Model): The inefficiencies of the single-tier model suggest structuring CBDCs within a two-tier framework, where both the central bank and other service providers have roles. Within this architecture, there are two models i.e. Indirect Model and the hybrid model.

Indirect Model: In this setup, consumers would store their CBDC in an account. A bank or service provider would provide the wallet. The responsibility for fulfilling requests would lie more with these intermediaries than with the central bank. To ensure customer consistency, the central bank would only monitor CBDC balances held by these intermediaries.

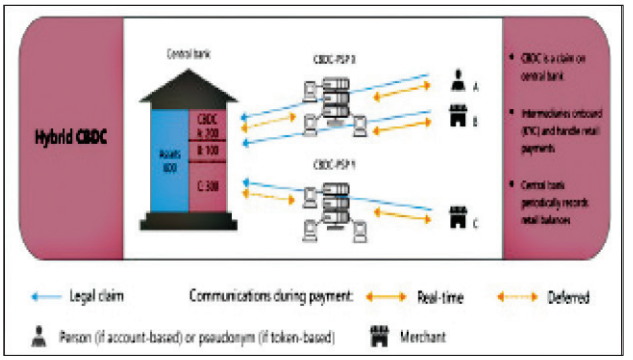


Source: Indirect Model, Source: Bank for International Settlements (BIS))

Hybrid Model: This model combines a direct connection to the bank with a private sector communication layer. The central bank issues CBDC to entities that then undertake all customer-related activities. In this setup, payment service providers act as middlemen offering services to consumers, while the central bank maintains a record of consumer transactions.

This system operates using two components: the intermediaries, such as commercial banks or payment service providers, handle consumer payments and transactions, while the CBDC itself serves as a digital claim or ownership stake issued and backed by the central bank. The central bank also maintains a ledger of all transaction.

The central bank has backup technical systems in place to restart the payment system in case intermediaries face financial difficulties or technical issues.



Source: Hybrid Model Source: BIS)

5.4 An analysis of the Direct Model, Indirect Model, and Hybrid Model:

When discussing the distribution of Central Bank Digital Currency (CBDC) central banks have a range of models to consider. Let's take a look, at the Direct Model, Indirect Model and Hybrid Model;

✓ ****Direct Model**;**

- Under the Direct Model the central bank directly engages with end users to issue and manage accounts.
- Users maintain accounts directly with the central bank establishing a connection between users and the central bank.
- This model offers a high level of control and supervision for the central bank over the CBDC system, ensuring effective oversight and regulation. allowing for closer monitoring of transactions and monetary policy.

It ensures a high level of security, as transactions are recorded on the central bank's ledger, enabling effective monitoring and fraud prevention. However, the degree of privacy depends on the system's privacy features; while transparency for oversight is enhanced, user anonymity may be limited compared to cash transactions. However, implementing this model may necessitate alterations to existing infrastructure and could potentially sideline commercial banks.

✓ **Indirect Model;**

- In the Indirect Model, banks or intermediaries facilitate CBDC issuance and management on behalf of the central bank.
- Users maintain accounts with commercial banks that act as intermediaries for CBDC transactions.
- This model makes use of the banking infrastructure and network of banks enhancing access to CBDC, for a wider range of users.

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- However there may be concerns about data privacy and security with this model as transactions are handled by banks.

✓ **Hybrid Model;**

- The Hybrid Model merges aspects of both the Direct and Indirect Models providing users with flexibility and customization options.
- Users can opt to have accounts with the central bank or through commercial bank intermediaries.
- This model offers choices for account management while still allowing a connection with the central bank if preferred.
- It enables a step by step approach to implementing CBDC to accommodate user preferences.

The aim of the Hybrid Model is to balance the central bank's need for direct oversight with the practical advantages of leveraging bank intermediaries. This approach allows the central bank to maintain control over the monetary system and regulatory compliance, while utilizing the existing banking infrastructure to ensure broader accessibility, efficiency, and scalability for end users.

In essence, the choice of a CBDC model depends on the specific needs, objectives, and priorities of the central bank, as well as the overall financial environment and infrastructure in which the CBDC is to be introduced. Each model presents its pros and cons, requiring central banks to assess these factors carefully to determine the most appropriate strategy for issuing and distributing CBDC—one that aligns with regulatory standards, technological capabilities, and stakeholder preferences.

5.5 Instrument Design - Should Central Bank Digital Currencies (CBDCs) earn interest?

The issue of whether Central Bank Digital Currencies (CBDCs) should earn interest is a matter that central banks must carefully evaluate. Here are some considerations to take into account when determining whether CBDC balances should earn interest;

Arguments, in favour of CBDCs earning interest

Impact on Monetary Policy Transmission; Allowing CBDCs to earn interest gives central banks a valuable monetary policy tool, enabling them to influence interest rates directly related to the digital currency. By adjusting the interest rate on CBDC holdings, central banks can more effectively manage the level of money supply, control inflation, and stabilize the overall economy. This direct mechanism enhances the effectiveness and responsiveness of monetary policy implementation.

✓**Promoting Usage**;
Offering interest on CBDCs may incentivize individuals to hold and use currency particularly if the interest rate is competitive compared to banking products.

Providing interest can encourage the adoption and utilization of CBDCs aligning with the banks goals of promoting inclusion and enhancing payment system efficiency.

✓**Enhancing Financial Stability**;
Interest-bearing CBDCs could help prevent hoarding or abrupt shifts of funds into or out of the currency, which often occur during times of economic uncertainty or sudden shifts in investor confidence. By providing a stable and controllable digital currency, central banks can support financial stability and reduce the risk of these disruptive capital flows that might otherwise cause market volatility or undermine economic stability.

Interest on CBDCs may also discourage risky or speculative behaviours, such as excessive hoarding or rapid, impulsive fund movements, which can contribute to financial instability. By promoting responsible use of CBDCs, interest incentives can help build a more resilient financial system that is better equipped to withstand economic shocks and market fluctuations.

***Why CBDCs Shouldn't Earn Interest**;*

✓**Risk of Bank Disintermediation**;
If CBDCs offer interest rates higher, than bank deposits there's a chance people might prefer holding onto CBDCs instead of keeping money in banks.

✓**Complexity in Operations**;
Introducing interest earning CBDCs requires setting up systems to calculate and distribute interest, which could make operations more complex and costly for the bank.

✓**Impact on Monetary Policy**;
Balancing the interest rates on CBDCs with other monetary policy tools requires careful assessment. If set too high or too low, these rates could undermine the central bank's ability to control inflation, influence borrowing and lending, and maintain overall economic stability. Therefore, the central bank must evaluate the optimal interest rate levels on CBDCs to ensure they complement existing tools and effectively support price stability and economic growth.

Ultimately, whether CBDCs should earn interest depends on the central bank's broader goals, such as maintaining price stability, promoting financial inclusion, and supporting economic growth, as well as specific factors within the financial system—like the structure of the banking sector, capital market development, and stability objectives. Central banks must carefully weigh the potential benefits of interest-bearing CBDCs—such as guiding user behaviour, strengthening financial stability, and enhancing monetary policy effectiveness—against challenges such as the risks of disintermediation, operational complexities, and impacts on traditional banking models. Each central bank will need to evaluate these considerations in light of its unique economic circumstances and policy priorities before making an informed decision.

5.6 Overview of Design Features of Bahamas, Canada, ECCU, Sweden, Uruguay:

Presented below is a concise overview of the design features of central bank digital currencies (CBDCs) in the Bahamas, Canada, Eastern Caribbean Central Bank (ECCB), Sweden, and Uruguay:

Bahamas

- **Status:** The Sand Dollar was officially launched in October 2020 and is currently in active use across the Bahamas.

- **Design Features:**

✓ Operates on a blockchain-based platform with controlled access.

✓ Available nationwide through digital wallets.

✓ Supports real-time, secure, and cost-effective transactions.

✓ Aims to enhance financial inclusion in a geographically dispersed archipelago.

Canada

- **Status:** The Bank of Canada is in the exploratory and research phase for a potential CBDC called «Digital Loonie," with ongoing consultations and pilot studies.

- **Design Features:**

✓ Focuses on designing a fast, secure, and privacy-preserving digital currency.

✓ Likely to be an account-based CBDC with strong privacy safeguards.

✓ Emphasizes interoperability with existing payment systems to ensure seamless integration.

Eastern Caribbean Central Bank (ECCB)

- **Status:** The ECCB launched DCash in March 2021 as a pilot, now expanded to several member countries, with plans for broader rollout. However, the pilot faced a significant technical challenge when the platform experienced a ***system-wide outage that lasted approximately two months in early 2022***. This incident served as a critical case study on the need for robust redundancy and resilience in CBDC infrastructure.

- **Design Features:**

✓ Operates on a blockchain platform with controlled access.

✓ Designed for instant, secure cross-border and domestic transactions.

✓ Focuses on financial inclusion and boosting regional economic activity.

Sweden

- **Status:** The Riks bank is in the advanced testing phase of an e-krona pilot, with ongoing research on technical design and privacy considerations.
- **Design Features:**

✓ Focuses on creating a digital complement to cash for secure and speedy payments.

✓ Utilizes a digital ledger with strong security and privacy protections.

✓ Aims to maintain trust and stability in the payment system amid declining cash use.

Uruguay

- **Status:** Uruguay is conducting active experiments and pilot projects for an e-Peso, with ongoing assessments for potential full deployment.

- **Design Features:**

✓ Explores blockchain or centralized digital ledger platforms.

✓ Focuses on enhancing digital payment capabilities and financial inclusion.

✓ Designed to be secure, scalable, and compliant with regulatory standards.

In general, the CBDC initiatives in these countries have similar goals of improving financial inclusion, increasing efficiency in digital payments, prioritising security and privacy, and adjusting to the evolving digital economy. CBDC designs vary across countries to accommodate different economic contexts, regulatory frameworks, and technological capabilities, ensuring that they meet the specific needs of their populations and financial systems.

Chapter 6

Technology Considerations for Central Bank Digital Currency (CBDC)

6.1 Introduction:

Given its digital nature, technology considerations will always be central to CBDC. Technology plays a crucial role in translating core policy objectives—such as financial inclusion, payment efficiency, and monetary stability—into effective and practical implementations. After examining the motivations behind introducing CBDC and understanding its potential impacts, it is now important to explore the technological aspects involved in designing and deploying a secure, scalable, and efficient digital currency.The technical principle that guides the implementation of CBDC to accomplish the desired goals may include:

- Ensuring robust cybersecurity measures, technical stability, and resilience.
- **Strong technical governance:** The selection of the technology platform is a crucial consideration. The platform can be either a distributed ledger or a centralised system.

Furthermore, policy imperatives will dictate various technical considerations, in addition to platform choices. For example, if one of the driving forces behind the implementation of CBDC is to promote financial inclusion, it is important to ensure that it has offline capability.

In addition, the security considerations of CBDC will play a crucial role in determining its strength and will be essential for a strong and secure implementation. The technology architecture should also integrate business continuity planning. Ultimately, it is important to consider environmental and energy efficiency concerns when making technology decisions.

6.2 Selection of Technology Platform:

When central banks consider the technology platform for implementing their Central Bank Digital Currency (CBDC), they need to thoroughly evaluate different factors to ensure the platform meets the necessary requirements of security, efficiency, scalability, and interoperability. Here are some important factors for central banks to consider:

Blockchain Technology:

- **Advantages:** Blockchain provides transparency, immutability, and security for transactions, making it a suitable choice for a digital currency system.
- **Drawbacks:** Certain blockchain networks might encounter difficulties with scalability, excessive energy usage, and governance concerns that central banks must tackle.

Distributed Ledger Technology (DLT):

- **Advantages**: DLT offers a decentralised and secure ledger for recording transactions, which enhances trust and reliability in CBDC operations.
- **Drawbacks:** Central banks need to assess the scalability, privacy features, and consensus mechanisms of the specific DLT platform to ensure they meet the requirements of CBDCs.

Permissioned Networks:

- **Advantages:** Permissioned networks provide participants with control over data access, resulting in improved privacy, security, and compliance in CBDC transactions.
- **Drawbacks**: Central banks need to evaluate the governance model, participants' roles, and networkconfiguration to ensure that the permissioned platform complies with regulatory standards.

Interoperability:

- **Advantages:** Opting for a technology platform that facilitates interoperability with current payment systems and financial infrastructures allows CBDC to be seamlessly integrated into the wider financial ecosystem.
- **Drawbacks:** Central banks must consider the compatibility, data sharing protocols, and standards necessary to ensure seamless CBDC transactions across various platforms.

✹ ***Smart Contract Capabilities:***

- **Advantages:** By incorporating smart contracts into the technology platform, transactions can be automated and programmed, leading to improved efficiency and transparency in CBDC operations. However, to realize these benefits, the ideal consensus mechanism for a retail or wholesale CBDC must satisfy critical requirements, including:

✓ High Throughput & Low Latency

✓ Immutability

✓ Energy Efficiency

✓ Lower Transaction Costs

✓ Robust Security & Byzantine Fault Tolerance (BFT)

✓ Controlled Governance

- **Drawbacks:** Key Risks and Challenges While offering significant benefits, the implementation of a CBDC also introduces several inherent risks that central banks must carefully manage to uphold the integrity of the system:

✓ ***Data Privacy Risks:*** The centralization of transaction data within the CBDC ledger creates a risk of unprecedented governmental surveillance or tracking of individuals' spending habits, fundamentally altering the existing anonymity afforded by physical cash.

✓ ***Systemic Cybersecurity Vulnerability:*** The entire CBDC system presents a single, highly attractive target for cyberattacks. A breach of the central ledger or encryption protocols could lead to the loss of public confidence, system collapse, or large-scale financial disruption, thereby threatening the integrity of the sovereign currency.

✓ ***Financial Disintermediation Risk:*** In times of financial stress, the public may rapidly transfer large balances from commercial bank accounts into the risk-free CBDC, leading to disintermediation—a substantial drain on the reserves of commercial banks.

✓ ***Operational Risk:*** The dependence on complex technological infrastructure means that technical failures, power outages, or software bugs could render the sovereign currency inaccessible or unusable for extended periods, causing severe economic friction.

✹ ***Privacy and security features:***

- **Advantages:** Emphasising the importance of privacy-enhancing technologies and strong security measures in the technology platform ensures data protection, confidentiality, and user trust in CBDC transactions.

- **Drawbacks:** It is important for central banks to address concerns regarding data privacy, encryption protocols, and cybersecurity threats in order to uphold the integrity of the CBDC system.

✹ ***Scalability and Performance:***

- **Advantages:** Opting for a technology platform that provides scalability, excellent performance, and minimal latency ensures swift and effective handling of CBDC transactions, even during periods of high demand.

- **Drawbacks:** Central banks must thoroughly evaluate the platform's performance, resilience to stress, and speed of transaction processing to ensure it can handle the requirements of real-time digital payments. Through a thorough analysis of these technological factors and the careful selection of a platform that matches the unique needs and goals of the CBDC project, central banks can construct a strong and forward-thinking digital currency system that improves access to financial services, boosts effectiveness, and supports the modernization of the financial industry.

6.3 Features of the platform:

Central Bank Digital Currency (CBDC) platforms need to have a variety of features to guarantee safety, efficiency, ease of use, and compliance with regulations. The following are platform elements that central banks might want to consider for a CBDC rollout:

✹ ***Security Measures:***

- **Strong Encryption;** Utilise encryption methods to secure transactions and safeguard user data. Ensure security by implementing multi-factor authentication procedures for user verification.

- **Secure Wallet Storage**: Use secure storage mechanisms to protect wallets from unauthorized access.

- ***Privacy Settings;***
  - **User Control over Privacy:** Enable users to manage their privacy settings and control data sharing preferences.
  - **Anonymity options:** Provide features that support transactions while adhering to requirements.
  - **Data Protection Compliance:** Adhere to data protection laws and regulations to ensure the safety of user information.
- ***Interoperability;***
  - **Smooth integration:** facilitate interoperability with payment systems and financial infrastructure for transactions.
  - **Compatibility across Platforms:** For adoption, ensure compatibility across devices and operating systems.
  - **Standards:** For interoperability with payment systems, follow industry standards and protocols.
- ***Efficient Transactions;***
  - **Quick Processing;** Develop the system to efficiently handle numbers of transactions for processing.
  - **Fast Response:** Reduce transaction processing times for responsive payments. Scalable System: Ensure that the platform can expand smoothly to accommodate increased transaction volumes.
- ***Enhanced User Experience;***
  - **Intuitive Design;** Create a user interface that is easy to navigate for an improved user experience.
  - **Inclusive Features:** To meet the needs of users with disabilities, include accessibility options.
  - **Multilingual Support:** Provide language assistance to a diverse user community.
- ***Transparent tracking and accountability:***
  - **Comprehensive transaction logs, and the preservation of transaction records for transparency**, audits, and conflict resolution.
  - **Ledger System:** Use blockchain or distributed ledger technology to establish an unchangeable history of transactions.
  - **Instant Reporting Tools:** To ensure compliance with regulations and oversight requirements, provide tools for real-time reporting.

Smart contract functionality includes the automation of transaction rules and agreements through contracts that allow for transactions based on pre-set criteria and integrate regulatory compliance checks. By utilising these platform features, central banks can effectively implement their systems, enhancing the modernization and efficiency of the ecosystem and meeting diverse stakeholder needs.

6.4 Exploring Technology Architecture Options:

- Traditional client-server architecture has proven to be effective in implementing large-scale digital platforms in various sectors such as banking, retail, and health, among others. When considering CBDC, it is critical to plan carefully for the following essential requirements:
- System should works suninterrupted with zaro down time so that the economy can keep running smoothly;
- Strict measures to prevent perpetration of any fraud that might threaten the economy's stability need be in place;
- Adequate decentralisation should persist so that everyone in the ecosystem can take part;
- Understanding how Important of privacy, authentication, data integrity, and non-repudiation for keeping the system safe need be well understood.
- Capability to handle a large number of transactions;
- The platform should be able to handle both lean and peak load periods in a cost-effective manner, taking into account unpredictable workloads.
- Loss caused by distributed denial of service (DDoS) and other cyberattacks to be minimised
- A mission-critical approach to fulfil all the aforementioned requirements

6.5 Choose between DLT and Non DLT:

When central banks are deciding between distributed ledger technology (DLT) and non-DLT solutions for implementing central bank digital currency (CBDC), they need to carefully assess the advantages and challenges associated with each option. Here are some considerations

for choosing between DLT and non-DLT for CBDC implementation:

- ***DLT (Distributed Ledger Technology)**:
  - **Transparency and Security**: DLT offers enhanced transparency, immutability, and security through its distributed and decentralized nature. A shared ledger records transactions, offering cryptographic security and verification.
  - **Decentralisation:** DLT eliminates the need for a central authority by distributing transaction data across a network of nodes. This promotes trust, reduces intermediary risks, and prevents a single point of failure.
  - **Smart Contracts:** DLT allows for the implementation of smart contracts, enabling automated and self-executing transactions based on predefined rules and conditions.
  - **Challenges:** DLT may face scalability limitations, high energy consumption (e.g., proof-of-work protocols), regulatory uncertainties, and governance complexities that central banks need to address.
- ***Non-DLT (Centralised Database):**
  - **Control and Governance**: A centralised database provides full control and oversight to the central bank over the CBDC system. It offers a clear governance structure and control over data management.
  - **Efficiency and Performance**: A non-DLT solution may be more efficient and have higher transaction processing speeds compared to that of some DLT platforms. It can optimise performance for high transaction volumes. Compliance Flexibility: Centralised systems may provide greater flexibility for compliance with existing regulatory frameworks and data privacy laws. Challenges: Centralised systems may raise concerns about data security, privacy, single points of failure, and potential vulnerabilities if not implemented and secured properly.
- ***Factors to Consider:**
  - **Regulatory Compliance:** Assess how DLT or non-DLT solutions align with regulatory requirements and compliance obligations in the jurisdiction where the CBDC will operate.
  - **Security and Privacy:** Evaluate the security features, privacy controls, and data protection mechanisms offered by each technology option to safeguard user information and transaction data.
  - **Scalability and Performance**: Consider the scalability, performance, and efficiency aspects of DLT and non-DLT solutions to support real-time transactions and handle high transaction volumes effectively. –
  - **Interoperability**: Assess how DLT or non-DLT systems integrate with existing payment systems, financial networks, and external platforms to ensure interoperability and seamless transactions.

By considering these factors and evaluating the advantages and challenges posed by DLT and non-DLT solutions, central banks can make an informed decision on the technology architecture that best aligns with their CBDC objectives, regulatory requirements, and operational needs.

When it comes to exercising of choice between distributed ledger technology (DLT) and non-DLT options for the implementation of central bank digital currency (CBDC), central banks need to carefully evaluate the benefits and difficulties that are associated with each alternative. The following factors should be considered when choosing between distributed ledger technology (DLT) and non-DLT for the implementation of CBDC:

Because of its distributed and decentralised nature, distributed ledger technology (DLT) provides greater transparency, immutability, and security. A shared ledger records the transactions, ensuring cryptographic security and transaction verification. By dispersing transaction data across a network of nodes, distributed ledger technology (DLT) eliminates the requirement for a central authority, achieving decentralisation. This approach boosts confidence, reduces intermediary risks, and prevents a single point of failure. Distributed ledger technology (DLT) enables the creation of smart contracts, allowing for the automatic and independent execution of transactions according to predetermined guidelines and criteria. On the other hand, distributed ledger technology (DLT) may be subjected to scaling limits, high energy consumption (for example, proof-of-work protocols), regulatory uncertainty, and governance complications, all of which require central banks to handle them.

- **Control and Governance:** A centralized database provides the central bank with complete control and oversight over the CBDC system. This is a non-decentralised ledger technology (DLT) feature. Additionally, it provides a transparent governance structure and control over the administration of data. In terms of efficiency and performance, a solution that does not utilise distributed ledger technology (DLT) might be more effective and have faster transaction processing times than certain DLT systems. It is able to optimize performance when dealing with large transaction volumes.

- **Compliance Flexibility:** Centralised systems may offer greater flexibility for complying with existing regulatory frameworks and data protection rules. This is one potential benefit of centralized technologies. In the event that they are not implemented and secured in an appropriate manner, centralised systems may give rise to problems regarding data security, privacy, single points of failure, and potential other vulnerabilities.

Fcators to consider

- **Regulatory Compliance:** Determine whether or not distributed ledger technology (DLT) or non-DLT solutions are in accordance with the regulatory requirements and compliance obligations in the jurisdiction in which the CBDC will be operating.

- **Security and Privacy:** It's crucial to assess the different security features, privacy controls, and data protection measures offered by each technological solution in order to safeguard user information and transaction data.

- **Scalability and Performance:** When it comes to supporting real-time transactions and effectively managing high transaction volumes, it is important to take into consideration the scalability, performance, and efficiency features of both traditional and distributed ledger technology (DLT) solutions. In order to guarantee interoperability and seamless transactions, it is necessary to evaluate the manner in which distributed ledger technology (DLT) or non-DLT systems connect with pre-existing payment systems, financial networks, and external platforms. If central banks think about the above factors and carefully weigh the pros and cons of distributed ledger technology (DLT) and other solutions, they can choose the technology architecture that best fits their CBDC goals, regulatory needs, and operational needs.

6.6 The ability to scale:

Each CBDC project will likely begin with a small-scale trial before gradually expanding to include the entire population. It is vital to plan for growth and adaptability from the start, even for a limited trial. The system should be built ensuring the potential for expansion and use in global or large-scale settings. The primary focus is on ensuring that the system can handle the projected volume of transactions (billions per day) that would come with a large-scale rollout without any changes. Additionally, it is crucial to design the system with scalability in mind, allowing for expansion without requiring redesign or reworking.

6.7 A trustworthy setting:

Ensuring a reliable environment for the life cycle of CBDC is crucial. To achieve this, prevention is essential. The system must regularly monitor for any unauthorized transactions, the creation of malicious tokens, or attempts at manipulation, in order to maintain security and integrity. Parties should receive data without the need to share it across the entire network for verification purposes. Additionally, having safeguards in place to ensure that only tokens authorised by the central bank are in circulation within the ecosystem is important. Third-party validation need be used to maintain the system's integrity. Moreover, it is crucial for an authorised entity to verify identity information before granting access to the CBDC network.

6.8 Considering the technological aspects of policy:

Ensuring recoverability: When it comes to account-based systems, there is no need to worry about recoverability since the user's identity is readily available within the account. Based on user consent, token-based systems can accommodate two types of wallets. Can CBDCs be recovered or reclaimed in case of loss or fraud?. In the custodian model, a token service provider (TSP) manages the keys for the user's wallet. In this setup, the user can recover the wallet using the address, wallet PIN, and tokens they hold. The security of these tokens depends on the TSP's security protocols, as user details are in their custody. Relying on an entity for recovery may compromise anonymity because it allows access to token movements in and out of the wallet. Conversely, in the user-held model, users are responsible for holding their keys on their devices. If a user loses their device, they won't be able to recover their wallet.

- **Functionality without an internet connection:** When it comes to account based systems the issue of recoverability isn't a concern as the users identity is readily available where their account is located. In token based systems there are two wallet options based on User Consent depending on whether CBDCs can be recovered. In the Custodian Model, a Token Service Provider (TSP) manages the keys of the users wallet holding tokens. In this setup recovery of the wallet is possible using the address, wallet PIN and tokens held by the user. Since user details are, with the service provider token security relies on the TSPs security protocols. Relying on an entity allows for recovery but compromises anonymity as the service provider can track movements in and out of the wallet.

On the hand in the User Held Model users are responsible for management, on their own devices. If a user loses their device recovering their wallet becomes impossible.

- **Programmability is an essential aspect to consider:**
- The ability to program CBDC is an aspect, with potential. CBDCs offer the opportunity to customize money by linking it to purposes. For example banks can create credit programs for agriculture that restrict its use to input store outlets only. This approach, similar to that of an executive could help address issues of misused funds and enhance financial inclusion. It can play a role, in ensuring utilization a challenge faced by banks worldwide. However a thorough examination of the programmability feature of CBDC is essential to uphold the core characteristics of a currency. It may also impact policy transmission as tokens could have expiration dates encouraging spending and stimulating consumption. Various methods can be employed to enable programmability;

- **Smart contracts;** Rules are encoded as code and executed during transactions to ensure token usage.

- **Token versioning;** the tokens version closely corresponds with its code class or stored as part of the token data.

6.9 Seamless integration with established Payment Systems and smooth interoperability: Both domestic and cross-border:

India is, at the forefront of payment advancements globally. Its payment platforms are accessible round the clock for both business customers offering real time transactions at a cost compared to other countries.

For an Indian Central Bank Digital Currency (CBDC) to succeed it should leverage existing payment infrastructures like UPI and popular digital wallets such as Paytm and Gpay. The ability for payment systems to work together plays a role in promoting user adoption fostering innovation and enhancing efficiency. Integrating a CBDC into India's payment landscape could encourage acceptance among users, including the public and merchants eliminating the need for creating a separate acceptance network.

As of the latest guidelines, the Reserve Bank of India (RBI) emphasizes the importance of a secure, scalable, and robust digital infrastructure for interoperability of CBDCs. The RBI advocates adopting established standards for messaging and data exchange (such as ISO 20022) to promote seamless communication between systems. Additionally, the RBI encourages the use of secure Application Programming Interfaces (APIs) to enable efficient integration with existing payment platforms and financial systems. Ensuring the security and reliability of these APIs is critical to maintaining cybersecurity, protecting user data, and safeguarding the integrity of the digital currency system. However challenges related to interoperability may arise due to commercial and legal factors that need to be addressed through dialogue, with stakeholders.

Achieving interoperability, in the Indian payments landscape requires collaboration from all industry players. When engaging in border CBDC transactions the RBI may interact with various networks for each major currency transaction. In scenarios involving cross-system or cross-platform transactions—such as payments between different financial institutions, integration with international payment networks, or interoperability between public and private digital currency systems—interoperability between networks becomes essential. The ability to exchange assets in coordinated transactions across ledgers whether managed through a centralized system or a decentralized network, enabling transactions without the need for an intermediary. Can improve efficiency. Reduce risks. For instance the BIS innovation hub project involves banks from China, Hong Kong United Arab Emirates and Thailand working together on the Multiple Central Bank Digital Currency (m CBDC) Bridge Project. This initiative aims to establish a settlement platform that allows central banks to use CBDCs for transactions facilitated by institutions. The mCBDC project facilitates time border

payments among these jurisdictions round the clock with foreign exchange settlements occurring instantaneously. Similarly Project Dunbar involves collaboration between the Reserve Bank of Australia ,Bank Negara Malaysia, Monetary Authority of Singapore and South African Reserve Bank along with the BIS Innovation Hub to experiment with using CBDCs for settlements.

When different regions operate with two infrastructures interoperability can be achieved through a shared bridge that standardizes inputs and outputs from various systems in a universally understandable format, for all involved parties. This bridge should also consider adapting to country regulations concerning access, foreign exchange laws, boundaries, governance matters and other related aspects. Implementing control mechanisms is crucial to prevent any impacts in an interconnected environment.

It would be beneficial for a region to focus on establishing standards for enabling interoperability between CBDCs and existing or proposed payment systems. Collaborating with stakeholders such, as the BIS to develop standards that facilitate seamless cross border transactions would pave the way forward.

6.9.1 Considering Security:

CBDC ecosystems face risks of cyber-attacks, as payment systems. It is crucial to address cybersecurity aspects for both the components and the overall environment. For instance when creating tokens robust cryptography must be employed to ensure security at the level. Similarly securing transactions is essential to maintain an environment. In regions with low levels of financial literacy, implementing digital currencies and payment systems may require additional education and support to ensure widespread adoption and proper usage. The rise in payment frauds could extend to CBDCs as well. Thus, implementing stringent cybersecurity measures and promoting literacy are vital for countries dealing with CBDCs. Given that CBDC ecosystems high value targets for public trust safeguarding them against cyber threats is paramount. The approach to mitigating cyber risks will vary based on the underlying technology used. While public blockchains offer transparency they do not inherently guarantee cybersecurity. Conversely centralized systems share cybersecurity concerns with existing Fast Payment Systems (FPS). Designing CBDCs with security as a principle, from inception is essential to combat cyber threats.

(i) It is important to implement a risk management framework, for users in roles within the CBDC network.

(ii) While ensuring the robust back end infrastructure it is equally crucial to test the user interface to prevent any vulnerabilities from being exploited.

(iii) Redundancy: The CBDC ecosystem will be divided into segments such as wholesale or retail each utilizing formats like account based or token based systems to avoid any single point of failure. A breach in one segment should not impact the others automatically.

(iv) Security, through Cryptography and Quantum Resistance:

CBDCs will employ advanced cryptographic techniques to strengthen system security, protect user data, and prevent fraud, making the digital payment structures Quantum threats refer to the risk that sufficiently powerful quantum computers could break the foundational cryptographic algorithms that secure nearly all of today's digital systems. Additionally ,it is essential to consider threats posed by quantum computing when designing CBDCs. Quantum computers possess processing power beyond supercomputers requiring quantum resistant algorithms that can withstand such attacks. Therefore, for the RBI and other central banks, quantum readiness is no longer a theoretical research topic but a critical component of long-term financial stability and public trust.

Hence, it is crucial to ensure the robustness of cryptographic methods and encryption techniques used in CBDCs, with particular emphasis on adopting quantum-resistant algorithms. This approach will help establish a secure and resilient technological foundation capable of safeguarding transactions and user data against emerging threats posed by future quantum computing capabilities.

When considering the possibility of a security breach where specific token sequences are compromised having the ability to promptly recall them or introduce security features is essential.

Moreover ,CBDCs should incorporate recoverability principles meaning that if a breach occurs the system must be resilient enough to recover. Efforts should be made to minimize any impact on production systems and business processes. APIs play a role in facilitating interactions with currency management systems at banks and token service providers.

In addition to technical solutions for addressing security

risks, effective policy measures—such as establishing transaction limits, strengthening risk management practices, and developing comprehensive governance frameworks—will be essential. Furthermore, conducting thorough testing through pilot programs prior to the public launch of CBDCs is crucial to ensure system stability, security, and operational readiness..

6.9.2 Utilising data analytics:

The CBDC platform is set to produce amounts of real time data. Taking into account privacy concerns thorough analysis of the Big Data from CBDC can support making policies based on evidence. It could also serve as a data pool for financial service providers to gain insights into their products. Moreover, the data could be instrumental in enforcing money laundering laws. Additionally, it might uncover information that could help prevent violations of rules and regulations thereby supporting a risk focused approach to combat money laundering by identifying potential risks and crafting strategies to address them.

6.9.3 Considering the various options in technology:

It is crucial to keep the design decisions flexible, in the stages as technical choices should not be set in stone. With the advancement of technology considerations related to policies and security will also evolve. Thus ,adopting an approach is essential when finalizing decisions. It is important to avoid vendor lock in when engaging with any technology service provider and include provisions for ownership by the Central Bank if proprietary systems are utilized. Central Banks will issue CBDCs using algorithm driven processes rather than mining methods based on competitive rewards. These algorithms prioritize energy efficiency and environmental friendliness. As a result the issuance and management of CBDCs are anticipated to consume less ,energy compared to the resource intensive processes typically associated with mining and distributing private cryptocurrencies. Therefore ,when selecting technology it is crucial to consider the systems resource intensity.

6.9.4 Examining the ownership of creation and distribution of CBDCs:

When we look into who would be responsible for creating and distributing Central Bank Digital Currencies (CBDCs) it is important to think about the banks role , the parties involved and how it would impact the financial world. Here are some key aspects that may be kept in mind;

- **Control by Central Banks:** Typically central banks have control over making, issuing and circulating CBDCs. This reflects their duty in shaping policy and ensuring stability.

When the central bank owns this process it guarantees supervision, adherence to regulations and alignment with monetary policy goals when handling CBDCs.

- **Ownership by the Public:** Typically, central banks hold ownership of CBDCs on behalf of the public. This arrangement ensures trustworthiness, transparency, and accountability in the issuance and circulation of the digital currency, as the central bank is responsible for managing the supply, security, and integrity of the CBDC system.

- Public ownership highlights the central bank's responsibility to act in the public interest, ensuring the stability of the financial system and promoting economic growth and prosperity through the issuance and management of CBDCs.

- Collaboration, with Banking Institutions: To introduce and circulate CBDCs central banks might team up with banks and financial institutions utilizing the existing banking framework to facilitate currency transactions.

- This collaboration between the central bank and commercial banks or authorized payment service providers ensures seamless interaction, broad accessibility, and widespread acceptance of CBDCs among users, while maintaining the central bank's supervision and regulatory authority over the digital currency system.

- Government Involvement: Governments could have a stake in the ownership and management of CBDCs showcasing a partnership between the Central (?) bank and government bodies to enforce compliance and alignment with economic policy goals.

- Government ownership may mirror policy aims, societal objectives and strategic priorities in issuing and distributing CBDCs.

- Ownership by Users: Individuals possess ownership of CBDCs through tokens or accounts issued by the bank granting them direct access, control and utilization of digital currencies for transactions and payments.

User ownership underscores empowerment, privacy

protection and independence, in managing assets under the central banks' oversight and safeguards.

- Engagement of Stakeholders: When it comes to the creation and distribution of Central Bank Digital Currencies (CBDCs) it is crucial for central banks to work together with a range of partners such, as regulators, financial institutions, technology experts and users. This collaboration is key to ensuring the introduction and acceptance of currency systems.

Involving stakeholders helps promote teamwork, creativity and inclusivity in the advancement and use of CBDCs within the financial world.

- **Models of Ownership Spread:** Certain initiatives related to CBDCs are exploring ownership models that are decentralized and rely on technology. In these models ownership and control are shared among network participants through agreement mechanisms.

Decentralized ownership models provide opportunities for decision making, transparency and security in how CBDCs operate. They emphasize spreading out control, independence and community involvement in managing currencies.

By investigating how ownership is structured among CBDC's stakeholders more can be understand about the roles, duties and consequences linked to ownership when creating and distributing currencies. This sheds light on the banks power, confidence levels, cooperation with stakeholders as well as user empowerment, within the realm of CBDCs.

Chapter 7

Additional Factors to Consider

7.1 Level of resource usage:

When planning the technology framework, for CBDC it is crucial to take into account the resource usage. In such systems, the amount of computational and energy resources used is comparable to that of existing payment systems, ensuring efficiency without significantly increasing operational costs. In distributed systems the outcomes depend heavily on the presence and nature of a consensus protocol. If such a protocol exists, its resource requirements would be similar to those of demanding consensus mechanisms like "Proof of Work," which require significant computational power and energy consumption.

Play a role. It is widely understood that CBDCs will not be generated through mining, like cryptocurrencies where anyone can compete to mine and create currency. With CBDCs only the sovereign/central bank has the authority to issue them. In account-based systems, users can opt to convert their existing bank balances into CBDC balances with relative ease. However, in token-based systems, the process of creating new tokens—based on agreed-upon cryptographic techniques—may require significantly more computational resources and complex protocols to ensure security and scalability.Additionally considering the energy consumption involved in validating transactions and storing them on distributed or centralized systems is important when evaluating the resource intensity of the CBDC ecosystem.

7.2 Ensuring the continuity of business operations:

Ensuring that business operations run smoothly is essential, for banks, financial institutions and organizations involved in the development, issuance and distribution of Central Bank Digital Currencies (CBDCs). Here are some important strategies to uphold business continuity;

- **Managing Risks:** Recognize potential risks and weaknesses that could affect operations, such as cyber threats, system failures and regulatory changes.

Create risk management plans, contingency strategies, and response procedures to handle risks proactively.

- **Building Infrastructure Resilience:** Maintain durable infrastructure to support CBDC operations, including networks, data centers and digital payment systems.

Put in place redundancy measures, backup systems and disaster recovery plans to ensure continuous operation during technological disruptions.

- **Enhancing Cybersecurity:** Implement cybersecurity measures to safeguard assets, user information and transactional systems, from cyberattacks and breaches.

Regularly conduct security audits, penetration tests and assessments to identify vulnerabilities and bolster defenses against potential cyber threats.

- **Adhering to Regulations:** Stay updated on mandates, compliance requirements, legal frameworks related to CBDC issuance, and operational guidelines.

Make sure to follow data privacy laws, financial regulations and industry standards to uphold compliance and keep operations running smoothly.

- **Training and Education:** Offer training, education and skill building programs, for team members involved in CBDC operations to boost knowledge, awareness and preparedness.

Conducting simulation exercises and training drills is essential to prepare staff for potential operational disruptions, ensuring they are equipped to respond effectively and maintain system stability during emergencies.

- **Collaboration across Teams:** Encourage communication among departments, teams and external partners engaged in CBDC operations to enhance coordination.

Set up joint response teams, crisis management committees and communication channels for decision making during disruptions.

- **Planning for Business Continuity:**Create business continuity plans that define roles, communication procedures and escalation steps in case of disruptions.

Test the effectiveness of business continuity plans through exercises, simulations and scenario based drills to confirm readiness.

- **Managing Suppliers and Vendors:** Build relationships, with suppliers, vendors and service providers to ensure uninterrupted availability of critical services and resources.

To effectively manage supply chain risks and dependencies it is important to have plans, service level agreements and sourcing strategies, in place.

By focusing on risk management, infrastructure stability, cybersecurity protocols, compliance with regulations, staff training, teamwork, continuity planning and supplier relationships central banks and businesses can boost their readiness and quick response capabilities. These measures are essential to support continuous and reliable business operations as the landscape of CBDC implementation and oversight evolves.

7.3 Consumer protection and Grievance Handling:

Central bank digital currency (CBDC) is expected to introduce challenges related to consumer protection, for its users due to its nature. The advantages of CBDC include improved access to a wide range of financial products and services, often at lower costs, thereby enhancing financial inclusion and reducing transaction expenses. The . However, there are also risks of frauds, data and privacy breaches and digital security incidents. When considering the architecture and technological design of CBDC, the following consumer related risks may be taken into consideration:

(I) Privacy Concerns: The widespread use of CBDC would raise the privacy issues as it offers anonymity and privacy up to a level unlike cash . The design principles underlying CBDC will play a role in determining the level of privacy risk for users and exploring ways to address these risks.

(ii) Security and Technological Risks: The technology framework of CBDC will impact the security risks faced by users. Issues related to the development and implementation of security protocols, including their technical design and effectiveness, will be crucial for ensuring the safety and integrity of the CBDC system.for ensuring the safety and reliability of products/services.

Understanding the intricacies involved in issuance of CBDC may be beyond the comprehension of a consumer. Therefore, establishing and following comprehensive audit standards—such as regular security audits, compliance checks, and internal control assessments—could be essential to identify and address potential technical vulnerabilities that might, if left unchecked, pose risks to consumers and undermine system integrity.

Accountability risk arises when there is uncertainty about who should be responsible for consumer losses, underscoring the need for strong consumer protection measures and clear governance frameworks to ensure accountability and safeguard users' interests. Ensuring consumer protection is vital for stability as it fosters trust and confidence in markets promoting efficiency and stability beneficial for both financial institutions and their customers. The framework for safeguarding consumers in CBDC adoption should account for varying levels of literacy among consumers aiming to enhance understanding and transparency for decision making. It is imperative that the central bank safeguards both the infrastructure and participants within a system against cyber threats and counterfeiting.

To uphold trust in CBDC it would be essential for a country's CBDC system to be scalable enough to meet demand.

Financial intermediaries, such as banks and payment service providers, should also be able to effectively fulfil their roles in meeting customer demand and ensuring smooth transaction flow. Additionally, the ease of access to CBDC for initiating a transaction by the public should be smooth. Furthermore, the digital nature of CBDC could give rise to types of customer complaints such as service deficiencies of intermediaries, technical disruptions in CBDC supply and transactions. Effectively and efficiently resolving customer complaints will be crucial in encouraging adoption of CBDC. A strong and effective mechanism, for addressing CBDC related grievances may cover a range of issues.

Chapter 8

Policy Implications of Introducing a Central Bank Digital Currency (CBDC)

8.1 Exploring the Impact of Central Bank Digital Currencies on Monetary Policy:

Digital currencies issued by banks, known as Central Bank Digital Currencies (CBDCs) have the potential to significantly influence policy through their effects on money supply, payment systems, financial stability, and economic dynamics. Below are some ways in which CBDCs can impact policy;

- **Transmission of Monetary Policy:** CBDCs present new avenues for banks to implement policy by directly impacting the money supply, interest rates and liquidity within the financial system. Central banks can manage inflation, regulate money supply growth and stabilize conditions efficiently by adjusting the circulation of CBDCs.

- **Interest Rates and Money Supply** CBDCs provide central banks with a powerful tool to influence interest rates by adjusting the amount of digital currency in circulation or by setting interest rates on CBDC holdings. This ability to actively manage the supply of digital currency can affect key aspects of the economy—such as the overall money supply, the availability of credit, and borrowing costs—thereby shaping liquidity conditions and supporting monetary policy objectives.

- **Financial/ Regulatory Measures:** By offering an efficient payment method that minimizes counterparty risks and enhances transaction transparency CBDCs can contribute to bolstering stability. Central banks have the ability to utilize Central Bank Digital Currencies (CBDCs) for monitoring risks ensuring compliance and improving oversight of financial markets to uphold stability in the banking sector.

- **Regarding Payment Systems and Efficiency:** CBDCs can modernize payment systems simplify transaction processes and enhance payment efficiency by enabling real time settlements, cross border transactions and cost effective payments. Central banks can employ CBDCs to boost inclusion ,decrease payment barriers and encourage innovation, within the financial landscape.

- **Concerning Exchange Rate and International Transactions:** For example, if a country issues a highly stable and widely adopted CBDC, it could strengthen the national currency by increasing investor confidence and attracting foreign capital. Conversely, if the CBDC leads to significant capital outflows or creates instability, it might put downward pressure on the exchange rate. Additionally, CBDCs can facilitate cross-border transactions and reduce transaction costs, which may influence currency demand and value. For instance, a well-designed CBDC can make a country's currency more attractive for international trade and investment, thereby impacting its exchange rate dynamics. international trade dynamics and cross border transactions by impacting currency values, trade balances and capital movements. Central banks have the opportunity to utilize CBDCs for facilitating cross border payments strengthening financial connectivity across borders and reducing transaction costs in global trade.

- **In terms of Financial Inclusion and Economic Development:** CBDCs have the potential to advance inclusion by offering underserved populations access to digital payment services at affordable rates along with basic financial tools. Central banks can harness CBDCs as a tool to address economic inequalities, promote economic progress and improve financial accessibility, for individuals who are either unbanked or underserved.

- **Changes, in Monetary Policy Strategies:** The introduction of CBDCs could require banks to adjust their monetary policy strategies, tools and methods of implementation to accommodate the integration of digital currencies.

Central banks might need to develop new and improved strategies to handle the effects of CBDCs on the money

supply, interest rates and overall financial stability.

By examining how CBDCs impact policy central banks can evaluate how digital currencies affect monetary policy goals, operational structures and policy instruments in order to bolster economic stability encourage ,financial innovation and adjust to the changing financial environment in this digital era.

8.2 Considerations regarding CBDC and its impact on liquidity management:

Issuance of Central Bank Digital Currency (CBDC) ,similarto money, is set to bring changes in liquidity across the system. The central bank will need to factor in its effects on liquidity and implement its liquidity measures accordingly. When the demand for CBDC rises (similar to cash) it leads to a shift of deposits from the banking system. The transition from physical cash to CBDC could influence how the public holds money affecting choices between currency and deposits well as between physical and digital currencygiven that most central banks exploring CBDC issuance predicting the exact impact beforehand is challenging.

If CBDC is interest-bearing, it could influence reserve money, overall money supply, and the liabilities of commercial banks. This is because changes in CBDC holdings by the public may affect the reserves held bybanks, alter the amount of money they can lend, and impact their balance sheet liabilities, thereby influencing liquidity and financial stability in the banking system.This could potentially lead to a scenario where commercial bank deposits are replaced by CBDCs. Consequently, commercial banks may face funding constraints and rely more on central bank liquidity support. This could result in an expansion of central bank balance sheet due to disintermediation. Interest-bearing CBDCs can significantly aid in minimizing disruptions to monetary policy implementation and the process of financial intermediation. By providing a direct and flexible tool for influencing interest rates and controlling liquidity, CBDCs can help maintain stability in financial markets. Additionally, their use can ensure continuity in payment and settlement systems during periods of economic stress, supporting smoother transmission of monetary policy and safeguarding the stability of financial intermediation.

Implementing a CBDC with interest payments would require reevaluating how monetary policy is conducted, including establishing appropriate interest rates for the digital currency. It would also involve addressing potential challenges such as disintermediation—where funds shift away from commercial banks—and ensuring that the policy framework remains effective in achieving economic stability.

8.3 The effect of Central Bank Digital Currency (CBDC) on monetary variables:

Impact on	Non Remunerated CBDCs	Remunerated CBDCs
Reserve Money	Yes/No	Yes
Money Supply	No	Yes
Velocity	No	Yes
Money Multiplier	Yes/No	Yes
Liquidity Conditions/LAF	Yes/No	Yes
Monetary Policy (Repd Rate)	No	Yes

Source: RBI concept paper

8.4 Examining the Impact of CBDC on Financial Stability:

The Bank, for International Settlements (BIS) has outlined three principles to consider when contemplating the introduction of a CBDC. The first principle, known as "do no harm" emphasizes that while a CBDC can bring about changes its introduction should align with public policy goals and should hinder none but ideally support the central bank's role in maintaining financial stability. This principle acknowledges the benefits of a CBDC in enhancing the resilience of the system while also recognizing the risks it may pose to existing market structures and business models especially in terms of potentially undermining traditional banking functions.

Although the demand for a CBDC remains uncertain. It could be influenced by how it is designed and implemented. Central banks have expressed concerns about two issues; firstly that during periods of turmoil

a CBDC could exacerbate bank runs; and secondly that reduced intermediation by banks might lead to reliance on more costly and less reliable funding sources. However, these challenges can be mitigated through placing limits, on CBDC holdings and transactions.

Central banks are currently looking into ways to incorporate measures into any Central Bank Digital Currency (CBDC) in order to address the risks to financial stability. However, the implementation of measures requires deliberation. Central banks may contemplate implementing strategies to influence or regulate the adoption and usage of CBDCs. These strategies could involve setting access requirements for users imposing limits on CBDC holdings and transactions and making specific decisions regarding CBDC rewards.

Numerous studies suggest that the introduction of CBDCs could impact bank profitability and lending activities If banks respond to the introduction of a CBDC by increasing their reliance on market-based funding, it could lead to several potential effects, such as increased volatility in funding costs, reduced stability of bank deposits, and a shift in liquidity management strategies. This change might also impact the bank's ability to lend, influence overall credit availability, and potentially increase the risk of funding shortages during periods of market stress. The specific effects would depend on the nature of the market-based funding—whether it is short-term, volatile, or long-term—and how banks adapt their funding and risk management practices accordingly. Banks that depend more on market-based funding sources rather than traditional deposits may face increased pressure on their maturity transformation and liquidity management, especially if market volatility leads to funding shortages or abrupt withdrawals. However, if market discipline is strengthened—through transparency, improved oversight, and enhanced investor scrutiny—it can encourage banks to maintain healthier liquidity and risk management practices. This increased discipline can help stabilize funding flows, reduce excessive cyclicality in lending activities, and mitigate the fluctuation risks associated with volatile market-based funding. Effective regulatory oversight and transparent disclosure requirements are key to ensuring that market discipline functions as a positive stabilizing force.

8.5 Examining the Legal Implications of CBDC:

CBDC necessitates a legal framework to define the central bank's authority in issuing CBDC and its legal status. The current legal frameworks were established in a time, before the era so exploring CBDC. It would also be necessary to assess if adjustments to the existing legal framework would be needed to enable the central bank to issue CBDC.

The legal considerations for introducing CBDC will primarily rely on the operational and technological design aspects. Depending on whether its account based or token based different legal implications will arise. Account based CBDCs, similar to existing account based money are viewed as a form of 'book money' represented by credit balances in accounts. On the hand token based CBDCs represent a form of money where the central banks liability is embedded in the token.

Most central banks derive their authority from their laws to issue currency in forms such, as banknotes, coins, book money and bills. Some central banks have mandates that encompass currency issuance broadly potentially including CBDC.

If central banks opt to introduce token based CBDCs they must have the authority to issue currency in a sense, beyond banknotes and coins. Likewise if central banks choose to issue CBDCs in account form legal changes will be necessary to permit central banks to open accounts for the public. Currently, central banks can typically open accounts for certain entities or participants, subject to specific eligibility criteria. The introduction of CBDC in a digital form would establish a widespread, secure payment system accessible to a broader range of users, thereby facilitating digital transactions and increasing the efficiency of monetary exchanges.If the payment system role of banks is limited to interbank systems only the implications of CBDC issuance on payment system laws will also need to be taken into account.

In addition to changes in central bank laws adjustments must also be made in the country's law regarding issues such as the authority to issue CBDCs, legal tender status and protection against crimes. However there is differentiation between bank and monetary laws and any legislative amendments should be reflected in both laws. Therefore careful consideration of amendments or new legislation is essential, before creating and issuing CBDCs.

The Reserve Bank of India introduced CBDC with the requirement of a framework to align with the existing provisions designed for paper currency. As, per the Reserve Bank of India Act, 1934 the Bank is authorized to regulate bank notes issuance and reserves to maintain stability and manage the country's currency and credit system effectively (Preamble). The Reserve Bank derives its powers from sections of the RBI Act concerning

denominations (vide Section 24), design of banknote forms (vide., Section 25) and legal tender status (vide., Sec 26(1)) among others. The Parliament has approved amendments to expand the definition of "bank note" to explicitly include digital currency, while also removing or excluding provisions that are specific only to physical currencies and are irrelevant to digital currency. For the latest official notifications and details on these amendments, please refer to the Government of India's official gazette and notifications issued by the Ministry of Finance or Reserve Bank of India.

8.6 Examining the Balance Sheet implications of CBDC:

For CBDC to be truly beneficial, both the general public and businesses must actively embrace and use it for payment. In order to optimise their financial holdings, individuals need to reallocate a portion of their funds from banknotes and commercial bank deposits to central bank money, specifically in the form of CBDC. However, the transition from deposits to CBDC could have noteworthy effects on the banking system, monetary policy, and financial stability. To grasp these implications, it is crucial to comprehend the effects of transitioning from deposits to CBDC on the balance sheets of the Reserve Bank of India and commercial banks.

The transition from cash or deposits to CBDC has a significant impact on the balance sheet.

- **Transition from physical currency to a Central Bank Digital Currency (CBDC):** Banknotes and CBDC represent distinct forms of central bank liability; thus, transitioning from banknotes to CBDC alters the composition of household and central bank balance sheets without impacting their overall size. Households exchange one asset (cash) for another asset (CBDC), while the central bank exchanges one liability (cash) for another liability (CBDC). Even though banks may assist in the transition from cash to CBDC, it does not affect the size of the banking sector's balance sheet. (what if the banks hold CBDC balance of the client in their books for their client as under CBDC Retail indirect model?)

- **Transition from deposits to CBDC:** The move from deposits to CBDC has a similar effect on bank balance sheets as withdrawing banknotes from an ATM or bank branch. This results in a decrease in both the bank's assets and liabilities, ultimately shrinking its balance sheet. This transfer alters the makeup of the central bank's liabilities, with a decrease in reserve liabilities and an increase in CBDC liabilities. However, the size of the central bank's balance sheet remains unchanged for the time being. When deposits shift to CBDC, it could lead to a decrease in reserves held by commercial banks. If they find themselves with insufficient reserves to meet their own or supervisory liquidity risk measures, they may consider obtaining additional reserves from the central bank. If the central bank decides to address this demand by issuing new reserves, the central bank's balance sheet will increase by the amount of newly issued reserves.

8.7 Examining the AML/CFT Perspective of Central Bank Digital Currency (CBDC):

Central banks are required to design CBDCs that comply with AML/CFT requirements, along with any other regulatory expectations or disclosure laws. A CBDC payment system must adhere to AML and CFT regulations and requirements. In order to ensure the legitimacy of transactions, it would be necessary for some authority or institution within the CBDC network to have knowledge of the identities of CBDC users and be able to validate their transactions. Payment interface providers (commercial banks) could handle all AML responsibilities. According to an economic perspective, the intermediate model suggests that commercial banks are well-suited to carry out AML/CFT checks. It is recommended that the responsibility for adhering to AML/CFT guidelines lie with these banks. Unless the Financial Action Task Force (FATF) introduces a new recommendation specifically for CBDCs, opening and maintaining CBDC accounts with commercial banks would not necessitate any alterations to the existing AML/CFT guidelines. This setup ensures that the central(?))bank doesn't have detailed personal data on any user, which addresses privacy concerns. However, the CBDC system as a whole can still meet the requirements for anti-money laundering laws.

From an economic standpoint, it is crucial for the CBDC framework to focus on two key aspects in relation to AML and CFT.

i. It is important to establish a clear delineation of the ultimate responsibility for customer due diligence (CDD) within the framework.

ii. The CBDC design should include a mechanism to identify and monitor transactions, similar to the threshold limit for cash, in order to uphold the integrity of the financial sector.

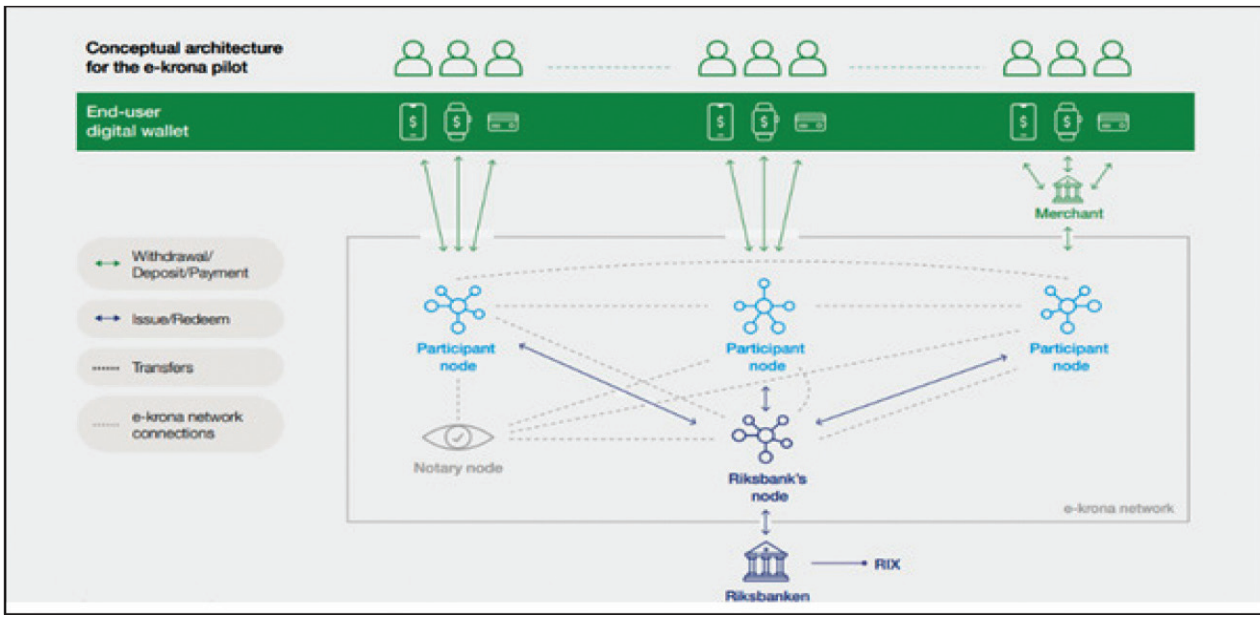
8.8 Privacy and data protection considerations:

Source: World Economic Forum, Central Bank Digital Currency Global Interoperability Principles

Privacy and data protection	Safeguarding user privacy and data protection is a significant consideration. Many regions emphasize the need for strong privacy measures in CBDC design, such as ensuring anonymity or pseudonymity while balancing the requirements for transparency and regulatory oversight.
Cybersecurity and resilience	Building resilient CBDC systems and protecting them against cyberthreats is a universal priority. Robust security measures, including encryption and authentication protocols, are essential to ensure the integrity of CBDC platforms and maintain public trust.
User experience and accessibility	Focusing on user experience and ensuring that CBDCs are intuitive and accessible to all users is a shared concern. This includes designing user-friendly interfaces and addressing potential barriers to adoption, such as digital financial literacy.
Offline capabilities	Fiat currency today has features that are favoured when compared to digital solutions. It is recognized that CBDCs must provide offline capabilities in order to become more widely adopted.
Cross-regional cooperation	Although each jurisdiction has specific motivations for CBDCs, there is an understanding that broader success of CBDC on a global scale is necessary, and this must be achieved with collaboration across jurisdictions.
Public-private cooperation	The public sector and central banks are the final decision-makers for CBDC implementation; however, private sector players are deeply entrenched in the current financial system and payments system and add significantly to the creation and design of a CBDC.
Interoperability and standards	Achieving interoperability between CBDC systems and establishing global standards are important priorities. Collaboration among different regions to develop common protocols and frameworks can facilitate seamless integration between CBDCs.

Examples of CBDC privacy protections in action around the world:

The Riks bank, Sweden's central bank, has implemented privacy architecture as part of its e-krona CBDC pilot programme. An open-source distributed ledger is used to ensure that information is shared only when necessary with central bank authorities, financial regulatory bodies, and financial intermediaries. (Appended chart need be explained to reveal the privacy architecture)



Source: World Economic Forum Digital Currency Governance Consortium White Paper Series/Accenture

To achieve the highest levels of privacy, confidentiality, and anonymity in financial systems, researchers are developing advanced cryptographic techniques such as zero-knowledge proofs, homomorphic encryption, and secure multi-party computation. These systematic and mathematical methods enable secure transactions and data privacy by allowing information to be verified or processed without revealing sensitive details, thereby strengthening the overall security and privacy of digital financial platforms.

Cybersecurity is a crucial issue for CBDCs, as it plays a crucial role in integrating privacy and data protection. In the digital age, banks have updated their cybersecurity systems frequently due to the evolution and sophistication of online threats. Any effort to implement CBDCs would require implementing additional cybersecurity safeguards at the same time.

➤ **Considerations for CBDC consumer protection:**
Ensuring consumer protection is a crucial factor when designing CBDCs. Payment method innovations have always presented fresh opportunities for consumers, but they also bring along new challenges and risks. Establishing consumer trust is crucial for the widespread adoption of any digital currency. Therefore, it is essential to carefully consider and implement appropriate consumer protections to ensure the successful use of CBDCs.

It will be crucial to educate consumers so that they can make well-informed decisions that align with their needs and enable them to choose the right digital payment solution, while minimising any potential risks.

➤ **Privacy and data protection with reference Digital Personal Data Protection Act, 2023:**
The President's assent has allowed the Digital Personal Data Protection (DPDP) Act, which Parliament recently passed during the monsoon session, to become law. This legislation establishes guidelines for organisations regarding the handling of users' data. The legislation empowers individuals with enhanced authority over their data while also permitting corporations to transmit users' data overseas for processing, with the exception of nations and territories that have been limited by the Centre through notice.

According to the DPDP Act, state agencies have the potential to be granted exemptions from its rules based on the discretionary authority of the government. The primary objective of this Act is to enhance data protection measures and promote accountability among various entities, including internet corporations, mobile applications, and enterprises involved in the processing of individuals' data. Additionally, it is important to acknowledge that the DPDP Act would have ramifications for India's economic agreements with other countries. The alignment of this approach with global data protection standards is evident, as it draws influence from established models such as the European Union's General Data Protection Regulation (GDPR) and China's Personal Information Protection Law (PIPL).

➤ **Important Provisions of India's New Personal Data Protection Act, 2023 :**
The Digital Personal Data Protection (DPDP) Act, first implemented in 2019, is a significant legal framework designed to safeguard the privacy rights of individuals. Its primary focus is on regulating the collection, storage, processing, and transmission of personal information within digital environments. The DPDP Bill has undergone a total of 81 revisions since its initial introduction, leading to a major overhaul that has shaped its current form. The DPDP Act attempts to provide a comprehensive structure that effectively tackles the complexities associated with data management in the era of digitalization, with a particular emphasis on safeguarding privacy and enhancing security measures. The DPDP Act of 2023 encompasses several significant clauses, which are outlined below:

Definitions: *While the DPDP Act shares similarities with the EU's General Data Protection Regulation (GDPR) in terms of many ideas, there are distinctions in the use of language.*

a) Data fiduciary: This term pertains to the entity that, either autonomously or in conjunction with others, determines both the objective and the techniques for handling personal data (analogous to a data controller). The government has the authority to designate any entity or a certain set of entities responsible for handling data as 'significant data fiduciaries' (SDFs). The classification as an SDF is determined by various factors, including the nature of processing activities, such as the extent and sensitivity of personal data involved, as well as the potential impact on the rights of data principals. Additionally, broader societal and national considerations, such as the potential effects on India's sovereignty and integrity, electoral democracy, state security, and public order, are also taken into account. The assignment of the SDF label has an

increased level of compliance responsibilities, which will be further discussed in the subsequent discussion.

b) **Data Processor:** A data processor refers to an oganisational entity that assumes the responsibility of processing digital personal data on behalf of a data fiduciary

c) **Data Principal:** Data principal refers to individuals from whom personal data is collected and processed, which is analogous to the concept of a data subject.

d) **Consent Manager:** The consent manager refers to an individual who is officially registered with the Data Protection Board. Their role is to serve as a central point of contact, facilitating the process for a data principal to provide, manage, evaluate, and withdraw their consent. This is accomplished through the utilisation of an accessible, transparent, and interoperable platform.

➤ **Applicability:** The applicability of the DPDP Act extends to all forms of data, regardless of their initial format as either online or offline, which subsequently undergo digitization within the jurisdiction of India. Moreover, the Act is applicable to the processing of digital personal data that extends beyond the geographical boundaries of India, namely in cases where it involves the offering of products or services to individuals residing within the territorial jurisdiction of India.

➤ **Personal Data Breach**: A personal data breach refers to the unauthorised processing of personal data as well as the accidental disclosure, acquisition, sharing, use, alteration, destruction of or loss of access to personal data. Such breaches undermine the confidentiality, integrity, or availability of the personal data in question.

➤ **Individual consent in relation to the utilisation of data, as well as the corresponding rights of data principals**: According to the newly enacted laws, the inclusion and processing of personal data will be contingent upon obtaining explicit agreement from the subject, unless certain exceptional situations related to national security, law enforcement, and public order necessitate an alternative approach. Within the framework of data principal rights, persons possess certain entitlements, including the right to access information, the right to rectify and erase data, the right to seek redressal for grievances, and the right to designate a representative to exercise these rights in the event of the individual's demise or inability. At present, a definitive schedule for the implementation of grievance redressal and data principle rights has not been established.

➤ **Additional responsibilities of SDF:** Data fiduciaries that are classified as Significant Data Fiduciaries (SDF) are obligated to adhere to additional responsibilities as outlined in the DPDP Act. These requirements depend on the volume and sensitivity of the data being handled. For data fiduciaries that manage large volumes of sensitive or critical personal data—termed as having "substantial importance"—it is mandatory to appoint a Data Protection Officer (DPO). The DPO is responsible for addressing the concerns and inquiries of data principals—persons whose data is collected and processed—and ensuring compliance with data protection regulations

.

Note:

"Substantial importance" typically refers to organizations handling large-scale, highly sensitive, or critical personal data, such as financial institutions, telecom providers, or large corporates, where data breaches could cause significant harm or impact essential services.

➤ In relation to international data transfers, the DPDP Act grants data fiduciaries the authority to transfer personal data for the purpose of processing to any country or territory beyond the borders of India. Nevertheless, the central government has the authority to enforce limitations by means of official announcements. The determination of these restrictions will be made after assessing relevant variables such as the sensitivity and volume of the data, the jurisdictional legal requirements, the purpose of data processing, and the potential risks involved. This assessment will help establish the necessary terms and conditions to ensure that data protection standards are upheld throughout the process of international data processing.

➤ ***The implementation of a Data Protection Board*:** The Data Protection Board will serve as a neutral adjudicatory entity with the responsibility of addressing privacy-related complaints and conflicts among key stakeholders. In its capacity as an autonomous regulatory body, it will possess the requisite power to identify instances of non-compliance with the rules outlined in the Act and then levy fines commensurate with the severity of violations. The central government would conduct the selection process for the chief executive and board members of the Data Protection Board with the intention of ensuring fairness and transparency. In order to facilitate a mechanism for

customers to contest decisions rendered by the Data Protection Board, the government will establish an appellate entity. The appellate body in question might potentially be designated to the Telecom Disputes Settlement and Appellate Tribunal (TDSAT), an entity entrusted with the responsibility of resolving issues pertaining to data privacy and reviewing appeals against rulings issued by the Data Privacy Board.

- ***Voluntary endeavour:*** In accordance with the provisions of the Data Protection and Privacy Act, the Data Protection Board has the authority to recognize voluntary commitments made by any entity responsible for data handling. Such commitments pertain to compliance with the terms of the DPPA and can be acknowledged at any stage of the complaint resolution process, encouraging responsible data management and fostering accountability among data fiduciaries.

Note:
Please refer to the specific sections of the DPPAor associated regulations for exact stipulations regarding the Board's powers, as the above is a general depiction based on typical provisions related to data oversight.

- This voluntary endeavour may involve the implementation or avoidance of particular activities by the party involved. Moreover, the Board has the authority to modify the terms of the voluntary endeavour if deemed necessary. The voluntary commitment acts as a legal obstacle to legal actions related to the topic of the commitment, unless the data fiduciary fails to comply with its conditions. In the case of failure to comply, such a violation is regarded as a contravention of the DPDP Act, and the Board is empowered to levy sanctions for this transgression. Furthermore, the Board possesses the authority to mandate the disclosure of the undertaking to the general public.

- **An alternative technique for disclosure:** This mechanism facilitates the resolution of disputes between two parties through the intervention of a mediator.

- **Offence and Penalties:** Non-compliance with the regulations may result in data fiduciaries being subject to penalties amounting to a maximum of INR 2.5 billion. The penalties outlined in the DPDP Act, 2023, and its associated rules encompass various infractions related to data protection. These include a maximum penalty of INR 10,000 for breaching the duty owed to data principals, a fine of up to INR 2.5 billion for failing to implement reasonable security measures to prevent personal data breaches, fines of up to INR 2 billion for neglecting to inform the Data Protection Board and affected data principals in the event of a personal data breach, penalties of up to INR 2 billion for violating additional obligations pertaining to children's data, a penalty of INR 1.5 billion for non-compliance with significant data fiduciary obligations, and a penalty of INR 500 million for contravening any other provision of the DPDP Act, 2023 and its associated rules.

- **Conflict with Existing Laws**: One potential issue that may arise is a conflict between the proposed legislation and current legal frameworks. The requirements outlined in the DPDP Act will operate as supplementary measures and will not deprive or override any existing legislation currently in force. However, in cases where there is a direct conflict between a specific provision of this Act and a provision of any other law that is already applicable, the provision of this Act shall take precedence to the extent of the conflict, ensuring that data protection standards are upheld without creating legal ambiguity.

- **The DPDP Act's exemptions :**

The DPDP Act provides the following exemptions:

- In the interest of security, sovereignty, public order, etc., for notified agencies.
- For the objectives of research, archiving, or statistics.
- For startups and other categories of data stewards that have been notified.
- To assert legal claims and privileges.
- To fulfil judicial or regulatory responsibilities.
- To prevent, detect, investigate, or prosecute criminal activity. To prevent, identify, investigate, or prosecute criminal activity.
- Under a foreign contract, to process personal data of non-residents in India.
- For approved mergers, splits, etc.
- To identify defaulters and their assets, etc.

Chapter 9

Roles and Responsibilities in the Implementation of CBDC

9.1 Introduction:

Digital currencies (CBDCs) are considered a direct obligation of the central bank. This distinction may not always catch the public's eye. It is significant because it has the potential to completely disrupt the current financial system. To illustrate, a CBDC could exacerbate bank runs, prompt individuals to exit the banking sector, and raise loan costs. In essence, this direct obligation characteristic stands out as a factor indicating that a CBDC represents a departure from the established financial framework.

9.2 What exactly is a liability?

In finance, the term "liability" is used to indicate something that one person owes to another person, while "asset" is something that one person owns outright. This means that an item, like a loan or a deposit, can be both a liability for one individual and an asset for another individual. The difference between what's owned (assets) and what is owed (liabilities) is known as "equity," which represents the remaining value owned by the bank's owners. To illustrate the relationship between assets, liabilities, and equities, in a bank balance sheet (refer to Figure 1), various items may fall under each category; however, in essence, assets should equal liabilities plus equities. This connection is commonly referred to as "the accounting equation."

Figure 1
Using a simplified balance sheet for a bank, assets must equal liabilities plus equities:

Assets	Liabilities	Rs(000)
Loan……2500	**Deposits……2800**	
Reserves……..800	**Long term debt----------200**	
Bonds----------200		
	Equities	
	Shareholders Equities…….500	
Total Assets 3500	Total Liabilities and Equities: 3500	

9.3 Whose responsibility is it?

Currently, when individuals use digital payment methods such as debit or credit cards, the associated financial institution considers the funds in their linked accounts or the balance on their cards as a liability that the institution must honor and transfer upon request. The institution is responsible for ensuring funds are available for withdrawal or payment, and it facilitates these transfers on behalf of the customer.

In contrast, with a central bank digital currency (CBDC), the central bank itself would directly hold the digital money as a liability to the account holder. This places the central bank at the core of managing, transferring, and safeguarding the digital funds, thereby establishing a direct relationship between citizens and the central bank. This connection signifies a fundamental shift, positioning the central bank as the primary authority responsible for the issuance and control of digital money in the economy.

9.4 Why is the liability status of a CBDC important?

In the accounting guide, it was mentioned that something could be considered a liability by one person and an asset by another. However, it is not possible for something to be a liability owned by two parties (excluding scenarios like partnerships). When the Reserve Bank of India (RBI) issues a Central Bank Digital Currency (CBDC),

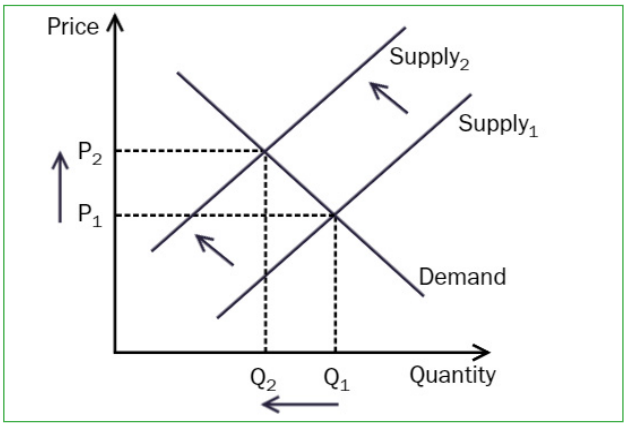
it remains a liability of the RBI, just like physical currency in circulation. Both CBDC and physical currency are fungible; they are in the same denomination and serve as legal tender issued by the RBI, and they are accounted for as liabilities in the RBI's Issue Department balance sheet. These liabilities are distinct from the RBI's banking department balance sheet.

When CBDC is issued directly into circulation, it effectively replaces an equivalent amount of physical currency. The total currency in circulation remains unchanged, but the composition shifts from cash to digital form. In this case, the RBI's liabilities increase with the issuance of CBDC, and the overall monetary base remains stable.

During digital transactions involving CBDC, when a customer's bank account is debited and the CBDC is credited to their digital wallet, the bank transfers an equivalent amount to the RBI by exchanging cash, causing the currency in circulation to decrease; the RBI then issues an equivalent amount of CBDC, keeping the total currency in circulation and CBDC in circulation unchanged. In this process, the liability of the bank becomes the liability of the customer's wallet, while the CBDC remains a liability of the RBI.

If individuals choose to hold their money directly in CBDC wallets or accounts, it can lead to a reduction in traditional bank deposits. Since CBDC holdings are liabilities of the central bank and are not classified as commercial bank deposits, they are not directly available for bank lending or funding loans. However, a decrease in bank deposits may reduce the availability of funds for loan origination, potentially affecting banks' capacity to extend credit. It is important to note that CBDC itself does not fund loans, but shifts in the composition of funds between bank deposits and CBDC holdings can influence the overall credit supply in the economy. With the reduction in loan supply from Q1 to Q2, the cost of these loans will begin to rise from P1 to P2.Essentially, this issue extends beyond just affecting bank profits. If increased funding costs lead to reduced loan availability or banks facing closures and mergers, the overall stability of the banking sector could be compromised. Increasing loan costs for banks would likely be passed on to borrowers as higher interest rates, making loans more expensive for all consumers and businesses. This could hinder credit growth, slow down economic activity, and limit access to financing, especially for smaller or riskier borrowers. As a result, the broader economy could experience decreased investment and increased financial strain across the board..

Figure 2
Decreasing the supply of loans will increase the cost of loans for everyone.



9.5 What are the advantages of choosing a CBDC over a traditional bank account?

There are concerns regarding liberties that could lead some individuals to hesitate in embracing a CBDC. Despite these concerns, there are factors that might persuade people to consider using a CBDC in certain situations within markets. For instance, consider scenarios such as a period of panic during a bank run and a time of planning amidst stability.

Bank runs occur when customers lose confidence in their bank for various reasons (often due to news about the bank's financial situation) and rush to the bank to withdraw all their funds. Traditionally, this involved individuals rushing to retrieve their funds in cash. However, when it comes to withdrawing cash during bank runs factors like waiting time in queues ,the availability of cash reserves at the bank , the inconvenience of handling money and the security risks associated with storing money all serve as obstacles that impede swift withdrawals.

In contrast, according to insights from the Federal Reserve itself, "the ability to promptly convert forms of currency—such as deposits held at banks—into CBDC could potentially increase the likelihood or severity of runs on financial institutions." In terms of going to the bank to withdraw physical money, a person could opt to transfer their funds into a Central Bank Digital Currency (CBDC) from the comfort of their own home. Furthermore, individuals have the option to retain this currency for extended periods due to its comprehensive protection and insurance. Unlike cash, there would be no need to worry about storing or carrying around large amounts of money.

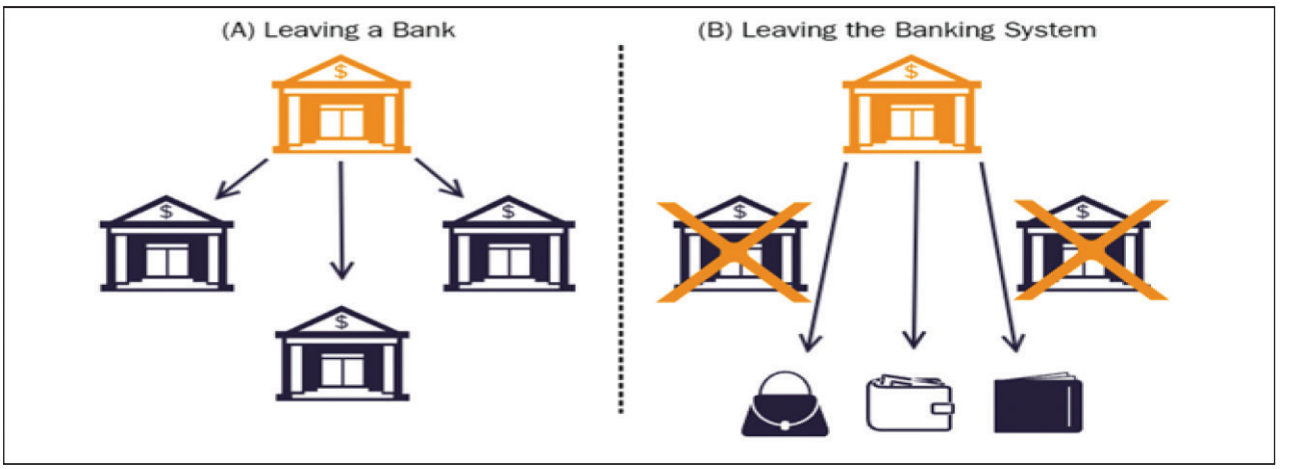
While it was more common for people to physically

withdraw cash during times of urgency, advancements in technology have led to transactions where individuals electronically transfer their funds between banks rather than taking out physical cash (refer to Panel A in Figure 3). It is important to note that the speed of these transactions can present a challenge. However, there is an aspect to this shift: These transactions primarily impact the institution involved and do not significantly affect the overall deposit supply. After exiting the system, transferred funds move between institutions and remain within the financial system. The issue with a CBDC in this situation is that individuals might opt to move their funds out of the banking system and into their wallets, akin to stashing cash under a mattress. Furthermore, it's possible to use incentives to encourage individuals to leave the framework, even in the absence of a crisis that triggers a bank run. For instance, proponents of CBDCs have suggested offering benefits like interest rates compared to bank accounts and government backing without the need for deposit insurance. The appeal of above-market interest rates could prompt individuals to switch to a CBDC. Advocates have acknowledged that these incentives could overshadow sector alternatives. One proponent even emphasised that disrupting the banking system is the advantage of introducing a CBDC, despite acknowledging that such action would bring about changes threatening various sectors within banks and credit card companies.

Apart from concerns, there are also worries about how government incentives might motivate individuals to exit the banking system. During the years between 1911 and 1966, the U.S. Postal Savings System functioned as a way to provide convenient options for saving money at a low interest rate. Officials initially set this interest rate. The interest rate ended up being relatively high when market rates dropped during the Great Depression, a time characterized by bank closures. Alongside individuals seeking returns and moving away from banks. Research indicates that some people transferred their funds to the postal savings system following news of local bank shutdowns. Between 1929 and 1933, deposits in the postal savings system surged significantly from $154 million to $1.2 billion. In both turbulent and tranquil times, the introduction of a central bank digital currency (CBDC) could pose risks to systemic stability. During periods of financial stress or crisis, rapid adoption or mismanagement of CBDCs might accelerate bank runs if individuals seek direct claims on the central bank, bypassing commercial banks, thereby undermining banking sector stability. Conversely, during stable periods, the shift of funds into CBDCs could lead to reduced bank deposits, impacting banks' ability to fund loans and maintain liquidity. Additionally, if cybersecurity vulnerabilities or operational flaws occur, they could cause widespread disruptions, eroding public confidence and threatening overall financial stability. Therefore, careful design and prudent management are crucial to mitigate these risks and ensure that CBDCs support, rather than destabilize, the financial system across different scenarios.

Figure 3

A bank run may entail individuals switching banks or completely withdrawing from the banking system.



Source: cato

9.6 Is it possible to store CBDC at the bank?

When it comes to understanding liabilities and bank runs, let's take a look at how the public could make use of a CBDC. One common question that arises in discussions about risks is: Why can't individuals simply keep their CBDC with the bank? Depending on the chosen model,

consumers have essentially three options for storing their CBDC.

This scenario, where the central bank issues CBDC directly and individuals hold their CBDC in accounts managed directly by the central bank, is a conceptual framework often discussed in international contexts. It involves each digital dollar being either withdrawn from the existing banking system or converted from cash, with banks having no access to these CBDC holdings. In such a setup, the central bank essentially acts as a payment platform for digital transactions—similar to platforms like PayPal or Cash App—by directly distributing money to the public.

It is important to note that this approach is not currently implemented in India, and in this context, the "Reserve Bank" refers to the central bank of the respective country, not necessarily the Reserve Bank of India. The Indian Reserve Bank's discussions on CBDC focus on a different model that maintains banking sector involvement and does not envisage direct customer accounts managed exclusively by the central bank.

Unlike a CBDC that intermediaries facilitate, individuals would store their CBDC in a digital wallet that banks (or other private entities) manage on behalf of the Reserve Bank.

Even though the bank has to cover expenses related to processing payments, ensuring cybersecurity, and meeting requirements, adding a Central Bank Digital Currency (CBDC) to this wallet doesn't mean that the CBDC becomes the bank's responsibility. It's like storing items in a safe deposit box. While banks may manage and oversee customer accounts, they cannot access or control the actual reserve funds backing the CBDC, which are held securely by the central bank. The Reserve Bank manages these accounts, so they cannot claim ownership. In either of these CBDC scenarios, individuals could opt to convert their CBDC into bank deposits, albeit through a process. In the background, the bank transfers the customer's CBDC to the Reserve Bank, which then uses the credit to balance out a newly created deposit. This approach enables banks to use deposit accounts for lending and operational purposes while allowing consumers to continue interacting with the financial system in their usual manner. However, account holders would not directly hold or manage the CBDC itself. Instead, transactions from these accounts would function similarly to current debit and transfer operations—like the billions of daily transactions in the United States—without involving the CBDC as a separate asset. This is comparable to depositing cash into a bank: once cash is deposited, the depositor no longer directly controls or uses cash but instead interacts through account-based transfers. Similarly, in this model, exchanging a CBDC for a deposit account would reduce direct access to the digital currency's functionalities, essentially integrating CBDC into existing banking channels rather than providing a standalone, user-controlled digital currency.

Wait, isn't cash considered a direct obligation of the central bank?

At this point, some individuals might still be wondering how a CBDC poses a risk, given that cash is also considered a central bank obligation and undergoes a similar exchange process when stored in banks. It's an aspect to ponder.

To start with, the presence of cash does contribute to disruptions in the system since it provides consumers with an ultimate method of making payments that they can resort to. Indeed, one could raise similar arguments about gold in the era of the gold standard. However, a CBDC poses a risk because consumers are likely to be able to withdraw their funds more swiftly than ever before and store their money easily without substantial storage or security expenses.

The Federal Reserve in the United States stated that a central bank digital currency (CBDC) could lead to an increased likelihood and severity of bank runs. A CBDC's digital aspect would amplify the effects of a run. This would prolong the recovery process compared to cash transactions.

Figure 4

Examining the impact of a CBDC on the speed of a bank run compared to cash

	Cash	CBDC
Final Means of Payment	Speeds Up	Speeds Up
Withdrawal Speeds	Slows Down	Speeds Up
Security Costs	Slows Down	Speeds Up
Storage Costs	Slows Down	Speeds Up

9.7 The Trade-off of Central Bank Digital Currencies

Many experts have also noted the risk of destabilising the system that Central Bank Digital Currencies (CBDCs) pose. Notable figures such as George Selgin from the Cato Institute, Andrea Maechler from the Swiss National Bank, and Greg Baer from the Bank Policy Institute Rob Morgan from the American Bankers Association, as well as researchers at institutions like the European Central Bank, the Massachusetts Institute of Technology, and the University of Michigan, have expressed similar concerns regarding CBDCs and their impact on financial stability. The Federal Reserve has even acknowledged that introducing a CBDC could lead to a decrease in bank deposits, potentially raising funding costs for banks and affecting credit availability or costs for both individuals and businesses.

Despite these challenges, some supporters of CBDCs have suggested making them intentionally unattractive to discourage use. For example, proposals by the Federal Reserve and European Central Bank include not offering interest on CBDC holdings, setting limits on CBDC holdings, and restricting accumulation over time. Essentially, this means no interest earnings on CBDC balances, capped holdings for individuals, and constraints on transfer amounts over time. William Luther, who heads the Sound Money Project at AIER, has labelled this dilemma the "CBDC Trade-off." Let's explore two ends of the spectrum. On one side, a CBDC could provide incentives like interest payments, subsidised transactions, and tax breaks, enticing individuals to shift from banking systems. This approach could attract a user base for the CBDC. Ensure network stability. On the other hand, a CBDC with no interest pay-outs, a capped limit of Rs10,000, and transaction restrictions may not encourage people to switch from their existing banks. However, this scenario could lead to user adoption, ensuring the viability of the CBDC. In essence, it boils down to a choice between creating a system that may impact the financial structure or developing an unattractive system that strains taxpayer funds.

Given this trade-off scenario, opting not to introduce a CBDC seems like the right decision.

9.8 Final thoughts for readers

Let's quickly go over what we've discussed.

When considering the introduction of a CBDC, there is a risk of destabilising the banking system and exacerbating panics. The US Federal Reserve attempted to mitigate this risk by involving banks in the process through a proposed CBDC. However, with a CBDC, banks would incur operational expenses to manage CBDC accounts without earning loan revenue from those funds since the CBDC remains a liability of the central bank. Additionally, reducing deposit supply could result in higher credit costs, making loans more expensive for everyone.

While today's financial system is not flawless, it typically functions enough that people seldom question, ***"Whose liability is it really?"*** While a CBDC is fundamentally a liability of the central bank, it also introduces certain considerations for systemic stability. In some interpretations, the introduction of a CBDC could, under certain conditions, make the financial system more vulnerable—particularly if rapid shifts between CBDC and bank deposits lead to increased liquidity risks or bank runs. This potential for destabilization arises because CBDC liabilities are directly linked to the central bank, which might incentivize rapid and large-scale movements of funds during periods of economic uncertainty. As such, one perspective suggests that the very feature of CBDC being a central bank liability could, in certain circumstances, contribute to systemic fragility. This underscores the importance of careful design to prevent destabilizing behaviours and manage risks effectively.

Chapter 10

Managing Digital Currencies in Financial Records

10.1 Introduction to the concept of IFRS standards

Digital currency is a cutting-edge advancement that has garnered increased interest from researchers, investors, financial institutions, and regulators. It serves as a medium of exchange that lacks form and solely exists in format. It's important to note that digital currency differs from money, like a bank account, which represents the cash held in a specific account tied to physical currency. Financial records should properly reflect the integration of currency into many businesses' financial management systems. Currently, there is no direction from the International Accounting Standards Board (IASB) regarding the accounting standards for the growing volume and complexity of currency transactions, including those involving CBDCs.

The categorization of currencies presents a challenge, and the lack of guidance from standard-setting bodies influences the accounting and disclosure of these currencies in financial statements.

Is there an accounting standard for currency that meets the current IFRS standards? Digital currencies operate through either a ledger or a distributed ledger technology platform. The blockchain is a well-known example of such technology. The Bank for International Settlements (BIS) (2020) suggests that digital currencies based on technology may enhance efficiency and establish secure payment systems. Devices globally manage blockchain-based currencies instead of a central hub, ensuring continuous verification of transactions.

However, many individuals and organisations may not fully grasp how blockchain operates, impacting the development of accepted accounting practices, taxation policies, and regulatory frameworks for currencies.

Moreover, the CBDC Handbook offers an overview of technology integration into accounting systems, introducing a new accounting approach known as 'triple entry accounting'.

10.2 Classifying digital currencies for accounting purposes

Currently, there is a lack of universally accepted accounting standards or categories for currencies. This lack of classifications in currency accounting could potentially impact the quality of financial information provided, influencing the decision-making processes of financial report users. A strict accounting approach could also raise uncertainty costs for both accounting firms and financial markets. Additionally, the subjective nature of currencies poses challenges, leading to increased reliance on judgment. This reliance on judgment in accounting can lead to issues, as it allows companies to choose accounting methods that increase profits or enhance perceived value without accurately reflecting their position. Consequently, this may compromise stakeholders' ability to accurately assess a company's revenue, while also increasing the risk of earnings manipulation. Earnings manipulation involves a company using accounting tactics to manipulate earnings in order to portray a position more accurately than reality.

10.3 Classifying CBDC in accounting

Currently, there are no accounting standards that deal with how to account for Central Bank Digital Currencies (CBDC). Divergent opinions exist regarding the appropriate use of International Financial Reporting Standards (IFRS) for currency accounting. According to the Australian Accounting Standards Board (AASB), digital currency falls under the definition of an asset. According to IFRS, assets are resources that an entity controls due to events. The entity anticipates future economic benefits from these assets. When it comes to assets, the straightforward classification for currencies is considered 'cash'.

However, there are arguments against categorising currencies as cash. One argument posits that CBDC does not align with the IFRS definition of cash, an accounting framework commonly employed by central banks. According to IFRS, cash is defined in the IAS 7 Statement as "cash on hand and demand deposits." Nonetheless, this definition could potentially change in the future to include CBDC. Another argument against labelling CBDC as cash is that CBDCs can potentially carry negative interest rates, a feature not applicable to physical cash issued by the central bank, which typically does not earn any interest. Since cash is a physical, non-interest-bearing form of currency, the possibility of negative interest rates with CBDC introduces a conceptual difference, as it could

incentivize holders to spend or transfer funds rather than hold them, thereby affecting its classification and the way it functions within the monetary system. However, one could apply a valid 'substance over form' argument in this context.

If individuals were to view CBDC as a form of money, and if the issuers aimed for CBDC to function like cash, then it could be considered enough for currencies to fall under the category of cash (Darbyshire, 2020).

IFRS's definition of a 'financial instrument' may also be relevant to CBDC. According to the IAS 32 Statement, a financial instrument is defined by IFRS as "any agreement that represents a remaining interest in an entity's assets after subtracting all its obligations" (IAS 32.11).

One challenge in classifying CBDC as a financial instrument is that, unlike bonds, it does not inherently represent a transfer of an asset from one party to another. Instead, CBDC essentially involves one party holding a liability of the central bank—an obligation to pay the holder in currency—while the central bank maintains the corresponding asset. This distinction is important because, without an underlying bond or similar asset-backed security, CBDC functions primarily as a digital form of cash rather than a tradable financial instrument. Clarifying this fundamental difference is essential before CBDC can be accurately classified as a true financial instrument, which typically involves rights to assets and obligations that can be transferred or traded.

Furthermore, some documents on CBDC suggest that its trading at a premium or discount ,makes it more suitable for classification as a 'security'. This scenario leads to accounting concerns regarding whether CBDC meets the criteria for being considered equivalent to cash. The presence of these interpretations of accounting standards concerning digital currency underscores the necessity for greater global agreement and transparency on accounting principles for digital currencies.

10.4 What is the relationship between block-chain and financial reporting?

Digital currency has been around, in economies for some time. It has recently found a suitable technology platform. Most digital currencies are based on a technology known as 'blockchain'. Blockchain is essentially a ledger that records transactions and facilitates direct value transfers between parties without the need for intermediaries (Treiblmaier, 2018). Originally intended for currency use blockchain has also emerged as a solution that eliminates the reliance on trust between parties required by institutions. By reducing the involvement of entities transaction costs and time associated with using regular banks and financial institutions can be minimized (Dai and Vasarhelyi 2017).

Blockchain boasts five characteristics; decentralization, security, transparency, consensus based decision making and flexibility. Data stored in blockchains is tamper proof preventing any user from altering or falsifying information. The consensus mechanism, in blockchain ensures trust in transactions by allowing decisions to be made collectively by the systems users than being controlled by a centralized authority like in traditional systems. Since the database is shared and decentralized among all network participants it is not possible to tamper with the recorded transactions, in the blockchain (Keogh et al., 2020). However it's important to address issues related to blockchain technology, including security, scalability, regulatory concerns, complexity and energy consumption.

Illustrated in Fig. 1 below is a depiction of how blockchain technology operates.

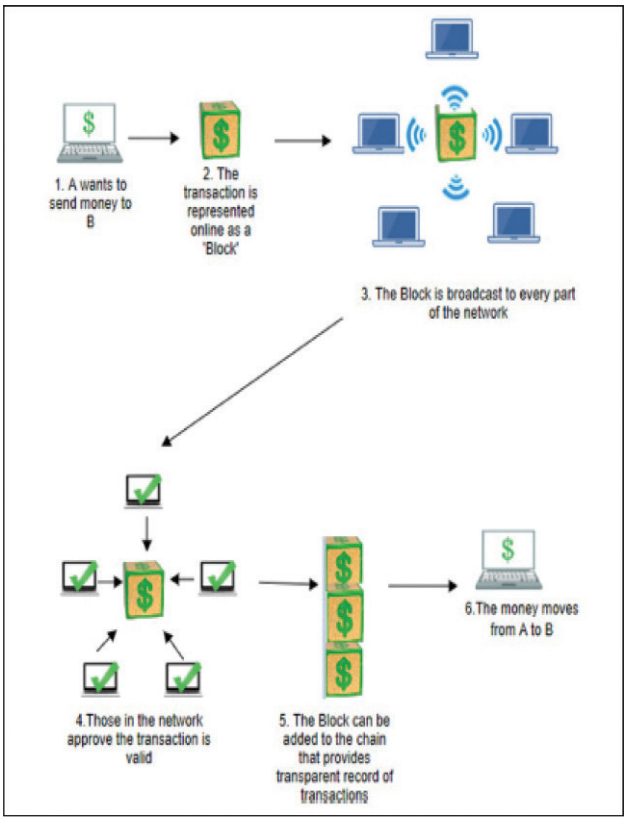


Figure 1. How does Blockchain work? Based on Sarmah's work in 2018.

While initially designed for recording cryptocurrency transactions blockchain is now utilized by organizations across sectors such, as supply chains, logistics, intellectual property management, healthcare services, data handling, food safety measures and notarization. Swan (2015) has categorized Blockchain applications into three stages;

Stage 1 known as 'digital currency' focused on developing applications, for Bitcoin and digital cryptocurrency transactions.

Stage 2 termed 'digital economy' introduced contracts and expanded to include mortgages, bonds, loans and futures.

Stage 3 labelled 'digital society' ventured into applications beyond the stages, such as government services, healthcare, scientific research, IoT (Internet of Things) culture, art and literacy.

Moreover existing literature outlines three categories of permissions; public blockchains (permission less) private blockchains (permissioned) and federated blockchains (a blend of public and private).

Public blockchains are fully accessible to all users for viewing and operations. These have primarily been used for cryptocurrencies like Bitcoin. On the hand ***private blockchains*** restrict access to authorized parties who can add transactions to the blockchain as, per Dai and Vasarhelyi (2017).This highlights why private blockchains are more attractive, to businesses; this choice doesn't require companies to make their transactions public. However it's crucial to remember that the reliability of blockchains hinges on the honesty of their users as they rely on users not collaborating to generate transactions.

In the realm of accounting blockchains are increasingly seen as a technology that could be utilized for recording, storing and reporting transactions. The potential use of technology for recording accounting transactions has been widely recognized by experts. For instance, Yu and colleagues (2019) proposed that parties involved in financial or corporate transactions could use blockchain technology to share and disclose non-confidential information—such as earnings forecasts, corporate social responsibility reports, or other public disclosures—while keeping sensitive or proprietary data secure. This approach aims to enhance transparency and trust among stakeholders, leveraging blockchain's secure and immutable ledger features for responsible information sharing. In the run blockchain technology could serve as an accounting ledger for divulging company's financial data to improve the quality of information for accounting purposes and reduce information disparities. The advantages of employing blockchain in accounting may include reducing transaction costs ,eliminating the need for data reconciliation enhancing efficiencies ,lowering fraud risks offering users timely accounting data and ensuring representation, in financial reports (Dai and Vasarhelyi 2017; Faccia and Mosteanu 2019; Kamble et al. 2020).

10.5 A revolutionary concept in the accounting industry: triple-entry accounting

The concept of 'triple entry accounting' is a term used by researchers to describe an accounting approach that enhances the double entry system. Initially proposed by financial expert Ian Grigg in 2005 the triple entry method suggests adding a signed receipt, as an entry to prevent transaction errors and fraud. While the specific platform for this entry was not initially specified blockchain technology emerged as a solution due to its decentralized, secure and immutable nature. ***In accounting this third entry serves as both a transaction record and an invoice that is recorded on the blockchain itself. This novel approach appears to address the limitations of double entry bookkeeping offering enhanced security and reducing the reliance on assurances for statements.***

Double entry accounting, which has been in use for over six centuries revolutionized accounting practices. Remains one of the significant advancements, in business and trade history even today.

The initial method of recording transactions involved a list of assets where items were added and removed as they entered or exited a company. However this system had its flaws, such, as making it hard to spot errors and leaving room for activities. To address these issues a reliable double entry system was introduced. This system ensures that each transaction leaves a trace requires assets and liabilities to be in balance and allows parties to view debit and credit records separately through their accounts. ***Despite its advantages the double entry system can still be manipulated similar to the single entry system since it depends on proving or verifying each transaction. Additionally regular auditing is necessary to uphold trust in this system even though it guarantees the accuracy and consistency of data over time albeit at a significant labor and time expense.***

On the hand ***the innovative triple entry blockchain system involves recording transactions, in three ledgers by both***

parties involved as well as in a shared ledger. Moreover accounting entries are timestamped for added security and transparency (Dai and Vasarhelyi 2017).

When a transaction is finalized in the system a receipt is instantly created utilizing the signatures of the users, where each user possesses their non-transferable digital signature. In a triple entry system, transactions can be easily verified by comparing them to the receipts issued by parties, which are cryptographically signed to provide evidence of the transaction. This approach helps to reduce fraudulent or dishonest behaviors, enhance control over financial records, and introduce a higher level of transparency to the accounting process—something that traditional double entry accounting cannot fully achieve.

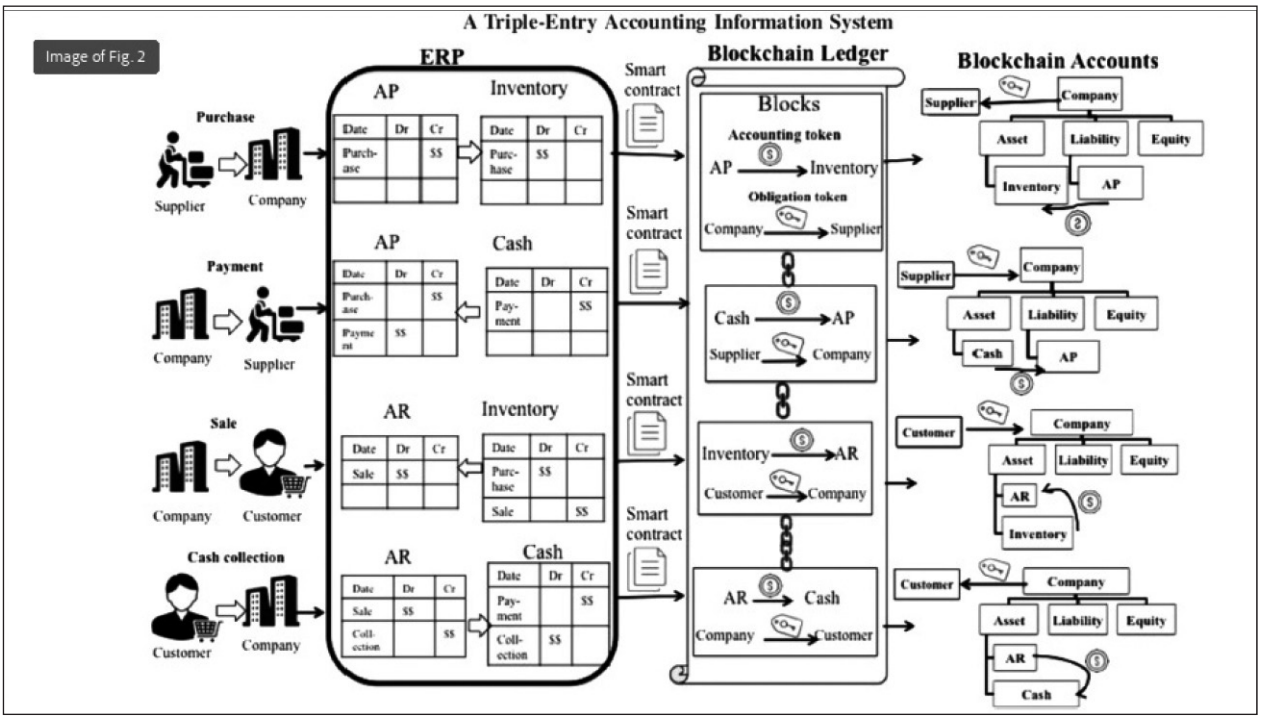


Figure 2 showcases a triple-entry accounting system.
Derived from - Towards Blockchain-Based Accounting and Assurance From the source by Dai, Jun and Vasarhelyi, Miklos (2017).

10.6 Effect on the economy

There are still questions left unanswered regarding how digital currencies could affect economic and environmental stability as mentioned by Elsayed and Nasir in 2022.

A recent report, from the Atlantic Council in 2021 highlights an issue of interoperability within the system due to the increasing use of CBDCs. There's a concern that customers might withdraw sums from banks simultaneously to buy CBDCs leading to a bank run that hampers their lending capabilities, impacting interest rates and causing market turbulence (Atlantic Council, 2021). This poses a challenge for countries with financial systems. Additionally there are worries about issued cryptocurrencies impacting the economy negatively particularly in developing nations by eliminating intermediaries like banks. The high volatility of cryptocurrencies and lack of oversight have raised concerns about their economic impact. For instance the Bank of Russia has expressed concerns about the risks associated with cryptocurrency mining, on the economy and financial stability of the Russian Federation (Bank of Russia 2022).

The Bank of Russia warns that alternative currencies not backed by governments could harm people's security by exposing them to investment losses caused by market fluctuations, fraudulent schemes and online attacks. Conversely some argue that digital currency might enhance the access of nations, in the worldwide market more effectively, than ever before. This is because of its cost transaction capabilities, potential to hedge against inflation when used as an asset reserve and the transparency it offers through ledger technology during transactions.

10.7 Insufficient regulations

There are still questions left unanswered regarding how digital currencies could affect the stability of economic and environmental sectors (Elsayed and Nasir, 2022). According to a report by the Atlantic Council (2021), there are emerging concerns about interoperability challenges within the cross-border payment system and global financial infrastructure, driven by the increasing adoption and use of CBDCs.

The report suggests that customers withdrawing sums of money from banks to buy CBDCs could spark bank runs impacting their lending capacity causing market disruptions and influencing interest rates (Atlantic Council, 2021). This issue is particularly troublesome for countries with fragmented or incompatible financial and payment systems, especially those lacking interoperable digital infrastructure or standardization across borders. Such challenges can hinder seamless cross-border transactions and reduce the effectiveness of CBDCs in facilitating global trade and finance. Additionally operational risks come into play with CBDCs as they are susceptible to cyber threats and require security measures to thwart attacks by cybercriminals.

Furthermore there are worries that issued cryptocurrencies might have effects on the global economy especially on developing nations' economies because they eliminate the need for intermediaries like banks. Critics argue that the high volatility of cryptocurrencies and absence of oversight could harm the economy. For instance the Bank of Russia has expressed concerns about risks posed by cryptocurrency mining activities, in Russia on its economy and financial stability (Bank of Russia 2022).The Bank of Russia has mentioned that currencies not backed by the government could jeopardize the wellbeing of individuals by exposing them to risks such as investment losses due to market fluctuations, fraudulent activities and cybercrimes. Conversely some argue that cryptocurrencies have the potential to enhance inclusivity for nations in the global economic landscape at an unprecedented level. This is attributed to their cost effectiveness in transactions ,their ability to serve as a hedge against inflation when used as a store of value and the enhanced transparency, in transactions facilitated by ledger systems.

10.8 Dealing with taxation matters and digital currencies

The introduction of currencies naturally leads to questions, about tax laws. A key question is how fluctuations in currency values affect a company's actual cash payments of taxes (cash taxes) as well as its reported tax expenses (book taxes). Another concern is how the taxation of cryptocurrency can be implemented when transaction details are scarce or unreliable. The presence of assets outside the financial system may prompt cryptocurrency investors to question whether their activities are subject to taxation.

While accounting standard setters have not provided guidance tax authorities have issued guidelines on how to treat cryptocurrency for accounting and tax purposes. Some countries have established rules on taxing currencies while others lack guidelines for their treatment. For instance cryptocurrencies are currently taxed in countries like the UK, US, Italy, Germany, Canada and India. To determine the tax implications of cryptocurrencies it is essential to classify them. In the US the Internal Revenue Service categorizes cryptocurrencies as 'property' rather than currency for taxation purposes. Consequently digital currency is taxed similarly to assets such, as stocks or gold.

In Italy, tax authorities consider cryptocurrencies to be treated the same as traditional currency for tax purposes. Consequently, any income earned from converting cryptocurrencies into fiat currencies is subject to a flat substitution tax rate of 26% (OECD, 2020). This means that profits from such conversions are taxed directly at this rate, regardless of the specific nature of the income, aligning cryptocurrency taxation with that of conventional currency transactions.

The tax authority's flexible approach aims to simplify cryptocurrency taxation and may prompt companies to pay their taxes. However this flexibility could lead to a rise in taxation methods and accounting practices for cryptocurrencies. Individuals may have accounts on exchanges in various tax jurisdictions and even individual accounts might generate revenue that falls under different international tax regulations.

Consequently information on cryptocurrency capital gains is limited since data may not accurately represent an individual's assets due to inconsistencies in tax laws (Thiemann, 2021).

Furthermore some argue that blockchain technology, the foundation of cryptocurrencies could enhance the tax system. Blockchain technology is well suited for transaction taxes because it offers information, with increased transparency and certainty. According to PWC (2016) blockchain applications could streamline processes and reduce the cost of tax collection while closing the tax gap.

Demirhan (2019) also proposed leveraging technology to enhance tax collection by increasing transparency and traceability. In a database all network participants have accessto the transaction records facilitating better oversight.

10.9 In summary, to conclude

Digital currencies are a truly innovative addition to the world of financial payments. One major concern revolves around the absence of generally accepted accounting standards or clear classifications of digital currencies, specifically regarding whether they should be treated as assets, liabilities, or other financial instruments. This lack of clarity hampers consistent accounting practices and affects how digital currencies are reflected in financial statements.. Understanding blockchain technology is crucial for developing accounting and taxation standards, as well as regulatory frameworks, in the digital currency space.

Blockchain has the potential to have a positive impact on business models because of its distinct characteristics, which can address various important business concerns. Moreover, it offers the option of 'triple-entry accounting', where a third entry securely seals accounting entries and makes them accessible to all third parties. In addition, blockchain accounting has the potential to minimise errors in disclosure and earnings management, enhance the dependability and timeliness of accounting information, and address information asymmetry.

It appears that accounting standard setters are facing challenges in keeping up with the rapid expansion of digital assets. As a result, there is a lack of agreement among them regarding the appropriate accounting treatment for crypto currencies. This highlights the pressing need for standard-setters to provide clear guidance. The lack of such guidance has impeded the establishment of a universal accounting practice for crypto currencies, posing various challenges for authorities when it comes to classification and measurement of these currencies.

Even with the establishment of a new standard, further research would still be necessary to address several issues related to the accounting of cryptocurrencies. These questions delve into the proper reporting of transactions related to cryptocurrencies, the recognition and measurement of cryptocurrencies in financial statements, and the impact of these measurements on the quality of financial reporting. Additional research is necessary to explore how auditors can effectively identify the scope and potential risks associated with digital currency transactions during the planning and evidence collection stages of an audit. It is crucial to ensure that financial statements are free of any significant errors or misstatements.

In conclusion, given its close association with financial transactions, we expect the growing adoption of crypto currencies by businesses, individuals, and governments to have a profound impact on the accounting profession. It is critical for accounting professionals to gain a deeper understanding of cryptocurrencies and their technological features, as well as the emerging accounting challenges associated with recording and reporting cryptocurrency transactions. According to Deloitte (2018), it is crucial for accountants to expand their knowledge and understanding of the different accounting treatments for cryptocurrency and its underlying technology. This will help ensure the proper classification, treatment, and handling of digital currencies, whether as assets, liabilities, or other financial instruments, promoting consistency and clarity in financial reporting.. In the cryptocurrency era, accounting practitioners have new opportunities to provide professional services, such as digital currency consulting or technology consulting in the field of accounting and auditing (Smith, 2018).

Chapter 11

The Impact of CBDCs on the Cost of Credit: A Cost Accountant's Strategic Role

11.1 Examining the impact of CBDC on the cost of credit and financial stability through empirical evidence:

It is important to analyze how the introduction of CBDC may impact the cost of credit and overall financial stability. When CBDC is introduced as a substitute for cash, widespread adoption could lead to a reduction in bank deposits, as individuals and businesses shift their funds into CBDC holdings. A decrease in bank deposits may result in higher borrowing costs for banks, since they would have fewer deposits available to lend. Elevated lending costs can, in turn, increase the risk of financial instability. However, these effects need to be empirically verified or refuted using data on CBDC holdings and its impact on the banking system.

CBDC deposits maintained on the books of commercial banks are essentially fungible claims created when the bank receives an equivalent amount of cash or reserves from the central bank—meaning they are interchangeable with physical cash and reserves. These CBDC-based deposits can also be considered for the purpose of credit expansion, as they represent reserves that banks can use to extend loans. Debtors should have the option to draw funds in cash, CBDC, or through other digital instruments such as digital transfers or cheques, providing flexibility in how they access their funds.

11.2 CBDC and the role of a Cost Accountant in increasing the Cost of Credit and ensuring financial stability as a partner of a commercial bank:

When evaluating the effects of Central Bank Digital Currency (CBDC) on credit costs and financial stability, the importance of a cost accountant as a commercial bank's partner becomes even more significant. Cost accountants play a crucial role in effectively managing the impact of CBDC on credit costs and maintaining financial stability. They can contribute in several ways:

Cost Analysis and Optimisation: Cost accountants are capable of conducting a thorough analysis of the commercial bank's cost structure to pinpoint areas for cost optimization. By optimizing operations, eliminating inefficiencies, and carefully managing expenses any potential rise in credit costs linked to CBDC can be effectively counterbalanced.

Financial Planning and Forecasting: By conducting comprehensive financial analysis and forecasting, cost accountants can help commercial banks anticipate and prepare for changes in the cost of credit due to CBDC adoption.

Risk Management and Compliance: Cost Accountants, just like financial analysts, can have a significant impact by evaluating risks associated with fluctuations in credit costs caused by CBDC and implementing risk management tactics to minimize any potential drawbacks. They can also help in ensuring compliance with regulatory requirements and financial standards, which will improve the bank's financial stability.

Monitoring performance and delivering timely reports: Cost Accountants have the ability to establish performance metrics that effectively monitor CBDC's influence on the cost of credit and the bank's overall financial well-being. Monitoring and reporting on financial performance is crucial for making timely decisions and adjusting strategies to ensure stability.

Strategic Financial Guidance: Cost accountants can provide valuable financial guidance to commercial banks, assisting them in effectively managing the complexities and potential benefits of CBDC implementation. With their expertise in cost management, profitability analysis, and capital planning, they play a crucial role in ensuring the bank's long-term financial stability.

In light of these initiatives, it is crucial for cost accountants to work closely with commercial banks to anticipate and tackle any potential rise in credit costs associated with CBDC. This collaboration will not only promote financial stability but also enhance resilience in the ever-changing digital financial environment.

11.3 Striking a balance between managing CBDC holdings and respecting users' choices and preferences:

Setting a cap on CBDC deposits diminishes its appeal when compared to physical currency. Ultimately, this can result in a greater inclination towards cash, as there are no restrictions on the amount one can possess and no limitations on the volume of bank deposits in an individual's account. Regulatory considerations may drive the implementation of a limit on CBDC holdings, but it restricts users' freedom to hold as many units of CBDC as they desire. Many individuals may find cash payments more appealing and choose to forgo CBDC. It is important to strike a balance between restricting CBDC holdings and user preferences. To avoid discouraging users from fully utilizing CBDC. It is important to find an appropriate balance between imposing restrictions on users' CBDC holdings—such as limits to prevent financial instability or abuse—and enabling users to hold as much CBDC as they need for their transactions. Striking this balance ensures that the CBDC remains accessible and useful for legitimate users while mitigating potential risks associated with excessive accumulation, such as impact on monetary policy transmission or stability concerns.

11.4 How can Cost Accountants contribute to striking a balance between limiting CBDC holdings and preserving user choice and preference?

Cost accountants can play a crucial role in striking a balance between limiting Central Bank Digital Currency (CBDC) holdings and preserving user choice and preference. In this regard, their financial expertise and analytical capabilities are invaluable. Here are some ways in which cost accountants can contribute to achieving a balance:

Conducting a thorough analysis of the data and studying user behaviour: Cost Accountants have the ability to analyse data and study user behaviour in order to gain insights into how various restrictions on CBDC holdings might influence user preferences and actions. We can gain valuable insights into the potential consequences of different limitations by analysing transaction patterns, user preferences, and demographic data.

Cost-benefit analysis: Cost Accountants have the ability to evaluate the advantages and disadvantages of limiting CBDC holdings compared to maintaining user freedom and preference. They have the ability to assess the financial consequences of transaction costs, operational expenses, and potential revenue effects. This enables them to provide valuable insights to central banks, helping them make well-informed decisions.

Scenario Planning: Cost accountants have the ability to create scenarios that demonstrate the potential trade-offs between restricting CBDC holdings and satisfying user preferences. Through the creation of various scenarios and the analysis of different limitations and user reactions, financial analysts provide valuable insights to central banks, enabling them to grasp the potential outcomes and implications of their policy choices.

Risk Assessment: Cost Accountants are capable of evaluating the risks involved in various strategies for managing CBDC holdings or maintaining user choice. They have the ability to spot financial risks, operational risks, compliance risks, and other potential challenges that may come up. They can then suggest strategies to minimise these concerns.

Stakeholder Engagement: Cost accountants can actively engage with users, financial institutions, regulators, and other relevant parties to gather valuable input and feedback on CBDC policies. With the input of various viewpoints and constructive criticism, they can assist central banks in making well-rounded decisions that take into account both restrictions on holdings and user preferences.

With their expertise in finance and analytics , and engaging with stakeholders, cost accountants can help central banks striking a delicate balance between managing CBDC holdings and respecting user preferences. Their expertise can assist in making well-informed decisions and formulating policies that cater to the requirements of both the central bank and CBDC users.

IT IS PERTINENT TO INCLUDE LATEST GUIDELINES / VIEWS ISSUED BY RBI AS IT IS VERY IMPORTANT FOR MEMBERS IN INDIA.

Chapter 12

Glossary

- **Anti-money laundering (AML)/Combating the financing of terrorism (CFT):** AML encompasses a range of measures aimed at preventing the infiltration of funds acquired through illegal activities, such as racketeering, corruption, drug trafficking, and fraud, into legitimate financial systems and transactions. CFT measures are put in place to prevent and combat the financing of terrorist activities. Both money laundering and terrorist financing activities have significant consequences, diverting resources away from productive uses and causing negative impacts on the financial sector, national fiscal stability, and society as a whole.

- **Atomic swaps:** Atomic swaps involve the complete exchange of assets between two parties, eliminating the need for reliance on a centralised exchange or third party. If one part of a transaction involving payment for an asset fails, the entire transaction is unsuccessful.

- **Anonymous:** As per the definition provided in the European Union's General Data Protection Regulation (GDPR), anonymity pertains to information that is not connected to a specific individual or to personal data that has been modified in a way that the person it pertains to cannot be identified.

- **Blockchain:** Blockchain is a type of distributed ledger technology (DLT) where transactions are carried out in a peer-to-peer manner and then shared with all system participants. These participants, working together, validate these transactions in batches called blocks. This validation process is carried out through the system's consensus protocol, which can be either proof-of-work or proof-of-stake. Verified blocks are subsequently connected through cryptographic links to form a primary sequence of blocks known as a blockchain.

- **Central bank digital currency (CBDC):** A digital representation of central bank money that could potentially be available to the public (general-purpose or retail CBDC), or to a specific group of authorised participants like financial institutions (wholesale CBDC). The CBDC is denominated in the national unit of account. This is issued by and is a direct liability of the central bank.

- **Confidentiality:** Ensuring confidentiality involves safeguarding sensitive information from unauthorised access. Confidentiality is safeguarded in certain legal systems through a responsibility placed on the recipient to refrain from disclosing information to third parties without the consent of the entity to which the information pertains to. It may also be safeguarded through an agreement between the person sharing the information and the person receiving it.

- **Centralised exchange:** A business service that facilitates exchange transactions by acting as a middleman, allowing for the conversion of specific assets or currencies.

- **Crypto-assets:** Crypto-assets are commonly associated with assets that rely on cryptography and operate on a distributed ledger. Bitcoin and ether are just a couple of examples of cryptocurrencies. However, the term "crypto assets" encompasses a wide range of assets that can be bought and sold on a distributed ledger.

- **Decentralized atomic cross-chain swap:** A decentralised atomic cross-chain swap is a financial arrangement that allows for the trading of digital assets across various block chains without the need for an intermediary party, like an exchange service.

- **Digital currency:** Refers to currency that is in electronic form, which may or may not have a physical counterpart. Digital currencies frequently exhibit certain currency-like traits, such as acting as a means of storing value, a unit of measurement, or a medium of exchange. However, the term may also be employed in a broader sense. They might also exhibit qualities similar to a commodity or another asset.

- **Digital identity (ID):** A collection of digital credentials utilised to authenticate and verify the identity of a real-world person, company, or electronic device on electronic or online platforms, as well as their entitlement to access specific information and services. Today, these certificates usually come in the form of digital certificates that use public-key cryptography to link a public-key with identity information and other details, including a private key and the owner's digital ID.

- **Digital token:** A unit on a digital and typically decentralised ledger that is used to represent value, such as an asset or a basket of assets, including real-world assets such as commodities, stock or real-estate property. The token enables seamless transactions and transfers

of ownership for the underlying value or asset.

- **Digital wallets:** A digital wallet is a convenient tool that allows you to securely store your payment information, such as passwords and private keys. By using a digital wallet in combination with a payment system, you can easily make online payments with peace of mind. When it comes to cryptocurrency, digital wallets serve as a means for users to securely store their private key information and access their digital currencies.

- **Distributed ledger technology (DLT):** DLT is a broad term that encompasses various blockchain technologies. It pertains to the protocols and infrastructure that enable computers in different locations to propose and verify transactions on a ledger, ensuring synchronised updates across a network. Several DLTs operate without a central trusted authority, instead relying on distributed consensus-based validation procedures and cryptographic signatures.

- **Delivery versus payment (DvP):** Delivery versus payment (DvP) is a settlement mechanism that ensures the final transfer of an investment security only happens when the payment for the asset is completed. Transfers can occur within a jurisdiction or across borders, just like any other financial transactions.

- **Electronic money:** E-money, also known as electronic money, refers to stored value that is held in digital accounts or physical devices such as chip cards or computer hard drives. It serves as a convenient means of payment and a reliable store of value. E-money systems differ across various jurisdictions, but they are typically supported by fiat currency. They are denominated in the same currency as central bank or commercial bank money and can be exchanged at their face value for such money or redeemed for cash.

- **Fiat currency:** A type of currency that is mandated by government and typically distributed by a monetary institution, like a central bank. Fiat currencies are different from other types of government-issued money because they are usually not supported by a commodity like gold or silver. There are different forms of fiat currency, including physical bank notes and cash, as well as electronic representations like bank credit, central bank reserves, or central bank digital currency (CBDC).

- **Financial inclusion:** Enabling individuals and businesses to easily and affordably access a range of financial products and services that cater to their specific needs. This includes payment solutions, savings options, credit facilities, and insurance services. Various factors, such as affordability, access to suitable technology, education and literacy levels, geographic accessibility, and the availability of financial infrastructure, play a crucial role in determining the extent of this access.

- **Know Your Customer (KYC):** Procedures and guidelines, typically mandated by legislation, that are applicable to specific responsible organisations, such as financial institutions, requiring them to authenticate and maintain documentation of their clients' identities in accordance with rigorous international or domestic measures against money laundering, terrorism, and other illicit activities.

- **Mobile money:** Mobile money is a wide-ranging category that encompasses services where the mobile phone is utilised for conducting financial transactions.

- **Peer-to-peer (P2P):** Peer-to-peer (P2P) refers to interactions between peers in a system, such as transactions or information exchange, which occur without the need of an intermediary. In the blockchain industry, this now refers to systems that facilitate value transfers without the need for a middleman bank. These systems make use of distributed ledger technology, among other methods.

- **Privacy-enhancing technology (PET):** Privacy-enhancing technology (PET) refers to the use of various technologies or systems that are designed to enhance privacy and protect personal data. These technologies incorporate technical processes, methods, or knowledge to achieve specific privacy or data protection functionality. They also help organisations comply with data protection laws and reduce the risks associated with processing personally identifiable information, such as the risk of data breaches.

Privacy: In this series, privacy is described as the right of individuals to keep their information confidential and protected from unwanted access or interference. Having control over the collection and use of personal information is an important aspect.

- **Pseudonymous:** As per the definition in the GDPR, pseudonymity refers to personal data that becomes unidentifiable without the use of additional information.

- **Public Key Infrastructure (PKI):** Public Key Infrastructure (PKI) encompasses the necessary

policies, procedures, software, and hardware for the creation, management, distribution, usage, storage, and revocation of public and private key pairs and digital certificates. These components are essential for encryption and various other purposes. Sharing the public key with relevant parties is safe and does not compromise security, but it is crucial to keep the private key confidential. Private keys are necessary for decrypting confidential information and messages. In addition, they have the capability to generate a digital signature for a message or document. A digital signature is a mathematical scheme that verifies to recipients that a message or document was indeed created by the owner of the private key, ensuring authentication and integrity. The owner uses their private key to generate the signature, while the corresponding public key is shared openly and used by recipients to verify the authenticity of the signature, confirming that the message has not been tampered with and that it originates from the claimed sender.

- **Payment versus payment (PvP):** Payment versus payment (PvP) is a settlement mechanism that ensures the final transfer of a payment in one currency only occurs if the final transfer of a payment in another currency or currencies also takes place. Transfers of PvP can take place either within a specific jurisdiction or across international borders.

- **Retail CBDC:** Retail CBDC would be potentially available for use by all viz. private sector, non-financial Concept Note on CBDC 8 consumers and businesses An accessible form of central bank digital currency (CBDC) that is available to the general public and business. There are two models for issuance and management of retial CBDCs viz. Direct model (Single Tier model) and Indirect model (Two-Tier model). Under the direct model the central bank would be responsible for managing all aspects of the CBDC system viz. issuance, account-keeping and transaction verification while in an Indirect model, central bank and other intermediaries (banks and any other service providers), each play their respective role. In this model central bank issues CBDC to consumers indirectly through intermediaries and any claim by consumers is managed by the intermediary as the central bank only handles wholesale payments to. A retail CBDC has the potential to be utilised both within a country's borders and across international boundaries, allowing foreign entities to access and use it. CBDCs are also known as general-purpose or universally available CBDCs.

- **RTGS:** RTGS refers to real-time gross settlement systems used in payment and settlement of interbank transactions. It is a payment system that enables instantaneous and secure fund transfers between remitter's/payer's and beneficiary accounts. It is used for high-value transactions due to its real-time processing and the system of processing transactions individually and not in batches.

- **Smart contract:** Automated agreements that are activated based on predetermined and agreed-upon conditions without any need for human involvement. Whether a smart contract is considered legally binding can vary depending on the context and jurisdiction. Typically, the term refers to self-executing contracts that are deployed on decentralized, distributed blockchain networks, where the terms are coded into software that automatically executes when certain conditions are met. While many entities use the term to describe such blockchain-based agreements, whether these smart contracts have legal standing depends on applicable laws and regulations.

- **Special drawing right (SDR):** An additional foreign exchange reserve asset established and upheld by the International Monetary Fund (IMF) to enhance the official reserves of its member countries. A Special Drawing Right (SDR) is not considered a currency or a direct claim on the IMF. Instead, it represents a potential claim on the freely usable currencies of IMF members, which can be exchanged for those currencies.

- **Stablecoin:** Stablecoin refers to a category of digital currencies, often cryptocurrencies based on distributed ledger technology (DLT), that aim to maintain a consistent and stable value in relation to another asset, such as a sovereign currency or commodity, or a collection of assets. To accomplish this, the value of a stablecoin can be pegged to a sovereign currency like the US dollar, other cryptocurrencies, commodities.. Algorithmic stablecoins aim to provide steady value by adjusting supply based on pre-set rules. The stability of the digital currency's value in relation to its reference asset will depend on the effectiveness of the stabilisation mechanism and quality of asset backing.

- **Synthetic CBDC:** An alternative framework to central bank digital currency (CBDC) involves private payment service providers holding reserves at the central bank to fully back the digital currency they issue to customers. With required regulatory framework in place to ensure that these providers

always have sufficient funds at the central bank to cover their liabilities, the system provides the users the needed protection against any potential issuer default. These liabilities may have similarities to a central bank-issued CBDC, but they would not be considered CBDC because the end-user would not have a direct claim on the central bank. Synthetic CBDC is not issued by the central bank and is not a direct liability of the central bank. Some have described synthetic CBDCs as a type of "narrow-bank" money.

- **Unbanked:** Unbanked individuals are adults or households who choose not to use the services of a bank or any other financial organisation for their financial transactions or any other financial needs. Many individuals or families in this situation might prefer alternatives such as cash or pre-paid vouchers—digital or physical certificates pre-loaded with a specific amount of money—which they can use to cover their expenses without relying on bank accounts or digital wallets. .

- **Underbanked:** Underbanked individuals or households rely more on alternative financial services, while still using banks or similar institutions to some extent. Underbanked households often rely on alternative financial services such as non-bank money orders, cheque-cashing services, remittances, payday loans, These terms refer to various types of short-term or asset-based lending. Rent-to-own services allow consumers to rent products with the option to purchase them later. Pawn shop loans involve pledging personal valuables as collateral to obtain a loan, which must be repaid to retrieve the item. Refund anticipation loans are short-term loans based on expected tax refunds, providing quick cash before the actual refund is received. Auto-title loans involve borrowing against the title of a vehicle, which serves as collateral, with the borrower risking the vehicle if the loan is not repaid. These financial products often carry high costs and risks for consumers.

- **Underbanked individuals** or households rely more on alternative financial services, while still using banks or similar institutions to some extent. Underbanked households often rely on alternative financial services such as non-bank money orders, cheque-cashing services, remittances, and payday loans.

- **Application Programming Interface (API):** A set of defined rules that allows two separate software applications to communicate with each other. In finance, APIs enable digital wallets, payment processors, and banks to interact seamlessly.

- **Crypto Mining:** The process of validating cryptocurrency transactions and adding them to the blockchain public ledger. This process typically involves solving complex computational problems to confirm transactions and is rewarded with new units of cryptocurrency.

- **Permissioned Ledger:** A type of Distributed Ledger Technology (DLT) where participants (nodes) must be invited and verified before they can join the network and validate transactions. This differs from a public blockchain and is the typical choice for CBDC systems due to the need for controlled governance.

- **Wholesale CBDC:** Wholesale CBDC is a type of digital currency issued by a central bank. It is specifically designed for use among licenced banks and other financial institutions that hold reserve deposits with the central bank for interbank payments and securities transactions. Wholesale CBDC has the potential to be utilised for both domestic and cross-border transactions. Domestic wholesale CBDC is similar to the reserve accounts that commercial banks typically maintain with central banks.

Annexure 1: The Digital Personal Data Protection Act, 2023

रजिस्ट्री सं॰ डी॰ एल॰—(एन)04/0007/2003—23 REGISTERED NO. DL—(N)04/0007/2003—23

सत्यमेव जयते

भारत का राजपत्र
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इस भाग में भिन्न पृष्ठ संख्या दी जाती है जिससे कि यह अलग संकलन के रूप में रखा जा सके।
Separate paging is given to this Part in order that it may be filed as a separate compilation.

MINISTRY OF LAW AND JUSTICE
(Legislative Department)

New Delhi, the 11*th August,* 2023/*Sravana* 20, 1945 (*Saka*)

The following Act of Parliament received the assent of the President on the 11th August, 2023 and is hereby published for general information:—

THE DIGITAL PERSONAL DATA PROTECTION ACT, 2023
(No. 22 of 2023)

[11*th August*, 2023.]

An Act to provide for the processing of digital personal data in a manner that recognises both the right of individuals to protect their personal data and the need to process such personal data for lawful purposes and for matters connected therewith or incidental thereto.

Be it enacted by Parliament in the Seventy-fourth Year of the Republic of India as follows:—

CHAPTER I
Preliminary

1. (*1*) This Act may be called the Digital Personal Data Protection Act, 2023. Short title and commencement.

(*2*) It shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint and different dates may be appointed for different provisions of this Act and any reference in any such provision to the commencement of this Act shall be construed as a reference to the coming into force of that provision.

Definitions.

2. In this Act, unless the context otherwise requires,—

(*a*) "Appellate Tribunal" means the Telecom Disputes Settlement and Appellate Tribunal established under section 14 of the Telecom Regulatory Authority of India Act, 1997; 24 of 1997.

(*b*) "automated" means any digital process capable of operating automatically in response to instructions given or otherwise for the purpose of processing data;

(*c*) "Board" means the Data Protection Board of India established by the Central Government under section 18;

(*d*) "certain legitimate uses" means the uses referred to in section 7;

(*e*) "Chairperson" means the Chairperson of the Board;

(*f*) "child" means an individual who has not completed the age of eighteen years;

(*g*) "Consent Manager" means a person registered with the Board, who acts as a single point of contact to enable a Data Principal to give, manage, review and withdraw her consent through an accessible, transparent and interoperable platform;

(*h*) "data" means a representation of information, facts, concepts, opinions or instructions in a manner suitable for communication, interpretation or processing by human beings or by automated means;

(*i*) "Data Fiduciary" means any person who alone or in conjunction with other persons determines the purpose and means of processing of personal data;

(*j*) "Data Principal" means the individual to whom the personal data relates and where such individual is—

(*i*) a child, includes the parents or lawful guardian of such a child;

(*ii*) a person with disability, includes her lawful guardian, acting on her behalf;

(*k*) "Data Processor" means any person who processes personal data on behalf of a Data Fiduciary;

(*l*) "Data Protection Officer" means an individual appointed by the Significant Data Fiduciary under clause (*a*) of sub-section (*2*) of section 10;

(*m*) "digital office" means an office that adopts an online mechanism wherein the proceedings, from receipt of intimation or complaint or reference or directions or appeal, as the case may be, to the disposal thereof, are conducted in online or digital mode;

(*n*) "digital personal data" means personal data in digital form;

(*o*) "gain" means—

(*i*) a gain in property or supply of services, whether temporary or permanent; or

(*ii*) an opportunity to earn remuneration or greater remuneration or to gain a financial advantage otherwise than by way of legitimate remuneration;

(*p*) "loss" means—

(*i*) a loss in property or interruption in supply of services, whether temporary or permanent; or

(*ii*) a loss of opportunity to earn remuneration or greater remuneration or to gain a financial advantage otherwise than by way of legitimate remuneration;

(*q*) "Member" means a Member of the Board and includes the Chairperson;

(*r*) "notification" means a notification published in the Official Gazette and the expressions "notify" and "notified" shall be construed accordingly;

(*s*) "person" includes—

(*i*) an individual;

(*ii*) a Hindu undivided family;

(*iii*) a company;

(*iv*) a firm;

(*v*) an association of persons or a body of individuals, whether incorporated or not;

(*vi*) the State; and

(*vii*) every artificial juristic person, not falling within any of the preceding sub-clauses;

(*t*) "personal data" means any data about an individual who is identifiable by or in relation to such data;

(*u*) "personal data breach" means any unauthorised processing of personal data or accidental disclosure, acquisition, sharing, use, alteration, destruction or loss of access to personal data, that compromises the confidentiality, integrity or availability of personal data;

(*v*) "prescribed" means prescribed by rules made under this Act;

(*w*) "proceeding" means any action taken by the Board under the provisions of this Act;

(*x*) "processing" in relation to personal data, means a wholly or partly automated operation or set of operations performed on digital personal data, and includes operations such as collection, recording, organisation, structuring, storage, adaptation, retrieval, use, alignment or combination, indexing, sharing, disclosure by transmission, dissemination or otherwise making available, restriction, erasure or destruction;

(*y*) "she" in relation to an individual includes the reference to such individual irrespective of gender;

(*z*) "Significant Data Fiduciary" means any Data Fiduciary or class of Data Fiduciaries as may be notified by the Central Government under section 10;

(*za*) "specified purpose" means the purpose mentioned in the notice given by the Data Fiduciary to the Data Principal in accordance with the provisions of this Act and the rules made thereunder; and

(*zb*) "State" means the State as defined under article 12 of the Constitution.

Application of Act.

3. Subject to the provisions of this Act, it shall—

(*a*) apply to the processing of digital personal data within the territory of India where the personal data is collected—

(*i*) in digital form; or

(*ii*) in non-digital form and digitised subsequently;

(*b*) also apply to processing of digital personal data outside the territory of India, if such processing is in connection with any activity related to offering of goods or services to Data Principals within the territory of India;

(*c*) not apply to—

(*i*) personal data processed by an individual for any personal or domestic purpose; and

(*ii*) personal data that is made or caused to be made publicly available by—

(*A*) the Data Principal to whom such personal data relates; or

(*B*) any other person who is under an obligation under any law for the time being in force in India to make such personal data publicly available.

Illustration.

X, an individual, while blogging her views, has publicly made available her personal data on social media. In such case, the provisions of this Act shall not apply.

CHAPTER II

OBLIGATIONS OF DATA FIDUCIARY

Grounds for processing personal data.

4. (*1*) A person may process the personal data of a Data Principal only in accordance with the provisions of this Act and for a lawful purpose,—

(*a*) for which the Data Principal has given her consent; or

(*b*) for certain legitimate uses.

(*2*) For the purposes of this section, the expression "lawful purpose" means any purpose which is not expressly forbidden by law.

Notice.

5. (*1*) Every request made to a Data Principal under section 6 for consent shall be accompanied or preceded by a notice given by the Data Fiduciary to the Data Principal, informing her,—

(*i*) the personal data and the purpose for which the same is proposed to be processed;

(*ii*) the manner in which she may exercise her rights under sub-section (*4*) of section 6 and section 13; and

(*iii*) the manner in which the Data Principal may make a complaint to the Board,

in such manner and as may be prescribed.

Illustration.

X, an individual, opens a bank account using the mobile app or website of Y, a bank. To complete the Know-Your-Customer requirements under law for opening of bank account, X opts for processing of her personal data by Y in a live, video-based customer identification process. Y shall accompany or precede the request for the personal data with notice to X, describing the personal data and the purpose of its processing.

(*2*) Where a Data Principal has given her consent for the processing of her personal data before the date of commencement of this Act,—

(*a*) the Data Fiduciary shall, as soon as it is reasonably practicable, give to the Data Principal a notice informing her,—

(*i*) the personal data and the purpose for which the same has been processed;

(*ii*) the manner in which she may exercise her rights under sub-section (*4*) of section 6 and section 13; and

(*iii*) the manner in which the Data Principal may make a complaint to the Board,

in such manner and as may be prescribed.

(*b*) the Data Fiduciary may continue to process the personal data until and unless the Data Principal withdraws her consent.

Illustration.

X, an individual, gave her consent to the processing of her personal data for an online shopping app or website operated by Y, an e-commerce service provider, before the commencement of this Act. Upon commencement of the Act, Y shall, as soon as practicable, give through email, in-app notification or other effective method information to X, describing the personal data and the purpose of its processing.

(*3*) The Data Fiduciary shall give the Data Principal the option to access the contents of the notice referred to in sub-sections (*1*) and (*2*) in English or any language specified in the Eighth Schedule to the Constitution.

Consent.

6. (*1*) The consent given by the Data Principal shall be free, specific, informed, unconditional and unambiguous with a clear affirmative action, and shall signify an agreement to the processing of her personal data for the specified purpose and be limited to such personal data as is necessary for such specified purpose.

Illustration.

X, an individual, downloads Y, a telemedicine app. Y requests the consent of X for (*i*) the processing of her personal data for making available telemedicine services, and (*ii*) accessing her mobile phone contact list, and X signifies her consent to both. Since phone contact list is not necessary for making available telemedicine services, her consent shall be limited to the processing of her personal data for making available telemedicine services.

(*2*) Any part of consent referred in sub-section (*1*) which constitutes an infringement of the provisions of this Act or the rules made thereunder or any other law for the time being in force shall be invalid to the extent of such infringement.

Illustration.

X, an individual, buys an insurance policy using the mobile app or website of Y, an insurer. She gives to Y her consent for (*i*) the processing of her personal data by Y for the purpose of issuing the policy, and (*ii*) waiving her right to file a complaint to the Data Protection Board of India. Part (*ii*) of the consent**,** relating to waiver of her right to file a complaint, shall be invalid.

(*3*) Every request for consent under the provisions of this Act or the rules made thereunder shall be presented to the Data Principal in a clear and plain language, giving her the option to access such request in English or any language specified in the Eighth Schedule to the Constitution and providing the contact details of a Data Protection Officer, where applicable, or of any other person authorised by the Data Fiduciary to respond to any communication from the Data Principal for the purpose of exercise of her rights under the provisions of this Act.

(*4*) Where consent given by the Data Principal is the basis of processing of personal data, such Data Principal shall have the right to withdraw her consent at any time, with the ease of doing so being comparable to the ease with which such consent was given.

(*5*) The consequences of the withdrawal referred to in sub-section (*4*) shall be borne by the Data Principal, and such withdrawal shall not affect the legality of processing of the personal data based on consent before its withdrawal.

Illustration.

X, an individual, is the user of an online shopping app or website operated by Y, an e-commerce service provider. X consents to the processing of her personal data by Y for the purpose of fulfilling her supply order and places an order for supply of a good while making payment for the same. If X withdraws her consent, Y may stop enabling X to use the app or website for placing orders, but may not stop the processing for supply of the goods already ordered and paid for by X.

(*6*) If a Data Principal withdraws her consent to the processing of personal data under sub-section (*5*), the Data Fiduciary shall, within a reasonable time, cease and cause its Data Processors to cease processing the personal data of such Data Principal unless such processing without her consent is required or authorised under the provisions of this Act or the rules made thereunder or any other law for the time being in force in India.

Illustration.

X, a telecom service provider, enters into a contract with Y, a Data Processor, for emailing telephone bills to the customers of X. Z, a customer of X, who had earlier given her consent to X for the processing of her personal data for emailing of bills, downloads the mobile app of X and opts to receive bills only on the app. X shall itself cease, and shall cause Y to cease, the processing of the personal data of Z for emailing bills.

(*7*) The Data Principal may give, manage, review or withdraw her consent to the Data Fiduciary through a Consent Manager.

(*8*) The Consent Manager shall be accountable to the Data Principal and shall act on her behalf in such manner and subject to such obligations as may be prescribed.

(*9*) Every Consent Manager shall be registered with the Board in such manner and subject to such technical, operational, financial and other conditions as may be prescribed.

(*10*) Where a consent given by the Data Principal is the basis of processing of personal data and a question arises in this regard in a proceeding, the Data Fiduciary shall be obliged to prove that a notice was given by her to the Data Principal and consent was given by such Data Principal to the Data Fiduciary in accordance with the provisions of this Act and the rules made thereunder.

Certain legitimate uses.

7. A Data Fiduciary may process personal data of a Data Principal for any of following uses, namely:—

(*a*) for the specified purpose for which the Data Principal has voluntarily provided her personal data to the Data Fiduciary, and in respect of which she has not indicated to the Data Fiduciary that she does not consent to the use of her personal data.

Illustrations.

(*I*) X, an individual, makes a purchase at Y, a pharmacy. She voluntarily provides Y her personal data and requests Y to acknowledge receipt of the payment made for the purchase by sending a message to her mobile phone. Y may process the personal data of X for the purpose of sending the receipt.

(*II*) X, an individual, electronically messages Y, a real estate broker, requesting Y to help identify a suitable rented accommodation for her and shares her personal data for this purpose. Y may process her personal data to identify and intimate to her the details of accommodation available on rent. Subsequently, X informs Y that X no longer needs help from Y. Y shall cease to process the personal data of X;

(*b*) for the State and any of its instrumentalities to provide or issue to the Data Principal such subsidy, benefit, service, certificate, licence or permit as may be prescribed, where—

(*i*) she has previously consented to the processing of her personal data by the State or any of its instrumentalities for any subsidy, benefit, service, certificate, licence or permit; or

(*ii*) such personal data is available in digital form in, or in non-digital form and digitised subsequently from, any database, register, book or other document which is maintained by the State or any of its instrumentalities and is notified by the Central Government,

subject to standards followed for processing being in accordance with the policy issued by the Central Government or any law for the time being in force for governance of personal data.

Illustration.

X. a pregnant woman, enrols herself on an app or website to avail of government's maternity benefits programme, while consenting to provide her personal data for the purpose of availing of such benefits. Government may process the personal data of X processing to determine her eligibility to receive any other prescribed benefit from the government;

(*c*) for the performance by the State or any of its instrumentalities of any function under any law for the time being in force in India or in the interest of sovereignty and integrity of India or security of the State;

(*d*) for fulfilling any obligation under any law for the time being in force in India on any person to disclose any information to the State or any of its instrumentalities, subject to such processing being in accordance with the provisions regarding disclosure of such information in any other law for the time being in force;

(*e*) for compliance with any judgment or decree or order issued under any law for the time being in force in India, or any judgment or order relating to claims of a contractual or civil nature under any law for the time being in force outside India;

(*f*) for responding to a medical emergency involving a threat to the life or immediate threat to the health of the Data Principal or any other individual;

(*g*) for taking measures to provide medical treatment or health services to any individual during an epidemic, outbreak of disease, or any other threat to public health;

(*h*) for taking measures to ensure safety of, or provide assistance or services to, any individual during any disaster, or any breakdown of public order.

Explanation.—For the purposes of this clause, the expression "disaster" shall have the same meaning as assigned to it in clause (*d*) of section 2 of the Disaster Management Act, 2005; or

53 of 2005.

(*i*) for the purposes of employment or those related to safeguarding the employer from loss or liability, such as prevention of corporate espionage, maintenance of confidentiality of trade secrets, intellectual property, classified information or provision of any service or benefit sought by a Data Principal who is an employee.

General obligations of Data Fiduciary.

8. (*1*) A Data Fiduciary shall, irrespective of any agreement to the contrary or failure of a Data Principal to carry out the duties provided under this Act, be responsible for complying with the provisions of this Act and the rules made thereunder in respect of any processing undertaken by it or on its behalf by a Data Processor.

(*2*) A Data Fiduciary may engage, appoint, use or otherwise involve a Data Processor to process personal data on its behalf for any activity related to offering of goods or services to Data Principals only under a valid contract.

(*3*) Where personal data processed by a Data Fiduciary is likely to be—

(*a*) used to make a decision that affects the Data Principal; or

(*b*) disclosed to another Data Fiduciary,

the Data Fiduciary processing such personal data shall ensure its completeness, accuracy and consistency.

(*4*) A Data Fiduciary shall implement appropriate technical and organisational measures to ensure effective observance of the provisions of this Act and the rules made thereunder.

(*5*) A Data Fiduciary shall protect personal data in its possession or under its control, including in respect of any processing undertaken by it or on its behalf by a Data Processor, by taking reasonable security safeguards to prevent personal data breach.

(*6*) In the event of a personal data breach, the Data Fiduciary shall give the Board and each affected Data Principal, intimation of such breach in such form and manner as may be prescribed.

(*7*) A Data Fiduciary shall, unless retention is necessary for compliance with any law for the time being in force,—

(*a*) erase personal data, upon the Data Principal withdrawing her consent or as

soon as it is reasonable to assume that the specified purpose is no longer being served, whichever is earlier; and

(*b*) cause its Data Processor to erase any personal data that was made available by the Data Fiduciary for processing to such Data Processor.

Illustrations.

(*I*) X, an individual, registers herself on an online marketplace operated by Y, an e-commerce service provider. X gives her consent to Y for the processing of her personal data for selling her used car. The online marketplace helps conclude the sale. Y shall no longer retain her personal data.

(*II*) X, an individual, decides to close her savings account with Y, a bank. Y is required by law applicable to banks to maintain the record of the identity of its clients for a period of ten years beyond closing of accounts. Since retention is necessary for compliance with law, Y shall retain X's personal data for the said period.

(*8*) The purpose referred to in clause (*a*) of sub-section (*7*) shall be deemed to no longer be served, if the Data Principal does not—

(*a*) approach the Data Fiduciary for the performance of the specified purpose; and

(*b*) exercise any of her rights in relation to such processing,

for such time period as may be prescribed, and different time periods may be prescribed for different classes of Data Fiduciaries and for different purposes.

(*9*) A Data Fiduciary shall publish, in such manner as may be prescribed, the business contact information of a Data Protection Officer, if applicable, or a person who is able to answer on behalf of the Data Fiduciary, the questions, if any, raised by the Data Principal about the processing of her personal data.

(*10*) A Data Fiduciary shall establish an effective mechanism to redress the grievances of Data Principals.

(*11*) For the purposes of this section, it is hereby clarified that a Data Principal shall be considered as not having approached the Data Fiduciary for the performance of the specified purpose, in any period during which she has not initiated contact with the Data Fiduciary for such performance, in person or by way of communication in electronic or physical form.

Processing of personal data of children.

9. (*1*) The Data Fiduciary shall, before processing any personal data of a child or a person with disability who has a lawful guardian obtain verifiable consent of the parent of such child or the lawful guardian, as the case may be, in such manner as may be prescribed.

Explanation.—For the purpose of this sub-section, the expression "consent of the parent" includes the consent of lawful guardian, wherever applicable.

(*2*) A Data Fiduciary shall not undertake such processing of personal data that is likely to cause any detrimental effect on the well-being of a child.

(*3*) A Data Fiduciary shall not undertake tracking or behavioural monitoring of children or targeted advertising directed at children.

(*4*) The provisions of sub-sections (*1*) and (*3*) shall not be applicable to processing of personal data of a child by such classes of Data Fiduciaries or for such purposes, and subject to such conditions, as may be prescribed.

(*5*) The Central Government may, if satisfied that a Data Fiduciary has ensured that its processing of personal data of children is done in a manner that is verifiably safe, notify for such processing by such Data Fiduciary the age above which that Data Fiduciary shall be exempt from the applicability of all or any of the obligations under sub-sections (*1*) and (*3*) in respect of processing by that Data Fiduciary as the notification may specify.

Additional obligations of Significant Data Fiduciary.

10. (*1*) The Central Government may notify any Data Fiduciary or class of Data Fiduciaries as Significant Data Fiduciary, on the basis of an assessment of such relevant factors as it may determine, including—

(*a*) the volume and sensitivity of personal data processed;

(*b*) risk to the rights of Data Principal;

(*c*) potential impact on the sovereignty and integrity of India;

(*d*) risk to electoral democracy;

(*e*) security of the State; and

(*f*) public order.

(*2*) The Significant Data Fiduciary shall—

(*a*) appoint a Data Protection Officer who shall—

(*i*) represent the Significant Data Fiduciary under the provisions of this Act;

(*ii*) be based in India;

(*iii*) be an individual responsible to the Board of Directors or similar governing body of the Significant Data Fiduciary; and

(*iv*) be the point of contact for the grievance redressal mechanism under the provisions of this Act;

(*b*) appoint an independent data auditor to carry out data audit, who shall evaluate the compliance of the Significant Data Fiduciary in accordance with the provisions of this Act; and

(*c*) undertake the following other measures, namely:—

(*i*) periodic Data Protection Impact Assessment, which shall be a process comprising a description of the rights of Data Principals and the purpose of processing of their personal data, assessment and management of the risk to the rights of the Data Principals, and such other matters regarding such process as may be prescribed;

(*ii*) periodic audit; and

(*iii*) such other measures, consistent with the provisions of this Act, as may be prescribed.

CHAPTER III

RIGHTS AND DUTIES OF DATA PRINCIPAL

Right to access information about personal data.

11. (*1*) The Data Principal shall have the right to obtain from the Data Fiduciary to whom she has previously given consent, including consent as referred to in clause (*a*) of section 7 (hereinafter referred to as the said Data Fiduciary), for processing of personal data, upon making to it a request in such manner as may be prescribed,—

(*a*) a summary of personal data which is being processed by such Data Fiduciary and the processing activities undertaken by that Data Fiduciary with respect to such personal data;

(*b*) the identities of all other Data Fiduciaries and Data Processors with whom the personal data has been shared by such Data Fiduciary, along with a description of the personal data so shared; and

(*c*) any other information related to the personal data of such Data Principal and its processing, as may be prescribed.

(*2*) Nothing contained in clause (*b*) or clause (*c*) of sub-section (*1*) shall apply in respect of the sharing of any personal data by the said Data Fiduciary with any other Data Fiduciary authorised by law to obtain such personal data, where such sharing is pursuant

to a request made in writing by such other Data Fiduciary for the purpose of prevention or detection or investigation of offences or cyber incidents, or for prosecution or punishment of offences.

Right to correction and erasure of personal data.

12. (*1*) A Data Principal shall have the right to correction, completion, updating and erasure of her personal data for the processing of which she has previously given consent, including consent as referred to in clause (*a*) of section 7, in accordance with any requirement or procedure under any law for the time being in force.

(*2*) A Data Fiduciary shall, upon receiving a request for correction, completion or updating from a Data Principal,—

(*a*) correct the inaccurate or misleading personal data;

(*b*) complete the incomplete personal data; and

(*c*) update the personal data.

(*3*) A Data Principal shall make a request in such manner as may be prescribed to the Data Fiduciary for erasure of her personal data, and upon receipt of such a request, the Data Fiduciary shall erase her personal data unless retention of the same is necessary for the specified purpose or for compliance with any law for the time being in force.

Right of grievance redressal.

13. (*1*) A Data Principal shall have the right to have readily available means of grievance redressal provided by a Data Fiduciary or Consent Manager in respect of any act or omission of such Data Fiduciary or Consent Manager regarding the performance of its obligations in relation to the personal data of such Data Principal or the exercise of her rights under the provisions of this Act and the rules made thereunder.

(*2*) The Data Fiduciary or Consent Manager shall respond to any grievances referred to in sub-section (*1*) within such period as may be prescribed from the date of its receipt for all or any class of Data Fiduciaries.

(*3*) The Data Principal shall exhaust the opportunity of redressing her grievance under this section before approaching the Board.

Right to nominate.

14. (*1*) A Data Principal shall have the right to nominate, in such manner as may be prescribed, any other individual, who shall, in the event of death or incapacity of the Data Principal, exercise the rights of the Data Principal in accordance with the provisions of this Act and the rules made thereunder.

(*2*) For the purposes of this section, the expression "incapacity" means inability to exercise the rights of the Data Principal under the provisions of this Act or the rules made thereunder due to unsoundness of mind or infirmity of body.

Duties of Data Principal.

15. A Data Principal shall perform the following duties, namely:—

(*a*) comply with the provisions of all applicable laws for the time being in force while exercising rights under the provisions of this Act;

(*b*) to ensure not to impersonate another person while providing her personal data for a specified purpose;

(*c*) to ensure not to suppress any material information while providing her personal data for any document, unique identifier, proof of identity or proof of address issued by the State or any of its instrumentalities;

(*d*) to ensure not to register a false or frivolous grievance or complaint with a Data Fiduciary or the Board; and

(*e*) to furnish only such information as is verifiably authentic, while exercising the right to correction or erasure under the provisions of this Act or the rules made thereunder.

CHAPTER IV

SPECIAL PROVISIONS

Processing of personal data outside India.

16. (*1*) The Central Government may, by notification, restrict the transfer of personal data by a Data Fiduciary for processing to such country or territory outside India as may be so notified.

(*2*) Nothing contained in this section shall restrict the applicability of any law for the time being in force in India that provides for a higher degree of protection for or restriction on transfer of personal data by a Data Fiduciary outside India in relation to any personal data or Data Fiduciary or class thereof.

Exemptions.

17. (*1*) The provisions of Chapter II, except sub-sections (*1*) and (*5*) of section 8, and those of Chapter III and section 16 shall not apply where—

(*a*) the processing of personal data is necessary for enforcing any legal right or claim;

(*b*) the processing of personal data by any court or tribunal or any other body in India which is entrusted by law with the performance of any judicial or quasi-judicial or regulatory or supervisory function, where such processing is necessary for the performance of such function;

(*c*) personal data is processed in the interest of prevention, detection, investigation or prosecution of any offence or contravention of any law for the time being in force in India;

(*d*) personal data of Data Principals not within the territory of India is processed pursuant to any contract entered into with any person outside the territory of India by any person based in India;

(*e*) the processing is necessary for a scheme of compromise or arrangement or merger or amalgamation of two or more companies or a reconstruction by way of demerger or otherwise of a company, or transfer of undertaking of one or more company to another company, or involving division of one or more companies, approved by a court or tribunal or other authority competent to do so by any law for the time being in force; and

(*f*) the processing is for the purpose of ascertaining the financial information and assets and liabilities of any person who has defaulted in payment due on account of a loan or advance taken from a financial institution, subject to such processing being in accordance with the provisions regarding disclosure of information or data in any other law for the time being in force.

Explanation.—For the purposes of this clause, the expressions "default" and "financial institution" shall have the meanings respectively assigned to them in sub-sections (*12*) and (*14*) of section 3 of the Insolvency and Bankruptcy Code, 2016.

31 of 2016.

Illustration.

X, an individual, takes a loan from Y, a bank. X defaults in paying her monthly loan repayment instalment on the date on which it falls due. Y may process the personal data of X for ascertaining her financial information and assets and liabilities.

(*2*) The provisions of this Act shall not apply in respect of the processing of personal data—

(*a*) by such instrumentality of the State as the Central Government may notify, in the interests of sovereignty and integrity of India, security of the State, friendly relations with foreign States, maintenance of public order or preventing incitement to any cognizable offence relating to any of these, and the processing by the Central Government of any personal data that such instrumentality may furnish to it; and

(*b*) necessary for research, archiving or statistical purposes if the personal data is not to be used to take any decision specific to a Data Principal and such processing is carried on in accordance with such standards as may be prescribed.

(*3*) The Central Government may, having regard to the volume and nature of personal data processed, notify certain Data Fiduciaries or class of Data Fiduciaries, including startups, as Data Fiduciaries to whom the provisions of section 5, sub-sections (*3*) and (*7*) of section 8 and sections 10 and 11 shall not apply.

Explanation.—For the purposes of this sub-section, the term "startup" means a private limited company or a partnership firm or a limited liability partnership incorporated in India, which is eligible to be and is recognised as such in accordance with the criteria and process notified by the department to which matters relating to startups are allocated in the Central Government.

(*4*) In respect of processing by the State or any instrumentality of the State, the provisions of sub-section (*7*) of section 8 and sub-section (*3*) of section 12 and, where such processing is for a purpose that does not include making of a decision that affects the Data Principal, sub-section (*2*) of section 12 shall not apply.

(*5*) The Central Government may, before expiry of five years from the date of commencement of this Act, by notification, declare that any provision of this Act shall not apply to such Data Fiduciary or classes of Data Fiduciaries for such period as may be specified in the notification.

CHAPTER V

DATA PROTECTION BOARD OF INDIA

Establishment of Board.

18. (*1*) With effect from such date as the Central Government may, by notification, appoint, there shall be established, for the purposes of this Act, a Board to be called the Data Protection Board of India.

(*2*) The Board shall be a body corporate by the name aforesaid, having perpetual succession and a common seal, with power, subject to the provisions of this Act, to acquire, hold and dispose of property, both movable and immovable, and to contract and shall, by the said name, sue or be sued.

(*3*) The headquarters of the Board shall be at such place as the Central Government may notify.

Composition and qualifications for appointment of Chairperson and Members.

19. (*1*) The Board shall consist of a Chairperson and such number of other Members as the Central Government may notify.

(*2*) The Chairperson and other Members shall be appointed by the Central Government in such manner as may be prescribed.

(*3*) The Chairperson and other Members shall be a person of ability, integrity and standing who possesses special knowledge or practical experience in the fields of data governance, administration or implementation of laws related to social or consumer protection, dispute resolution, information and communication technology, digital economy, law, regulation or techno-regulation, or in any other field which in the opinion of the Central Government may be useful to the Board, and at least one among them shall be an expert in the field of law.

Salary, allowances payable to and term of office.

20. (*1*) The salary, allowances and other terms and conditions of service of the Chairperson and other Members shall be such as may be prescribed, and shall not be varied to their disadvantage after their appointment.

(*2*) The Chairperson and other Members shall hold office for a term of two years and shall be eligible for re-appointment.

Disqualifications for appointment and continuation as Chairperson and Members of Board.

21. (*1*) A person shall be disqualified for being appointed and continued as the Chairperson or a Member, if she—

(*a*) has been adjudged as an insolvent;

(*b*) has been convicted of an offence, which in the opinion of the Central Government, involves moral turpitude;

(*c*) has become physically or mentally incapable of acting as a Member;

(*d*) has acquired such financial or other interest, as is likely to affect prejudicially her functions as a Member; or

(*e*) has so abused her position as to render her continuance in office prejudicial to the public interest.

(*2*) The Chairperson or Member shall not be removed from her office by the Central Government unless she has been given an opportunity of being heard in the matter.

Resignation by Members and filling of vacancy.

22. (*1*) The Chairperson or any other Member may give notice in writing to the Central Government of resigning from her office, and such resignation shall be effective from the date on which the Central Government permits her to relinquish office, or upon expiry of a period of three months from the date of receipt of such notice, or upon a duly appointed successor entering upon her office, or upon the expiry of the term of her office, whichever is earliest.

(*2*) A vacancy caused by the resignation or removal or death of the Chairperson or any other Member, or otherwise, shall be filled by fresh appointment in accordance with the provisions of this Act.

(*3*) The Chairperson and any other Member shall not, for a period of one year from the date on which they cease to hold such office, except with the previous approval of the Central Government, accept any employment, and shall also disclose to the Central Government any subsequent acceptance of employment with any Data Fiduciary against whom proceedings were initiated by or before such Chairperson or other Member.

Proceedings of Board.

23. (*1*) The Board shall observe such procedure in regard to the holding of and transaction of business at its meetings, including by digital means, and authenticate its orders, directions and instruments in such manner as may be prescribed.

(*2*) No act or proceeding of the Board shall be invalid merely by reason of—

(*a*) any vacancy in or any defect in the constitution of the Board;

(*b*) any defect in the appointment of a person acting as the Chairperson or other Member of the Board; or

(*c*) any irregularity in the procedure of the Board, which does not affect the merits of the case.

(*3*) When the Chairperson is unable to discharge her functions owing to absence, illness or any other cause, the senior-most Member shall discharge the functions of the Chairperson until the date on which the Chairperson resumes her duties.

Officers and employees of Board.

24. The Board may, with previous approval of the Central Government, appoint such officers and employees as it may deem necessary for the efficient discharge of its functions under the provisions of this Act, on such terms and conditions of appointment and service as may be prescribed.

Members and officers to be public servants.

25. The Chairperson, Members, officers and employees of the Board shall be deemed, when acting or purporting to act in pursuance of provisions of this Act, to be public servants within the meaning of section 21 of the Indian Penal Code.

45 of 1860.

Powers of Chairperson.

26. The Chairperson shall exercise the following powers, namely:—

(*a*) general superintendence and giving direction in respect of all administrative matters of the Board;

(*b*) authorise any officer of the Board to scrutinise any intimation, complaint, reference or correspondence addressed to the Board; and

(*c*) authorise performance of any of the functions of the Board and conduct any of its proceedings, by an individual Member or groups of Members and to allocate proceedings among them.

CHAPTER VI

POWERS, FUNCTIONS AND PROCEDURE TO BE FOLLOWED BY BOARD

Powers and functions of Board.

27. (*1*) The Board shall exercise and perform the following powers and functions, namely:—

(*a*) on receipt of an intimation of personal data breach under sub-section (*6*) of section 8, to direct any urgent remedial or mitigation measures in the event of a personal data breach, and to inquire into such personal data breach and impose penalty as provided in this Act;

(*b*) on a complaint made by a Data Principal in respect of a personal data breach or a breach in observance by a Data Fiduciary of its obligations in relation to her personal data or the exercise of her rights under the provisions of this Act, or on a reference made to it by the Central Government or a State Government, or in compliance of the directions of any court, to inquire into such breach and impose penalty as provided in this Act;

(*c*) on a complaint made by a Data Principal in respect of a breach in observance by a Consent Manager of its obligations in relation to her personal data, to inquire into such breach and impose penalty as provided in this Act;

(*d*) on receipt of an intimation of breach of any condition of registration of a Consent Manager, to inquire into such breach and impose penalty as provided in this Act; and

(*e*) on a reference made by the Central Government in respect of the breach in observance of the provisions of sub-section (*2*) of section 37 by an intermediary, to inquire into such breach and impose penalty as provided in this Act.

(*2*) The Board may, for the effective discharge of its functions under the provisions of this Act, after giving the person concerned an opportunity of being heard and after recording reasons in writing, issue such directions as it may consider necessary to such person, who shall be bound to comply with the same.

(*3*) The Board may, on a representation made to it by a person affected by a direction issued under sub-section (*1*) or sub-section (*2*), or on a reference made by the Central Government, modify, suspend, withdraw or cancel such direction and, while doing so, impose such conditions as it may deem fit, subject to which the modification, suspension, withdrawal or cancellation shall have effect.

Procedure to be followed by Board.

28. (*1*) The Board shall function as an independent body and shall, as far as practicable, function as a digital office, with the receipt of complaints and the allocation, hearing and pronouncement of decisions in respect of the same being digital by design, and adopt such techno-legal measures as may be prescribed.

(*2*) The Board may, on receipt of an intimation or complaint or reference or directions as referred to in sub-section (*1*) of section 27, take action in accordance with the provisions of this Act and the rules made thereunder.

(*3*) The Board shall determine whether there are sufficient grounds to proceed with an inquiry.

(*4*) In case the Board determines that there are insufficient grounds, it may, for reasons to be recorded in writing, close the proceedings.

(*5*) In case the Board determines that there are sufficient grounds to proceed with inquiry, it may, for reasons to be recorded in writing, inquire into the affairs of any person for ascertaining whether such person is complying with or has complied with the provisions of this Act.

(*6*) The Board shall conduct such inquiry following the principles of natural justice and shall record reasons for its actions during the course of such inquiry.

(*7*) For the purposes of discharging its functions under this Act, the Board shall have the same powers as are vested in a civil court under the Code of Civil Procedure, 1908, in respect of matters relating to— 5 of 1908.

(*a*) summoning and enforcing the attendance of any person and examining her on oath;

(*b*) receiving evidence of affidavit requiring the discovery and production of documents;

(*c*) inspecting any data, book, document, register, books of account or any other document; and

(*d*) such other matters as may be prescribed.

(*8*) The Board or its officers shall not prevent access to any premises or take into custody any equipment or any item that may adversely affect the day-to-day functioning of a person.

(*9*) The Board may require the services of any police officer or any officer of the Central Government or a State Government to assist it for the purposes of this section and it shall be the duty of every such officer to comply with such requisition.

(*10*) During the course of the inquiry, if the Board considers it necessary, it may for reasons to be recorded in writing, issue interim orders after giving the person concerned an opportunity of being heard.

(*11*) On completion of the inquiry and after giving the person concerned an opportunity of being heard, the Board may for reasons to be recorded in writing, either close the proceedings or proceed in accordance with section 33.

(*12*) At any stage after receipt of a complaint, if the Board is of the opinion that the complaint is false or frivolous, it may issue a warning or impose costs on the complainant.

CHAPTER VII

APPEAL AND ALTERNATE DISPUTE RESOLUTION

Appeal to Appellate Tribunal.

29. (*1*) Any person aggrieved by an order or direction made by the Board under this Act may prefer an appeal before the Appellate Tribunal.

(*2*) Every appeal under sub-section (*1*) shall be filed within a period of sixty days from the date of receipt of the order or direction appealed against and it shall be in such form and manner and shall be accompanied by such fee as may be prescribed.

(*3*) The Appellate Tribunal may entertain an appeal after the expiry of the period specified in sub-section (*2*), if it is satisfied that there was sufficient cause for not preferring the appeal within that period.

(*4*) On receipt of an appeal under sub-section (*1*), the Appellate Tribunal may, after giving the parties to the appeal, an opportunity of being heard, pass such orders thereon as it thinks fit, confirming, modifying or setting aside the order appealed against.

(*5*) The Appellate Tribunal shall send a copy of every order made by it to the Board and to the parties to the appeal.

(*6*) The appeal filed before the Appellate Tribunal under sub-section (*1*) shall be dealt with by it as expeditiously as possible and endeavour shall be made by it to dispose of the appeal finally within six months from the date on which the appeal is presented to it.

(*7*) Where any appeal under sub-section (*6*) could not be disposed of within the period of six months, the Appellate Tribunal shall record its reasons in writing for not disposing of the appeal within that period.

(*8*) Without prejudice to the provisions of section 14A and section 16 of the Telecom Regulatory Authority of India Act, 1997, the Appellate Tribunal shall deal with an appeal under this section in accordance with such procedure as may be prescribed. 24 of 1997.

(*9*) Where an appeal is filed against the orders of the Appellate Tribunal under this Act, the provisions of section 18 of the Telecom Regulatory Authority of India Act, 1997 shall apply. 24 of 1997.

(*10*) In respect of appeals filed under the provisions of this Act, the Appellate Tribunal shall, as far as practicable, function as a digital office, with the receipt of appeal, hearing and pronouncement of decisions in respect of the same being digital by design.

Orders passed by Appellate Tribunal to be executable as decree.

30. (*1*) An order passed by the Appellate Tribunal under this Act shall be executable by it as a decree of civil court, and for this purpose, the Appellate Tribunal shall have all the powers of a civil court.

(*2*) Notwithstanding anything contained in sub-section (*1*), the Appellate Tribunal may transmit any order made by it to a civil court having local jurisdiction and such civil court shall execute the order as if it were a decree made by that court.

Alternate dispute resolution.

31. If the Board is of the opinion that any complaint may be resolved by mediation, it may direct the parties concerned to attempt resolution of the dispute through such mediation by such mediator as the parties may mutually agree upon, or as provided for under any law for the time being in force in India.

Voluntary undertaking.

32. (*1*) The Board may accept a voluntary undertaking in respect of any matter related to observance of the provisions of this Act from any person at any stage of a proceeding under section 28.

(*2*) The voluntary undertaking referred to in sub-section (*1*) may include an undertaking to take such action within such time as may be determined by the Board, or refrain from taking such action, and or publicising such undertaking.

(*3*) The Board may, after accepting the voluntary undertaking and with the consent of the person who gave the voluntary undertaking vary the terms included in the voluntary undertaking.

(*4*) The acceptance of the voluntary undertaking by the Board shall constitute a bar on proceedings under the provisions of this Act as regards the contents of the voluntary undertaking, except in cases covered by sub-section (*5*).

(*5*) Where a person fails to adhere to any term of the voluntary undertaking accepted by the Board, such breach shall be deemed to be breach of the provisions of this Act and the Board may, after giving such person an opportunity of being heard, proceed in accordance with the provisions of section 33.

CHAPTER VIII

PENALTIES AND ADJUDICATION

Penalties.

33. (*1*) If the Board determines on conclusion of an inquiry that breach of the provisions of this Act or the rules made thereunder by a person is significant, it may, after giving the

person an opportunity of being heard, impose such monetary penalty specified in the Schedule.

(*2*) While determining the amount of monetary penalty to be imposed under sub-section (*1*), the Board shall have regard to the following matters, namely:—

(*a*) the nature, gravity and duration of the breach;

(*b*) the type and nature of the personal data affected by the breach;

(*c*) repetitive nature of the breach;

(*d*) whether the person, as a result of the breach, has realised a gain or avoided any loss;

(*e*) whether the person took any action to mitigate the effects and consequences of the breach, and the timeliness and effectiveness of such action;

(*f*) whether the monetary penalty to be imposed is proportionate and effective, having regard to the need to secure observance of and deter breach of the provisions of this Act; and

(*g*) the likely impact of the imposition of the monetary penalty on the person.

Crediting sums realised by way of penalties to Consolidated Fund of India.

34. All sums realised by way of penalties imposed by the Board under this Act, shall be credited to the Consolidated Fund of India.

CHAPTER IX

MISCELLANEOUS

Protection of action taken in good faith.

35. No suit, prosecution or other legal proceedings shall lie against the Central Government, the Board, its Chairperson and any Member, officer or employee thereof for anything which is done or intended to be done in good faith under the provisions of this Act or the rules made thereunder.

Power to call for information.

36. The Central Government may, for the purposes of this Act, require the Board and any Data Fiduciary or intermediary to furnish such information as it may call for.

Power of Central Government to issue directions.

37. (*1*) The Central Government or any of its officers specially authorised by it in this behalf may, upon receipt of a reference in writing from the Board that—

(*a*) intimates the imposition of monetary penalty by the Board on a Data Fiduciary in two or more instances; and

(*b*) advises, in the interests of the general public, the blocking for access by the public to any information generated, transmitted, received, stored or hosted, in any computer resource that enables such Data Fiduciary to carry on any activity relating to offering of goods or services to Data Principals within the territory of India,

after giving an opportunity of being heard to that Data Fiduciary, on being satisfied that it is necessary or expedient so to do, in the interests of the general public, for reasons to be recorded in writing, by order, direct any agency of the Central Government or any intermediary to block for access by the public or cause to be blocked for access by the public any such information.

(*2*) Every intermediary who receives a direction issued under sub-section (*1*) shall be bound to comply with the same.

(*3*) For the purposes of this section, the expressions "computer resource", "information" and "intermediary" shall have the meanings respectively assigned to them in the Information Technology Act, 2000. 21 of 2000.

Consistency with other laws.

38. (*1*) The provisions of this Act shall be in addition to and not in derogation of any other law for the time being in force.

(*2*) In the event of any conflict between a provision of this Act and a provision of any other law for the time being in force, the provision of this Act shall prevail to the extent of such conflict.

Bar of jurisdiction.

39. No civil court shall have the jurisdiction to entertain any suit or proceeding in respect of any matter for which the Board is empowered under the provisions of this Act and no injunction shall be granted by any court or other authority in respect of any action taken or to be taken in pursuance of any power under the provisions of this Act.

Power to make rules.

40. (*1*) The Central Government may, by notification, and subject to the condition of previous publication, make rules not inconsistent with the provisions of this Act, to carry out the purposes of this Act.

(*2*) In particular and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:—

(*a*) the manner in which the notice given by the Data Fiduciary to a Data Principal shall inform her, under sub-section (*1*) of section 5;

(*b*) the manner in which the notice given by the Data Fiduciary to a Data Principal shall inform her, under sub-section (*2*) of section 5;

(*c*) the manner of accountability and the obligations of Consent Manager under sub-section (*8*) of section 6;

(*d*) the manner of registration of Consent Manager and the conditions relating thereto, under sub-section (*9*) of section 6;

(*e*) the subsidy, benefit, service, certificate, licence or permit for the provision or issuance of which, personal data may be processed under clause (*b*) of section 7;

(*f*) the form and manner of intimation of personal data breach to the Board under sub-section (*6*) of section 8;

(*g*) the time period for the specified purpose to be deemed as no longer being served, under sub-section (*8*) of section 8;

(*h*) the manner of publishing the business contact information of a Data Protection Officer under sub-section (*9*) of section 8;

(*i*) the manner of obtaining verifiable consent under sub-section (*1*) of section 9;

(*j*) the classes of Data Fiduciaries, the purposes of processing of personal data of a child and the conditions relating thereto, under sub-section (*4*) of section 9;

(*k*) the other matters comprising the process of Data Protection Impact Assessment under sub-clause (*i*) of clause (*c*) of sub-section (*2*) of section 10;

(*l*) the other measures that the Significant Data Fiduciary shall undertake under sub-clause (*iii*) of clause (*c*) of sub-section (*2*) of section 10;

(*m*) the manner in which a Data Principal shall make a request to the Data Fiduciary to obtain information and any other information related to the personal data of such Data Principal and its processing, under sub-section (*1*) of section 11;

(*n*) the manner in which a Data Principal shall make a request to the Data Fiduciary for erasure of her personal data under sub-section (*3*) of section 12;

(*o*) the period within which the Data Fiduciary shall respond to any grievances under sub-section (*2*) of section 13;

(*p*) the manner of nomination of any other individual by the Data Principal under sub-section (*1*) of section 14;

(*q*) the standards for processing the personal data for exemption under clause (*b*) of sub-section (*2*) of section 17;

(*r*) the manner of appointment of the Chairperson and other Members of the Board under sub-section (*2*) of section 19;

(*s*) the salary, allowances and other terms and conditions of services of the Chairperson and other Members of the Board under sub-section (*1*) of section 20;

(*t*) the manner of authentication of orders, directions and instruments under sub-section (*1*) of section 23;

(*u*) the terms and conditions of appointment and service of officers and employees of the Board under section 24;

(*v*) the techno-legal measures to be adopted by the Board under sub-section (*1*) of section 28;

(*w*) the other matters under clause (*d*) of sub-section (*7*) of section 28;

(*x*) the form, manner and fee for filing an appeal under sub-section (*2*) of section 29;

(*y*) the procedure for dealing an appeal under sub-section (*8*) of section 29;

(*z*) any other matter which is to be or may be prescribed or in respect of which provision is to be, or may be, made by rules.

Laying of rules and certain notifications.

41. Every rule made and every notification issued under section 16 and section 42 of this Act shall be laid, as soon as may be after it is made, before each House of Parliament, while it is in session, for a total period of thirty days which may be comprised in one session or in two or more successive sessions, and if before the expiry of the session immediately following the session or the successive sessions aforesaid, both Houses agree in making any modification in the rule or notification or both Houses agree that the rule or notification should not be made or issued, the rule or notification shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule or notification.

Power to amend Schedule.

42. (*1*) The Central Government may, by notification, amend the Schedule, subject to the restriction that no such notification shall have the effect of increasing any penalty specified therein to more than twice of what was specified in it when this Act was originally enacted.

(*2*) Any amendment notified under sub-section (*1*) shall have effect as if enacted in this Act and shall come into force on the date of the notification.

Power to remove difficulties.

43. (*1*) If any difficulty arises in giving effect to the provisions of this Act, the Central Government may, by order published in the Official Gazette, make such provisions not inconsistent with the provisions of this Act as may appear to it to be necessary or expedient for removing the difficulty.

(*2*) No order as referred to in sub-section (*1*) shall be made after the expiry of three years from the date of commencement of this Act.

(*3*) Every order made under this section shall be laid, as soon as may be after it is made, before each House of Parliament.

Amendments to certain Acts.

24 of 1997.

44. (*1*) In section 14 of the Telecom Regulatory Authority of India Act, 1997, in clause (*c*), for sub-clauses (*i*) and (*ii*), the following sub-clauses shall be substituted, namely:—

"(*i*) the Appellate Tribunal under the Information Technology Act, 2000; 21 of 2000.

(*ii*) the Appellate Tribunal under the Airports Economic Regulatory Authority of India Act, 2008; and 27 of 2008.

(*iii*) the Appellate Tribunal under the Digital Personal Data Protection Act, 2023.".

(*2*) The Information Technology Act, 2000 shall be amended in the following manner, namely:— 21 of 2000.

(*a*) section 43A shall be omitted;

(*b*) in section 81, in the proviso, after the words and figures "the Patents Act, 1970", the words and figures "or the Digital Personal Data Protection Act, 2023" shall be inserted; and 39 of 1970.

(*c*) in section 87, in sub-section (*2*), clause (*ob*) shall be omitted.

(*3*) In section 8 of the Right to Information Act, 2005, in sub-section (*1*), for clause (*j*), the following clause shall be substituted, namely:— 22 of 2005.

"(*j*) information which relates to personal information;".

THE SCHEDULE

[*See* section 33 (*1*)]

Sl. No.	Breach of provisions of this Act or rules made thereunder	Penalty
(1)	(2)	(3)
1.	Breach in observing the obligation of Data Fiduciary to take reasonable security safeguards to prevent personal data breach under sub-section (*5*) of section 8.	May extend to two hundred and fifty crore rupees.
2.	Breach in observing the obligation to give the Board or affected Data Principal notice of a personal data breach under sub-section (*6*) of section 8.	May extend to two hundred crore rupees.
3.	Breach in observance of additional obligations in relation to children under section 9.	May extend to two hundred crore rupees.
4.	Breach in observance of additional obligations of Significant Data Fiduciary under section 10.	May extend to one hundred and fifty crore rupees.
5.	Breach in observance of the duties under section 15.	May extend to ten thousand rupees.
6.	Breach of any term of voluntary undertaking accepted by the Board under section 32.	Up to the extent applicable for the breach in respect of which the proceedings under section 28 were instituted.
7.	Breach of any other provision of this Act or the rules made thereunder.	May extend to fifty crore rupees.

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