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CBDC as a tool for Financial Inclusion

DGN Research Paper 4

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August 2023

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Suggested Citation

Kwatra, N., Sinha, V. & Adarkar, H. (2023). "CBDC as a tool for Financial Inclusion." Working Paper. Mumbai: Artha Global

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1. Introduction

The global payment landscape has transformed remarkably over the past decade. Digital payments have increased exponentially and are gradually replacing physical cash transactions even in Low and Middle Income Countries (LMIC). Private digital currencies such as Bitcoin have also proliferated as an asset class (Bitcoin etc) and as a medium of exchange, like Diem.

While the goals of private cryptocurrencies such as Bitcoin differ dramatically from a sovereign currency, they have offered evidence of feasibility and technical ideas for retail deployment of central bank digital currencies (CBDC) (Brookings, 2020). At its simplest, a CBDC is cash but in digital form. Similar to physical cash, it is issued by the central bank and guaranteed as a claim on the central bank reserves, can be accepted broadly, and results in instant transfer of value.

The popularity of CBDCs among central banks has increased dramatically in the past few years. According to the Atlantic Council, 130 countries, representing over 98 percent of global GDP, were exploring a CBDC as of July 2023. At the time of writing, 64 countries were already in an advanced phase of exploration (development, pilot, or launch). Eleven countries had fully launched a digital currency– Jamaica being the latest, and China's pilot, with the potential to reach 260 million people, was set to expand to most of the country in 2023. In 2022, India had also launched two CBDC pilot projects - one wholesale for settlement of transactions between financial institutions and one retail for general public use.

There are many reasons for the growing interest among central banks in issuing retail CBDCs including preserving monetary sovereignty in the face of increasing popularity of foreign currency-backed stable coins, potentially strengthening monetary policy pass-through, improving payment efficiency, strengthening competition for e-money payment providers and in countries where cash use is declining rapidly, ensuring continued access to "risk-free" central bank money[1] (Auer et al, 2021).

The motives mentioned above feature more prominently in reports published by central banks of advanced economies (Tan, 2023) but the aspect that has more widely captured the attention of policymakers in the emerging economies is the broader implications of a retail CBDC for a more inclusive financial ecosystem. There is a growing argument that "the digital technologies that are powering this transformation could foster useful innovations and broaden access to basic financial services" (Prasad, 2022). Bank of International Settlements (BIS, 2021) carried out a survey among more than 60 central banks that found it to be a top motivation for developing and emerging economies pursuing a CBDC within their jurisdictions.

These emerging economies face some common barriers to financial inclusion. These include market inefficiencies such as lack of access points, insufficient Information and Communication

[1] Central bank money (as distinct from commercial bank money - the portion of a currency which is made of book money) plays a key role in payment arrangements, as it has proved safe and efficient to have a central reference of value with which all other forms of the currency maintain this par convertibility. (https://www.bis.org/cpmi/publ/d55.pdf)

Technology (ICT) infrastructure, high costs and the private sector's unwillingness to serve some segments of the society as well as broad structural factors such as financial and digital illiteracy, poverty and limited trust in service providers.

While exploratory research on the effectiveness of CBDC as a tool for financial inclusion is ongoing, an argument has been made that CBDCs can mitigate some of the market imperfections inhibiting inclusion even if they might not be able to directly overcome structural barriers to inclusion (BIS, 2022). For instance, CBDCs have the potential to "bank" the unbanked by offering easy access to CBDC wallets, promote competition among payment service providers through an interoperable, open infrastructure[2], promote better usability by facilitating offline payments or help cut the cost of payment services through a low-fee structure.

India is no exception to the financial inclusion conundrum. While it has witnessed some increase in the ownership of bank accounts in the past decade, it still faces issues of dormant accounts and last-mile connectivity of financial institutions. Addressing these barriers has emerged as a high priority for India in recent years, especially in the past decade or so. The JAM (short for Jan Dhan-Aadhaar-Mobile) trinity - the Indian government's initiative to link Jan Dhan accounts, mobile numbers and Aadhaar (India's universal biometric identification system) - to make government-to-person (G2P) payments more efficient and inclusive, the banking correspondent model to facilitate provision of financial services through intermediaries, and the promotion of digital payments such as United Payments Interface (UPI) have been significant efforts in that direction.

India therefore provides an exceptionally mature and stable environment for trying out CBDCs for financial inclusion: It has a robust banking ecosystem regulated by a credible and strong central bank – and it has leapfrogged global peers by creating robust digital public infrastructure (DPI) called the India Stack,[3] which is already widening access to the formal financial system.

This paper explores the value proposition of a retail CBDC in further improving financial inclusion in India. The focus of the paper is on the domestic payment landscape of India and as such other potential objectives associated with the retail CBDC (or e-rupee in India) such as more efficient cross border payments are outside the scope of the paper.

The paper lays out the nature of the challenge of financial inclusion in India and the initiatives taken towards improving the access and quality of financial services in recent years. The paper studies the gaps that remain and explores how a retail CBDC might address these. For instance, the paper assesses the potential of the CBDC to reach large unbanked populations and create financial data trails for users which can improve their access to financial services

[2] India has a unique context where UPI provides an open infrastructure with an interoperability feature which allows users to make payments through the platform regardless of their bank of payment service provider.
[3] India Stack is the moniker for a set of open APIs and digital public goods upon which third parties can build software with access to government IDs, payment networks and data. The India Stack started with the Aadhaar digital ID scheme, which was launched in 2009. Atop this "identity layer" sits a "payments layer," which includes the UPI digital money system, and a "data layer" where citizens can, for example, store official documents virtually.

and products such as credit and insurance. It presents the design features that could be built into the CBDC architecture to make it an effective tool to address financial inclusion challenges in India. The feasibility of these design choices are considered within the regulatory framework of Anti-Money Laundering (AML) and Combating the Financing of terrorism (CFT) rules. The paper throws up key tradeoffs that policymakers and regulators will have to consider in striking the balance between financial inclusion imperatives on the one hand and security and privacy imperatives on the other.

The rest of the paper is organised as follows. Section 2 presents the financial inclusion challenge in India. Section 3 discusses AML/ CFT boundary conditions within which CBDC design may be considered. Section 4 studies CBDC design features critical to address financial inclusion gaps in India and the associated tradeoffs. Section 5 concludes.

Section 2. Financial Inclusion

Financial inclusion is a pyramid with access to the banking system via transaction accounts, and increasingly, digital payments at the base. Services across a range of core areas necessary for inclusive growth -- insurance, credit, pension -- build on this base and form the higher layers of the pyramid (Auer et al, 2022). The Indian policy perspective on financial inclusion hews closely to this understanding, defining financial inclusion as "convenient access to a basket of basic formal financial products and services that should include savings, remittance, credit, government-supported insurance and pension products to small and marginal farmers and low-income households at reasonable cost with adequate protection… besides increasing the access of small and marginal enterprises to formal finance with a greater reliance on technology to cut costs and improve service delivery…" (RBI, 2015).

In many instances, emerging economies lack high quality, easily accessible electronic commercial bank money, and its corollary, a secure, efficient digital payment system (Bindsell, 2020). These are essential in markets with mismatches between physical infrastructure and population density. Financial exclusion in terms of individuals and communities being 'unbanked' is a feature in these markets, not a bug. When it is financially unviable for financial institutions to offer services in poor or thinly populated areas, they won't do so. Central bank and government mandates, regulatory innovation, subsidies or other special measures can go some way towards ameliorating this. CBDCs are not a panacea or a substitute for such mandates and regulatory action. However, in theory, they can supplement them in two ways.

First, they would ensure a strong policy focus on financial inclusion; it would be economically and politically impossible for the central bank to create a two-tier system with fiat currency where a section of the population has access to CBDC services and another section doesn't. The knock-on benefits of also giving a push to connectivity and financial education are also potentially significant.

Second, token-based CBDCs could address vulnerable populations' lack of access to the banking system. In remote areas that suffer from poor connectivity and banking penetration, CBDC with design choices that enable offline use would allow transactions and payments based on secure, sovereign digital money. Crucially, such transactions would create digital footprints. Given that the key to increasing comprehensive financial inclusion is understanding the earning cycles of individuals and businesses, and designing and offering products and services that plug the gaps in those cycles (credit) or provide a backstop to risks at low points of the cycles (insurance), this would enable customised products (RBI, 2022).

2.1. Evolution of financial inclusion in India

The Indian economy has characteristics that are markedly different from other emerging economies. To varying degrees, lack of formal identity mechanisms and paucity of access points gate the financial system in many emerging economies, while limited competition in the banking ecosystem allows for rent-seeking behaviour (Auer et al, 2022). A series of policy and digital infrastructure initiatives in India have already attempted to address these issues. These can be broadly divided into three phases, with the caveat that these overlap to a significant

degree. While the emphasis on different approaches has shifted across the phases, there is no clear line between various policy and regulatory measures.

The first phase spanned the post-independence decades almost until the turn of the century. It was state-led to a significant degree – from the nationalisation of life insurance companies in 1956 and general insurance companies in 1972 to the nationalisation of banks in 1969 and 1980. The Regional Rural Banks Act, 1976, meanwhile, allowed for the establishment of regional rural banks as a means of providing credit geared towards the needs of rural populations and the agricultural sector. Multiple reforms over subsequent decades aimed at improving the health of the sector, broadening the range of services and increasing penetration.

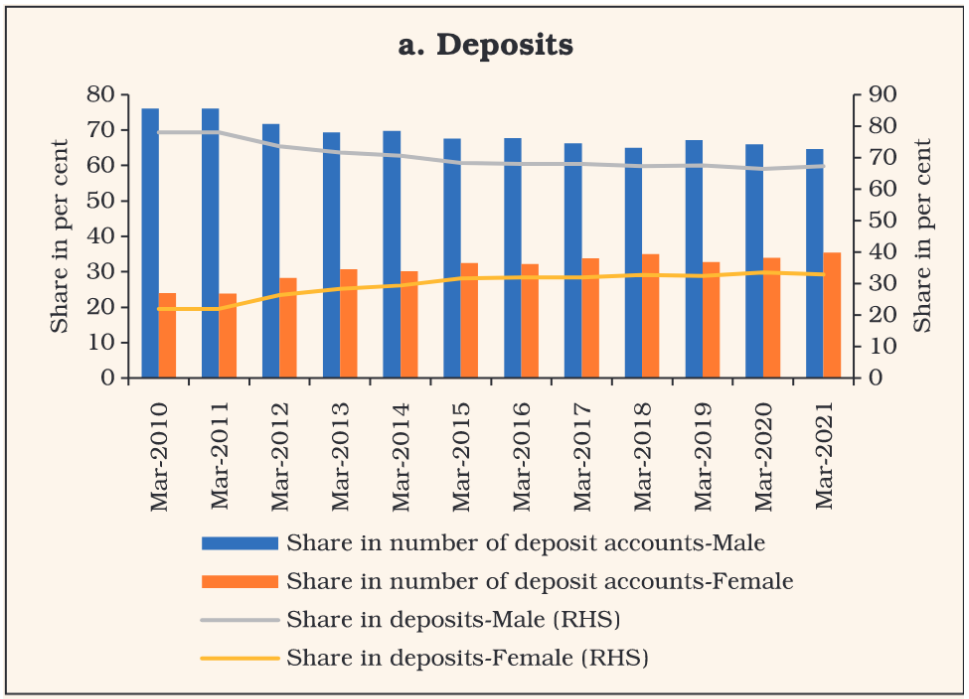
The second phase was an attempt to address the failure of the first phase initiatives to achieve impact, with limited expansion of brick-and-mortar branches. The RBI and the National Bank for Agriculture and Rural Development ramped up support for microfinance initiatives starting in the 1990s, attempting to expand credit access in rural areas. Such attempts, however, have been hampered by poor asset quality, over-indebtedness, high lending rates and other systemic issues. RBI's introduction of the banking correspondent (BC) model in 2006, as part of its increased focus on financial inclusion in the preceding years, was a crucial next step. In parallel, it also introduced business facilitators and deregulated the opening of ATMs and branches. The BC model in particular has had considerable success, introducing trusted intermediaries who can deliver financial services at a fraction of the operational cost of building bank outlets. They are now ubiquitous; as of March 2021, banking correspondents formed over 95% of total banking outlets in villages (RBIa, 2021).

The third phase has been built on the back of India's push for digital public infrastructure such as digital identity (Aadhaar), and the increasing ubiquity of cell phones that have become, in effect, points of sale. Since 2014, BCs have become distribution channels for arguably the most expansive financial inclusion initiative attempted to date: the central government's PMJDY initiative, utilising Aadhaar[4] and rapid mobile phone penetration to provide access to banking services to all unbanked households. This was via a debit card and mobile banking access to a no-frills zero balance account, coupled with overdraft facilities and basic life-insurance coverage. A cross-country analysis by (D'Silva et al 2019) shows impressive results with access to bank accounts improving by roughly the same percentage that peer economies have managed in close to five decades using conventional financial development and inclusion strategies. This works out to a growth rate of 14% per month under PMJDY, raising the ratio of banked individuals from 35% in 2011 to 80% in 2017 (Carriere-Swallow et al. 2021). Given that account ownership had reached 53.14% by 2014 when PMJDY was launched, the advent of Aadhaar has clearly lent a significant push to financial inclusion. In building on this to unlock more inclusion pathways using India Stack and mobile phones, PMJDY has also made headway

[4] Aadhaar is the digital identity component of India Stack, a modular, comprehensive digital system that also includes payments (Unified Payments Interface) and data management components. Together, they form the foundation of the country's digital public infrastructure (DPI) – population scale digital solutions for public and private service delivery.

in closing the gender gap with women making up 55.6% of the accounts opened under the scheme. That said, a significant gap remains, as Figure 2.1 shows.

Figure 2.1: There is a significant gender gap in account ownership



Source: Basic statistical returns I and II (annual), RBI.

2.2. Current state of financial inclusion in India

Access is, however, only one aspect of financial inclusion. The RBI's Financial Inclusion Index, launched in 2021, aggregates 97 metrics into three broad categories: access, usage and quality. The index encompasses data from across relevant sectors, including pensions, insurance and banking, among others. The idea is to capture trends and growth across the range of services and products that should be easily accessible to individuals and businesses. Performance when it comes to usage and quality lags considerably. The index reached 53.9 in the 2020-21 period, access increasing from 61.7 to 73.3, while usage and quality grew from 30.8 to 43 and 48.5 to 50.7 respectively (RBIb, 2021). Quality in the FI-Index encompasses both supply side and demand side factors – for instance, grievance redressal systems for the former and financial literacy for the latter.

The data on PMJDY account activity bears this out. According to data submitted to Parliament by Minister of State for Finance Bhagwat Karad in August 2022, 17.65% of the 461.1 million PMJDY accounts opened until July 2022 were inoperative. Given that the RBI defines operative accounts as those that have had a transaction in the past two years, it is possible that the ratio of accounts that are active in a meaningful sense and regularly used is significantly lower. According to Agarwal et al (2019), 81% of new PMJDY account holders did not deposit money, and 87% did not withdraw money. While the data sources and reference frame are different, the World Bank's Global Financial Index points to demographic factors mattering

when it comes to having active accounts. As of 2021, the gap between men and women stood at over 10 percent, with women having more inactive accounts. Likewise, the poorest 40% by income had over 12% more inactive accounts than the richest 60%. The rural-urban split had the former performing worse by about 8 percentage points. e-KYC conditions stipulated by the RBI in 2009, wherein accounts that don't have all KYC details within a specified period of time are shut down, may be a factor here.

Financial services higher up the pyramid fare worse. 44.79% of individuals above the age of 15 borrowed money in 2021 – down slightly from the 2014 level of 47.79% – with minor variations of 2 percentage points across socioeconomic indicators. However, only 11.78% of individuals borrowed money from a formal financial institution; there is a chasm between demand for credit and access to formal credit. This gap persists across gender, income and urban/rural divides with little deviation – and it has proved persistent, with a decadal improvement of just 4 percentage points from 2011's formal credit ratio of 7.7%. Evidence from similar no-frills account initiatives in Chile, Malawi and Uganda points to transaction costs being a factor in lack of financial services growth (Dupas et al, 2018).

This is where the Unified Payments Interface (UPI) comes in. Ideally, it should have seen banks and other payment service providers realise value propositions higher up the pyramid given the rapid growth of the payments layer and the wealth of data it generated. [5]

However, this hasn't happened. This is down to two issues. First, there is a lack of regulatory clarity. While a handful of fintech firms have floated UPI-based instant credit products, they operate in a regulatory grey area. Officially, NPCI allows credit only via overdraft accounts linked with UPI following the launch of UPI 2.0 in 2018. The uptake of this scheme has been poor. The target audience for such short-term loans tends to be relatively new to the formal credit system. Low balance accounts and lack of collateral make it difficult for them to get approved for an overdraft account – and if they are, to avail of the overdraft facility. The risks inherent in UPI credit are also significant – from *misreporting and weak KYC to laxer credit underwriting*.

Second, the fragmentation of data across entities within the ecosystem is a barrier to stronger prudential norms. One consequence of having digital payments via UPI is that interoperability degrades product loyalty when it comes to services and apps. Users therefore tend to multi-home; market share is split by transaction volume across apps rather than by dedicated single-app users. This leaves individual payment service providers (PSPs) with incomplete data – and therefore, weaker insights – about users. This throws off risk assessment for financial products; for instance, cash-flow based lending. Data is also fragmented across the value chain. The phone number and UPI ID sit with the app, the UPI ID and bank account sit with the acquiring bank (the bank with which the app has a tie-up, and which is the gateway for transactions), and the bank account and hashed UPI pin with the issuing bank (the bank with

[5] NPCI recorded a total transaction volume of a little over 83 billion in FY 2022– 2023, 82% higher compared to a year ago. UPI now accounts for over 75% of the overall retail digital payments in India. (PWC, 2023).

which the individual has an account). The full transaction record of each UPI ID across banks and apps sits with NPCI, but NPCI does not have access to identifiers. *No actor in the system thus has the data to generate person-specific insights that can be used to create financial products that sit higher on the pyramid.*

There are also hardware constraints. The rapid rise in UPI transactions has overwhelmed banks' core banking systems. These are legacy systems built to handle back-end operations. Layering UPI and other user-oriented front-end functionality on these systems has led to high failure rates. This is not a sound foundation for UPI-based financial products.

The MSME sector in India faces significant credit barriers. While this sector accounts for 30% of GDP, approximately 97% of it consists of informal enterprises. This points to a substantial gap between the need for timely and adequate finance, and the availability of documentation and data that banks and Non-Banking Financial Corporations (NBFC)'s require to carry out due diligence and assess risk. The recognition of the Non-Performing Assets (NPA) problem also caused banks to become more risk averse due to poor asset quality in its aftermath, reflected in their share of credit to Micro-Small and Medium Enterprises (MSMEs) declining between 2016-18. On both the retail and MSME fronts, NBFCs have plugged some of the gaps. For instance, they had an annual average growth rate of 35%, doubling their share in total credit to MSMEs from 5.5% in December to 10% in 2018. RBI's relief measures following the twin shocks of demonetisation and GST helped to a degree: from 2017-18 to 2020-21, MSME accounts rose from about 11 million to 15 million at an average year-on-year growth rate of 15.9%.

Microfinance NBFCs (NBFCs-MFI) are particularly important here given that they provide collateral-free small-ticket loans to unorganised sector enterprises and low-income households that formal institutions generally lack appetite for. And with a share of 31.1% in total micro-credit as of 2020-21, they punch above their weight. However, both retail and MSME lending as proportions of NBFC credit are anaemic – as of 2020-21, about 2.3% for the former and 2.2% for the latter – with immense scope for growth given the daunting scale of unmet credit need, to the tune of Rs 25.8 trillion, according to IFC estimates, as against a formal credit supply of Rs 10.9 trillion. The pandemic has created additional barriers, raising cost of borrowing and driving down collections and disbursements. There are two important points to note here. First, the pandemic has had a differential impact with large NBFCs-MFI faring better than smaller ones. Second, once the moratorium and standstill in asset classification put in place by the RBI wore off, the asset quality of NBFCs-MFI across the board has taken a hit.

Section 3. Regulatory considerations: AML/CFT/KYC

Regardless of the policy priority or the motivation for issuing a general purpose CBDC, all central banks have an overarching objective: to provide trusted money to the general public and ensure monetary and financial stability in their jurisdictions.

A key consideration in designing a CBDC payment system is therefore its ability to ensure secure transactions and preserve the integrity of government-backed payment channels. Among other security protocols, this requires preventing its use for unlawful activities and financial crimes including money laundering and terrorist financing, which undermine the integrity and stability of the financial sector and the broader economy (International Monetary Fund, 2021).

The IMF describes money laundering as the process of concealing the illicit origin of proceeds of crime (International Monetary Fund, n.d.) and terrorism financing as the process of raising funds to support terrorist activities. While these two phenomena differ in principle, they often exploit the same vulnerabilities in financial systems that allow for an "inappropriate level" of anonymity and opacity in carrying out transactions (International Monetary Fund, 2021).

Due to the clandestine nature of money-laundering, it is difficult to estimate the total amount of money that goes through the laundering cycle. However, the UN estimates the amount of money laundered globally in one year to be around 2 - 5% of global GDP, or $800 billion - $2 trillion in US dollars (United Nations, n.d).

Since mid-2000, India has increased its focus on provisions to check money laundering and terrorist financing. The Prevention of Money Laundering Act, 2002 (PMLA) came into force in 2005 and was amended in 2009. In 2004, the Unlawful Activities (Prevention) Act, 1967 (UAPA) was amended to criminalise terrorist financing.[6]

India's November 2016 demonetisation drive – where high-value currency notes were struck down as legal tender – was also driven in large part by money laundering and terrorist financing as key concerns (Press Information Bureau, 2016).

These are valid concerns – but they also point to regulatory tension between AML/CFT concerns and financial inclusion and its implication for CBDC design. While AML/ CFT requirements demand more visibility into payment activity, the design choice is more tricky when it comes to the goal of financial inclusion.

In 2017, a report by the Association of Chartered Certified Accountants (ACCA), said the "shadow" or hidden economy in India represents 17.22 per cent of GDP. However, it is worth noting that the entire shadow economy of a country does not reflect criminal activities, part of

[6] In India, the Enforcement Directorate (ED) has filed more than 5900 money laundering cases since the criminal law was enacted 18 years ago in 2005. Till January 2023, the ED had recorded 5906 cases under PMLA, with proceeds of crime amounting to roughly $140 million (Rs 1,15,350 crores).

the shadow economy simply reflects the informal or the unreported incomes from legal activity. Unaccounted money could be due to many reasons — complicated government procedures and approvals, high tax rates, especially direct taxes, and the desire to evade paying them. Section 2.2 highlights how despite access, bank account usage has not grown significantly in India and access to financial services higher up the pyramid have remained poor. The reasons mentioned here could be further factors why cash - which offers its users complete anonymity - is preferred over bank accounts.

As per the National Sample Survey (NSS) 73rd round conducted during the period 2015-16, there were 633.88 lakh unincorporated non-agricultural MSMEs in the country[7]. For most of these enterprises, the shift from cash to electronic payments indicates a shift from the informal to the formal sector. Most of these MSMEs operate under small profits and a business model which is vulnerable to sudden changes(Federation of Indian Chambers of Commerce and Industry and Konrad- Adenauer- Stiftung, 2017). For these enterprises, a decision to formalise entails questions of survival in a highly regulated and aggressive environment. They have to consider recurring costs associated with working in the formal economy, including monetary costs like taxes, fees, social security contributions, compliance costs with respect to labour and other regulations, harassment by government officials following any discrepancy in compliance. (Federation of Indian Chambers of Commerce and Industry and Konrad-Adenauer- Stiftung, 2017).

Using cash can reduce regulatory overheads for such low capacity enterprises, by preserving their privacy and protecting them against excessive government intrusion. High tax rates can choke off productivity and certain regulations enable rent seeking by regulators. Restrictions to cash usage can therefore discourage activity that is “underground” but “beneficial” (Prasad, 2021, pp 230). [8]

In this context, if the CBDC system were to compromise the privacy of its users, it could limit its acceptance and usability: If potential CBDC is to achieve its policy goal of financial inclusion, it would need to be adopted by users and accepted by merchants (BIS, 2021). As we have seen above, E-KYC norms can limit access to and usage of formal financial channels -- and this can have deleterious consequences when it comes to using services higher up the financial pyramid such as formal credit.

[7] The fourth census report of MSMEs (2006-07) puts the number of unregistered MSMEs in India at 346.12 lakh, which forms about 95.7% of all MSMEs present in the country.

[8] Cash, being anonymous and universal in nature, is also key to preserving the “societal value of money”: The movement away from cash could have a perverse effect on the financial exclusion of the elderly, poor, non-tech-savvy, and other marginalised groups in society. “Digitization has curtailed the particular quality of cash — its anonymity — and enabled greater surveillance and analysis of financial transactions, by private institutions as well as the state. While this increases transparency and security, it also erodes freedom and institutional trust.” Therefore, as central banks develop digital currencies, it is important to preserve the “social legitimacy” and “societal trust in money - by retaining particular qualities of cash. (AXA Research Fund, 2022).

However, The decision to stay informal and cash-reliant and therefore invisible in the financial system are also key factors why individuals and MSMEs continue to face significant barriers in access to formal credit, as highlighted in section 2.2.

In designing a retail CBDC system for financial inclusion, central banks, therefore, face the challenge of building a system with an architecture that respects privacy. But a fully opaque system, which does not allow the identity of its users or transactions data to be observed, is also not desirable as such a system could reproduce the pathologies of the existing 'anonymous' private virtual currencies, many of which have become safe havens for criminal activity including money laundering.

Central banks are therefore left with an important task to decide where on the spectrum of complete traceability to complete anonymity, should the CBDC system sit.

In the concept note that the central bank published before piloting CBDCs in India, it acknowledged anonymity as one of the key traits of cash and that the rise of digital payments threatens the lawful or legitimate preference for anonymity as they leave digital trails. But while anonymity will expand the user base for CBDC and will increase its acceptability and usage, it is seen as a potential risk in the digital ecosystem: "Anonymity, therefore, poses a policy trade-off—the more anonymous, the larger the risk for illicit use." The RBI therefore advocates the principle of "managed anonymity" (RBI, 2022).

In the first pilot to test the e-rupee in December 2022, the Reserve Bank of India is trying to replicate the features of physical cash including anonymity (transactions can be carried out without maintaining evidence of transacting parties) and universality (the currency can be used for any transaction). It is attempting to do so by keeping transactions below a certain threshold anonymous, by deleting digital trails between wallet-to-wallet transactions. The idea is fund transfers will only be recorded when they are converted to digital currency in the wallets (akin to when cash is withdrawn from ATMs or banks) but once the CBDC-R is transferred to customer wallets, banks will not track or report these transactions.The RBI will know the aggregate retail CBDCs in circulation, but it will not know exactly who owns how much of the virtual money.

Other central banks have also been exploring ways to achieve some degree of anonymity and privacy. For example, the European Central Bank (2019) has suggested various solutions including the concept of anonymity vouchers, which limit the amount of CBDC that each user can utilise under the guarantee of anonymity (Infocus, 2019).

Some bankers have pointed out that while the transactions will be anonymous, CBDC-R (CBDC - retail) will always be traceable. "Limited traceability and record keeping are important but how limited and how long it will be is all under formulation by the RBI. The central bank is working on the anonymity idea but it will take a very long time because it has to reconcile this with the anti-money laundering and other requirements" (as cited in The Economic Times, 2022).

As a broader principle, managed anonymity will require compliance to the existing standards of Anti-Money Laundering and Combating the financing of terrorism (CFT), in order to preserve the integrity of the CBDC system and prevent it from being misused for illegal purposes, at the very least, the system will have to maintain compliance.

These standards, overseen by the Financial Action Task Force (FATF) at an international level and the Reserve Bank of India within India, will therefore set the 'boundary conditions' or limits to privacy in a retail CBDC system, with significant implications for CBDC design choices.

3.1 Information Disclosure norms under AML and CFT standards

The Reserve Bank of India has detailed the 'Know Your Customer' norms and the AML and CFT obligations for banks and financial institutions in a master circular issued in July 2015 (RBI,2014). These instructions are based on the recommendations of FATF and the Basel Committee on Banking Supervision (BCBS).

As per these guidelines, there are three key aspects that dictate the requirements for information disclosure under the CBDC system:

- Customer Due Diligence
- Ongoing monitoring and
- Preservation of records.

These guidelines need to be understood in their larger context and logic rather than their narrowly defined dimensions. This is because these guidelines were set taking into consideration the inherent characteristics of cash and commercial bank money in bank accounts. Given that CBDC has significantly different characteristics, due to its digital nature, understanding the guidelines' underlying logic will allow us to assess alternative, CBDC-specific means of reaching the same ends where necessary.

Consider the norms under 'Customer due diligence' standards which are at the heart of AML and KYC initiatives. As banks and financial institutions can be used as conduits for the transfer of funds by illegal entities or for illegal purposes, it is essential that financial institutions have adequate control and procedures in place that enable them to know the person with whom they are dealing. This means that they should establish and verify the identities of their customers by collecting data (such as names, addresses, dates of birth). **The purpose of collecting this data is to create customer risk profiles and to screen against international sanctions lists.** From the perspective of CBDC design, these instructions imply that the "true identity" (and not a pseudonymous identity) of the users must be established *before* they are allowed to transact through the CBDC system.

The following table breaks these guidelines down to their subtext which set out the 'boundary conditions' for CBDC design.

Table 3.1 AML/ CFT Boundary conditions

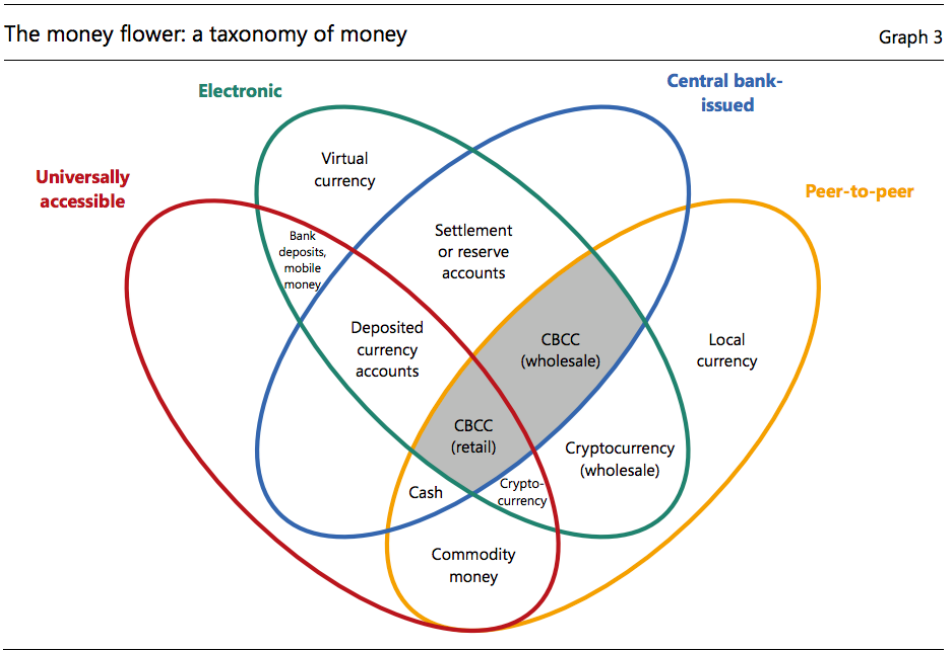
		FATF/ RBI guidelines	Boundary Conditions
Customer Due Diligence	Customer Acceptance Policy	No Anonymous / Benami Accounts & Necessary checks before opening an account	Account holder's "true" identity has to be established before the account is opened and transactions can take place. Transactions must be traceable against a person or legal entity.
		Profiling customer based on risk (adopt a risk based approach) +Documentation and information to be collected based on perceived risk	Other information about the account holder such as financial status or volume of turnover for a business entity have to be disclosed to determine risk associated with them. More personal information may be required for those in a "high risk" category.
		Screening against international sanctions lists.	The system should allow 'blacklisting' or scrutinising certain users. It cannot be fully non-discriminatory.
	Customer Identification Policy	System of periodical updation of customer identification data (including permanent address, photograph/s) after the account is opened.	The system must be able to maintain 'up to date' records of personal information of users.
Ongoing Monitoring	Transaction Monitoring	Identifying 'suspicious' or anomalous transactions	Transparency over transactions (size, location, time of transaction) must be observable, at least by banks and financial institutions required to conduct such inspections.
	Travel Rule	Requires participants' transaction data to be collected and shared along a payment chain.	Include required and accurate information of the transaction originator as well as the beneficiary at each level of transaction.
Record Keeping	Preservation of Records	All necessary data on transactions should be maintained for at least five years	Historical transaction data (at least till 5 years) should be retrievable

Section 4. Design Choices for an inclusive CBDC

4.1 Foundational design principles

CBDC is not a well-defined term. It is used to refer to a number of concepts. (BIS, 2018) Before discussing the design recommendations for a CBDC built to enable better financial inclusion, it is therefore useful to start with a functional definition of a CBDC. Bech and Garratt (2017) provided a taxonomy of different forms of money, which offers a useful starting point. Under the taxonomy, a central bank "cryptocurrency" (CBCC) is defined as an electronic form of central bank money that can be exchanged in a decentralised manner known as 'peer-to-peer', meaning that transactions occur directly between the payer and the payee without the need for a central intermediary. A retail form of CBCC is one that is universally accessible to the public, rather than restricted for settlements between financial institutions.

Figure 4.1 Taxonomy of Central Bank Crypto Currency



Source: Bech and Garratt, 2017

The peer-to-peer element of CBCC–which can provide anonymity features that are similar to those of cash but in digital form—is what conceptually sets it apart from deposited currency accounts (Bech and Garret, 2017). Tobin (1987) defines deposited currency accounts as direct accounts held by the general public with a central bank.

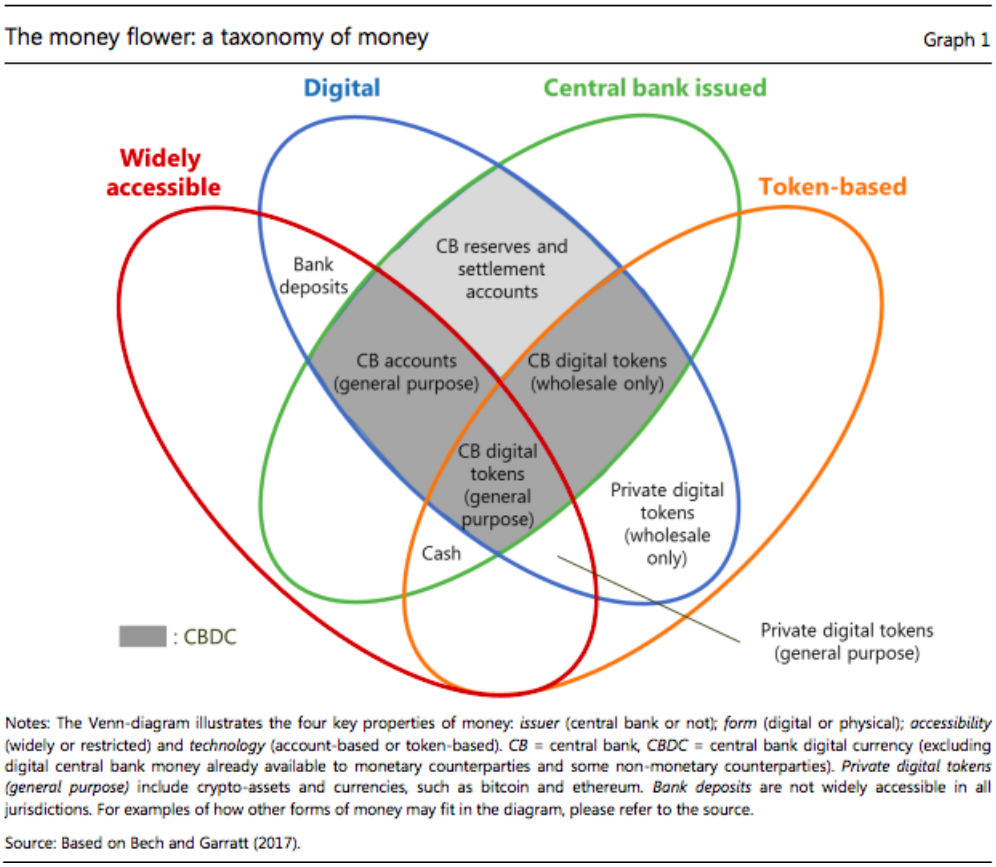
BIS (2018) recreated a version of this money flower which defined Central Bank *Digital* Currencies as token-based central bank currency–either for wholesale or retail use (defined by Bech and Garret as CBCCs) plus "account-based" digital central bank currencies (here account means a direct deposited currency account with the central bank).

Thus, there are four key characteristics of a CBDC:

- It is issued by a central bank.
- It is digital in form.
- Its use can be restricted to financial institutions or allowed for wider retail purposes
- It can either be in the form of a token of stored value or accounts.

The retail digital currency launched by the RBI as a pilot project in December 2022, neatly fits into the retail CBDC bucket, under this taxonomy. The observations on India's CBDC design are based on the concept note published by the RBI in November 2020 and the media reports on the pilot project launched in December 2022.

Figure 4.2 Taxonomy of Central Bank Digital Currency



Source: BIS, 2018

Khan and Roberds (2009) make a key distinction between token- and account-based money based on the form of verification needed when it is exchanged. Token-based money (or payment systems) rely critically on the ability of the payee to verify the validity of the payment object and whether it has already been spent. By contrast, systems based on account money depend fundamentally on the ability to verify the identity of the account holder. Identification is needed to correctly link payers and payees and to ascertain their respective account histories. (BIS, 2018). However, making a strict distinction between a token-based digital currency and account-based digital currency can be problematic. A digital currency can be both (New York Fed, 2020).

Garret (2020) uses the example of Bitcoin to explain how token-based and account-based terminologies are not necessarily mutually exclusive categories. A bitcoin is an account-based instrument, in that, in order to transact, bitcoin users must verify their identity by using their private key. (It is not relevant whether the system requires users to reveal their true identity. Rather, what matters is whether a user must follow a process the system has developed for verifying the identity that they established within the system). But Bitcoin is also a token-based instrument–the payment protocol verifies the validity of the object being transferred by tracing the transaction history.

The pilot version of the Indian digital rupee is not a pure token-based system. It is distributed by commercial banks as tokens in a digital wallet, in the same denominations that paper currency and coins. However, currently, its access is limited to those who have bank accounts in the commercial banks authorised to run the pilot. The access is thus conditional on identity verification and KYC by these banks.

Provided that both transacting parties have a CBDC wallet, the e-rupee can be exchanged person to person or person to merchant. Broadly, it checks all boxes of the defining features of a retail CBDC - it is electronic, it is issued by the central bank, it allows peer-to-peer transactions and is built for universal access.

In addition to these four core principles, however, there are other design features that determine how CBDCs are used. These include, among other features, what ledger is the CBDC transactions recorded on, which can be Distributed Ledger Technology or centralised ledger, the degree of anonymity offered under the system and who handles the payment claims.

In the case of the e-rupee, the claims are managed by the commercial banks, although they are backed by the central bank. As such, in this indirect model, even though the digital rupee is a liability of the central bank, it does not offer settlement finality quite the same way as physical cash.

Although, different jurisdictions are desgining their CBDCs in line with their policy priorities and country context, BIS (2020) has laid out a set of “foundational” principles and “core features'' that all CBDCs should follow to prevent negative international spillovers and ensure uninterrupted improvements to cross-border payments. These follow a risk-based approach and emphasise that the issuance of CBDCs should not compromise monetary or financial stability of the economy. In other words, it should not interfere with public policy objectives or prevent banks from performing their monetary stability mandate–a “do no harm” principle. The CBDC must also coexist with and complement existing forms of money (interoperability principle) and finally, they should promote innovation and efficiency in the overall payment system.

Based on these, the RBI concept note (2022) laid out some key design considerations for a CBDC. Some of these include:

- CBDC will be issued by Central Banks in alignment with their monetary policy;

- It will appear as a liability on the central bank's balance sheet;
- ***It must be freely convertible against commercial bank money and cash.***
- ***It is a fungible legal tender for which holders need not have a bank account and finally,***
- ***it should aim to lower the cost of transactions.***

Different design choices can be understood within the contours of these broader principles. The last three principles are especially relevant from a financial inclusion perspective and form the basis for some of the arguments presented in section 4.2.

4.2 CBDC design features to address financial inclusion barriers in India

This section explores design elements that need to be built into the CBDC architecture to overcome the challenges highlighted in section 2.1.

4.2.1 Addressing access barriers

a) Doing away with the precondition of having a traditional bank account to access CBDC

Given that a large population in India still does not have access to or does not actively use traditional bank accounts, bank accounts should not be the only gateway to issuing a CBDC wallet.

Scenario 1: Bypassing commercial banks: Direct provision of CBDC by central banks

One possibility is to provide direct CBDC wallets to the users. Raghuveera (2020) discusses an inclusive CBDC model in which retail CBDCs can be issued by a central bank directly to people without going through traditional bank accounts. In this system, individuals can have digit wallet applications linked directly to the central bank core ledger.

However, for reasons discussed in section 3.1, the central bank is not best placed to directly onboard customers, handle AML/ KYC processes and manage account keeping. Intermediaries such as commercial banks have a comparative advantage in performing this role. A single-tier system-with the central bank responsible for both issuance and distribution of the CBDC-also poses a risk to monetary policy since it can disrupt the payment system structure (IMF, 2023) A single tier CBDC can amplify the risk of structural disintermediation of banks and have undesired implications for credit allocation in the economy. Therefore there is a strong case for a two-tier CBDC model, where the central bank issues the digital currency but it is distributed through intermediaries better equipped to handle KYC and other transactional functions. Most central banks exploring a retail CBDC are considering a two-tier model.

Scenario 2: Involvement of non-bank actors

Private sector non-bank players such as telecom operations, retail stores could be involved in an intermediated model to onboard people to the CBDC platform.[9] Involvement of the private sector (ie banks, other PSPs and merchants) can support the attractiveness of a CBDC to users and ensure sufficient access points, even in remote areas. This can be done by revisiting rules on authorised access (BIS, 2021).

Different players can be involved at different stages of the payment system– For example, the distribution of a CBDC could be through commercial banks but non-bank PSPs could become access providers.

This will be akin to a mobile money account which allows users–including those without an account at a financial institution– to store, send, and receive money using their mobile phone. In such a system , telecom operators act as cash-in, cash-out gateways for users who can open a mobile money account through these service providers even without owning a formal bank account.

India has also witnessed the benefits of engaging non-bank third party service providers with UPI.[10] The facilitation of non-bank FinTech firms in the payment ecosystem as PPI issuers, Bharat Bill Payment Operating Units (BBPOUs) and third-party application providers in the UPI platform have furthered the adoption of digital payments in the country (RBI, 2022).[11]

But whether the system is direct or intermediated, a key consideration is that the ability to participate in the CBDC ecosystem should not be contingent on ownership of a formal financial account. CBDC has a unique proposition in reaching the unbanked population. The UPI system, which has facilitated digital payments in India, still largely caters to users within the banking network.

b) Leveraging innovations in digital payment infrastructure and the banking correspondent model

Setting up agent-based service points and "light" digital payment infrastructure at the point of sale will also be critical to address the problem of last-mile financial inclusion. The success of the banking correspondent model (see section 2.1) points to the potential benefits of integrating them into the CBDC rollout, for instance, They could help address many barriers that end-users face in formal financial accounts and services such as high private sector

[9] RBI's concept note also talks about a two-tier CBDC model where both commercial banks and "other payment service providers" act as intermediaries. Although, the current pilot only involves a few commercial banks.

[10] A key distinction between a CBDC and existing payment instruments (such as UPI) is that a CBDC is a liability of the central bank instead of that of a commercial bank or PSP.The absence of liquidity and solvency issues for the intermediaries and the associated need for prudential regulation for the CBDC issuer implies that new types of intermediaries could be licensed, thereby exerting competitive pressure on the national payment system. (Auer et al, 2022)

[11] Very few people in rural India use UPI for payments. A 2022 survey found that the most common reason for low uptake of UPI in rural India was the lack of trust in digital payments. Many also cited the low bank balance or inactive bank accounts as the reason. For more details refer to:
Ians. (2022, April 11). *Very few people in rural India use UPI for payments: Report*. News18.
https://www.news18.com/news/tech/very-few-people-in-rural-india-use-upi-for-payments-report-4964450.html

transaction fees and regulatory hurdles such as KYC requirements. The Business Correspondents carry a mobile device and can therefore help users with enrollment and transactions wherever the lack of mobile phone is a barrier. They can also help overcome consumer distrust in electronic-based money. By being a trusted human point of interaction, they could counteract any distrust people have in CBDCs

Deployment of light digital payment infrastructure including Quick Response (QR) codes like QRPH in the Philippines and UPI QR codes in India, will also help ease infrastructural constraints for consumers and merchants to accept digital payments [12] and allow for quick transfer of funds between users who may not hold accounts at the same bank or financial institution.

c) Simplifying the enrollment process

As mentioned in section 2.1, KYC and customer due diligence CDD processes and requirements often become barriers to financial inclusion, as key documents such as ID, proof of address and passport are relatively inaccessible to the underbanked and unbanked. India's digital ID- Aadhaar, has therefore been one of the most prominent KYC innovations in recent years. It has enabled eKYC, a function which greatly enhances the efficiency of the KYC process and fosters financial inclusion.

These E-KYC requirements could be further eased up by exempting certain marginalised groups up to a certain transaction or value limit (tiered KYC) (AFI, 2019). This entails relaxed CDD requirements but with restricted account functionality (to compensate for the risk) for the lower tier (tiered wallets). Further access or carrying out higher-value transactions could require the system to query a national ID system to authenticate or verify customers' identities and, in some cases, to retrieve basic attributes about them. The three active CBDC projects (Bahamian Sand Dollar, ECCB's D Cash and Sweden's e-krona) have chosen the same way to handle the policy trade-off between anonymity/ financial inclusion and AML/CFT compliance: a tiered selection of wallets with different levels of thresholds wherein those with lower thresholds allow for greater anonymity. "The use of tiered CBDC wallets thus gives rise to policy synergies between anonymity, risk-reduction (of bank runs), and financial inclusion" (Soderberg, 2022).

4.2.2 Addressing usage barriers

a) Reducing overhead operating costs for consumers

For low-income users, costs of transacting can also be a major barrier to financial inclusion. Cost-related concerns, such as the cost of financial services, remain important reasons why some households do not actively participate in the formal financial system. (Global Findex

[12] Launched in November 2019, QRPh (initially for P2P – person to person, for Instapay Payment Rails), allows quick payment and transfer of funds from other bank and e-money accounts in the Philippines. Users do not have to maintain a deposit account at the same bank to be able to send and receive money from each other—all they need is a smartphone with the app of their bank or e-wallet, and to ensure that their respective bank or e-wallet companies subscribe to InstaPay. This is similar to the UPI infrastructure in India.

Survey, 2021). The ability to transact at any time, at very low cost, will be a critical feature in the CBDC ecosystem to enable greater user participation.

However, the fee structure would have to be considered against the financial sustainability of the payment system. The zero-charge framework for UPI transactions invited much debate in recent years. One of the key reasons for UPI's popularity was the zero Merchant Discount Rate - a fee levied on merchants for processing payments. As such, charges in UPI are nil for users and merchants alike.[13] This raised questions about competitiveness and sustainability of running the system, as the cost of processing UPI transactions are predominantly borne by partner banks on the UPI platform.

CBDCs will face the same dilemma when it comes to transaction charges and fee structure. A fee structure that lowers the cost of transacting compared to other payment methods will boost CBDC adoption and financial inclusion. No minimum balance requirement, low or zero annual maintenance charges and transaction sub charges are critical features to drive inclusion. However, its feasibility will have to be considered in light of the concerns discussed above.

b) Creating an architecture designed to handle low value, high volume transactions

Another reason for low participation in the formal banking or payment systems among the low income groups is that they often have limited funds–and therefore transact in lower values. Cash payments seem far more conducive for low value transactions. A CBDC payment ecosystem that mirrors the cash payment ecosystem will also require the capacity to handle large volumes of low value, frequent transactions. India's UPI network saw a surge in failure rates in the face of large payment volumes. (Manikandan, 2020). To give a sense of the volume, in recent months, the UPI platform has been handling roughly 8-9 billion transactions of roughly $1.8 million in value, every month. In a country like India, scalability is a big challenge. But such failures, if not avoided, can quickly dwindle the trust among a population already wary of digital payment systems.

c) Developing offline/ feature phone capabilities

Although access to the internet and mobile penetration has improved in recent years, only about half of the Indian population owns smartphones. As of 2021, out of a population of 1.4 billion, India had around 1.2 billion mobile subscribers of which 750 million used smartphones (Deloitte, 2022).

CBDCs, which can be used only with the internet, can exclude many people who cannot use the internet from financial services. Further, if the system is shut down due to power outages and cyberattacks, financial services could turn out to be unavailable, which could cause a lot of

[13] UPI transaction charges: NPCI has advised that UPI transactions made via prepaid instruments, such as wallets and cards will attract an interchange fee of 1.1 per cent for merchant payments from April 1, 2023. An interchange fee is the fee charged by the receiver bank/payment service provider to the merchant.

confusion (Chu et al., 2022). The offline capabilities of a CBDC could reduce dependence on the quality and availability of mobile and broadband networks. Countries including China and the Bahamas, where the CBDC system is already introduced, are reviewing the offline payment function of CBDCs. "Retail CBDC can be designed to alleviate mobile phone and digital access divides through its unique ability to generate digital identity proxies and enable offline capabilities while being device agnostic" (AFI, 2022).

The RBI Concept note stated that the offline capability will be "critical" in the Indian context. The current pilot project in India does not allow offline use but independent projects are exploring offline capabilities in digital payments, which can be tested for the e-rupee. Visa's research and product teams have proposed the creation of a secure payment system protocol –Offline Payment System (OPS) – that can allow a user to make a digital payment in CBDC while both the sender and receiver are temporarily offline. The CBDC can be transacted from one device to another device directly without any intermediaries such as banks, payment networks, or payment processors using Bluetooth and Near Field Communication. The Bank of Japan (BoJ) is exploring the use of a chip (IC) on a SIM card but with a feature phone rather than a smartphone and the potential use of PASMO/Suica cards, which are used for railway and transport ticket passes as well as electronic money (RBI, 2022).

The NPCI launched UPI LITE and UPI 123 (which allows payments through feature phones) in India, which allows instant transactions of small value using an 'on-device' wallet and not from a linked bank account, without internet connection. However, it maintains strict transaction limits for offline use. The maximum per day transaction limit is Rs 200 (and the cumulative limit is Rs 4000) and at any given time only Rs 2000 can be maintained as balance. A caveat is important here: given that these products are still in their early stages, it is difficult to establish how successful or not they have been.

4.2.3 Improving access to formal credit and other financial services

a) <u>Creating data-backed financial footprint of users</u>

This is where a retail CBDC can potentially be a game changer.

A vast majority of Indians lack access to formal credit and other financial services because of their lack of credit history and collateral–which is critical for people to access services offered by private financial institutions.

A central bank digital account can help create a financial identity and payment history for people who have been historically excluded from private institutions and enable their access to cash-flow based lending. This is vital for catalysing economic activity, as we have seen with the gap between the need for finance in the MSME sector, and the availability of documentation and data that banks and NBFCs require to carry out due diligence and assess risk. Little, if any, public information exists about the performance of most small businesses. (RBI, 2019). This can become a serious hurdle in assessing the credit worthiness of these companies. Cash flow based lending can partially bridge that gap by allowing companies to borrow money on the

projected future cash flows– the loans are backed by the recipient's past and future cash flows. As opposed to asset-backed credit, individuals or small businesses can avail of loans based on expected cash flows. Additionally, new financial data may lead to a better segmentation of customers and the development of new products attuned to people's needs.

However, this raises pertinent questions about the ownership and protection of the personal financial data that will be generated through such a system. This is where RBI's account aggregator (AA) model can play a critical role.

Data portability and user consent

CBDC design could enable approaches for giving users control over data generated by payment transactions, which might otherwise remain for exclusive use by a few players in concentrated markets. This gives consumers the ability to "port" their payment transaction histories and use them to obtain access to financial services beyond payments. This would necessarily need to be accompanied by adequate data protection and privacy measures and be based on informed consent of the data owner – the payer or the payee (Auer et al, 2022).

Account aggregators

Touted as the UPI moment for lending, the account aggregator framework ensures quick data sharing with the consent of the users and eliminates the need for financial documents.

India's AA ecosystem can be leveraged to generate credit history for CBDC users with their consent but without the onus of maintaining financial records being on the users. Account Aggregator is a new piece of digital public infrastructure in India which allows users to link their bank or other transaction accounts with financial accounts (insurance, investments). A CBDC transaction account could allow data on payments to be captured and linked with other financial data through AAs. The AA platform facilitates exchange of financial data between Financial Information Users (FIUs) and Financial Information Providers (FIPs) but only with consent from customers. It is based on the Data Empowerment and Protection Architecture (DEPA) frame, also known as the 'Consent Layer of India Stack'.

The account aggregator framework can therefore help address the challenge of transaction data fragmentation in UPI (detailed in section 2.1), which prevents any actor in the system from generating person-specific insights that can be used to create financial products.

Account aggregation in combination with developing facilities such as a common-KYC is enabling seamless transfer of information across financial institutions and opening unprecedented doors for finance (Nageswaran, 2022).

The consent element of DEPA also aligns seamlessly with the DPDP Act of 2023. "This paradigm offers a promising avenue to operationalize the Act effectively. DEPA provides a foundation for operationalizing the Act with its code-based standards. This also empowers individuals with

granular control and real-time data access, enabling informed decisions and fostering trust in the digital ecosystem." (Sahamati, 2023)

Open Credit Enablement Network

The Open Credit Enablement Network (OCEN) , layered on top of the account aggregator model, can further support digital lending in the MSME sector and boost financial inclusion. Open Credit Enablement Network (OCEN) has emerged as a novel lending paradigm: Based on the AA Framework principles, OCEN digitises the lending process end-to-end, standardising the loan life cycle across financial institutions and marketplaces. Under the OCEN Framework, credit demand is shared with all potential lenders in the open network. (IMF, 2023) All relevant data about the potential borrower is equally accessible to potential lenders, allowing them to screen "loan-worthy" customers.

Data on payment transactions gathered from the CBDC system, integrated with all these layers of "India stack" can be a powerful instrument in promoting financial inclusion in India, especially higher up the pyramid.

Table 4.1: CBDC for financial inclusion - Design features

Barriers to financial inclusion	**Underlying limitations**	**CBDC architecture and design to address the challenge**
Barriers in access to traditional accounts	Lack of market incentives for commercial banks to operate in remote areas	Direct provision of CBDC by the central bank*
		Participation of non-bank PSPs
		Agent-based service points (banking correspondents) and digital payment infrastructure
	Enrollment challenges	Tiered wallets
		Simplified, electronic KYC
		Customer data portability
Usage barriers	Cost considerations	Maintaining low operating costs
	Insufficient funds	Processing ability to handle low value/ high volume transactions
	Poor internet connectivity	offline payments
	Limited penetration of smartphones	availability on feature phones
Low penetration into financial products and services markets	Lack of financial records / digital trails - challenges in assessing creditworthiness	Capture of cash-flow based financial records

*may not be feasible

4.3 Crafting an optimal design: Summary of key design considerations

Table 4.2 summarises how certain design features critical from a financial inclusion perspective interact with AML/CFT requirements (laid out in section 3) and data protection considerations.

Restrictions to avoid illicit activities would require the design of a CBDC to consider anti-money laundering and counter financing of terrorism risks (AML and CFT), as discussed in section 3. Financial Action Task Force (FATF) can be extended to CBDC but can come in conflict with the goal of protecting privacy of users. For example, the so-called "travel rule" (FATF (2021) requires participants' transaction data to be collected and shared along a payment chain (BIS, 2021). Outside these requirements, collecting and processing personal data is also subject to data protection regulations.

A pertinent question is how much user information and personal data should be captured in the system. [14]

4.3.1 Tiered Wallets/ Tiered KYC

From a financial inclusion perspective, there are two considerations: one, a pure "toke-based" instrument akin to cash could maximise access as it is non-discriminatory and offers anonymity. This means users can use the instrument without revealing their identity or any personal information. As in cash, it is only the verifiability of the instrument that matters.

However, to improve financial inclusion at the higher layers of the pyramid requires, it is important not only to establish the identity of the user on the platform at the time of enrollment but also to link the personal information with the transaction records in order to generate person-specific insights which can enable their access to formal credit, insurance and other financial products and services.

The latter point is in conflict with the first. The former may also compete with AML/ CFT requirements. This is where it is useful to think of a ***tiered wallet structure with tiered KYC***. In general the concept of tiered-access and anonymity is compatible with the current AML/ CFT system in India which allows anonymous cash transactions below 50,000 rupees, but requires adherence to customer due diligence and KYC requirements above that threshold.

Consider the Tiered wallet structure of the Bahamian Sand Dollar: The basic e-wallet tier has a holding limit of $500, with a monthly transaction limit of $1,500. Operating under this tier doesn't require the user to furnish any government identity proof. However, it means tier-I e-wallets can't be linked to bank accounts. If users are willing to give up anonymity, they can enrol under Tier II. Tier-II e-wallets can be linked to bank accounts. They have a far higher

[14] The architecture of the PMLA is worth bearing in mind. Under the current framework, there will be three nodes: The CBDC intermediaries (the payment service providers) would be required to register with the FIU, the RBI will perform the oversight role with the Enforcement Directorate required to step in if the need for criminal investigation arises.

holding limit of $8,000 and a monthly transaction limit of $10,000. These facilities require a government issued identity proof for enrolment (Sanddollar, nd).

It is also possible that ID verification may only be required at the time of uploading the wallet or enrollment while wallet-to-wallet transactions remain anonymous. This is similar to the model adopted in the e-rupee pilot. In the pilot project in India, the central bank has tried to maintain anonymity of CBDC transactions by erasing digital trails between wallets, to promote its acceptance among users (Business Standard, 2022).These transactions are simply not recorded on the core banking system. However, it is unclear how AML/ CFT requirements are met under such a system. Such a system also weakens the potential to create financial identity and digital records for its users, and thereby promote the financial inclusion goal.

4.3.2 Compatibility with Account aggregator model

The above model could also obstruct the process of generating transaction records of individual users, which could help both AML/ CFT procedures and financial inclusion goals. As suggested earlier, an account aggregator model which maintains data for CBDC users based on their consent, could allow for the users' personal financial data to be managed in a "privacy-preserving" way. Such data can be similarly made accessible to other third parties including those responsible for conducting AML/ CFT backchecks.

4.3.3 Offline functionality but with periodic need for power to synchronise wallets with servers

Another critical feature of a CBDC built to promote financial inclusion is offline functionality and compatibility with feature phones. Data capture requirements, both for AML/ CFT and financial inclusion purposes mean there will be some limits to the offline use. The system will require periodis of power and network connectivity to reload or redeem CBDC balances or to synchronise the local wallet balances with central servers. The electronic financial system with an offline payment function will also be a blind spot of security problems—not only portable devices but also transactions in an offline situation are isolated from the main system which means malicious behaviours, such as hacking attempts on portable devices or fraudulent transactions that exploit the system, cannot be detected in real time (Chu et al., 2022).

Table 4.2 Considering Financial Inclusion requirements and AML/ CFT boundary conditions in CBDC design

	Financial Inclusion requirement	**AML/CFT Requirement**	**CBDC Design**

ID verification and collection on personal information of the user	1. Limited KYC-related barriers to onboarding 2. Establishing identity of the participant in the system in order to create person-specific financial insights	At the very least the identity of the user has to be established to participate in the system. The system should allow back-checks against blacklisted entities. It can not be fully non-discriminatory.	Remote or e-KYC (leveraging digital ID-Aadhaar +Digilocker); Simplified Due Diligence/ Tiered KYC (with differentiated access limits)
Tracing transaction data	Maintenance of transaction records and history for users	Transaction recording to detect anomalous transactions (for electronic payments)	Data portability and compatibility with the account aggregator framework.
Offline functionality and compatibility with feature phones	Less dependency on internet connectivity	Maintenance of updated transaction records	Periodic need for power and network connectivity to reload or redeem CBDC balances or to synchronise the local wallet balances with central servers.]

5. Conclusion

While CBDCs can be tailored to address specific barriers to financial inclusion if designed for this objective from the get-go, they are not a magic bullet. As discussed in the earlier sections, a CBDC cannot address structural barriers to financial inclusion and would therefore need to be supported by policy and other government and central bank-led initiatives, especially towards financial and digital literacy. It is important to keep the limitations of the CBDC in mind given these structural constraints and local contexts.

The unique feature of CBDC, which makes it distinct from other digital payments instruments like UPI, is that it is issued by the central bank. However, this in itself may not make it a better tool. While interoperability and affordability can facilitate CBDC adoption, they are also key to all digital payment instruments. Central banks must therefore carefully consider what unique advantages CBDCs offer for promoting financial inclusion.

In India, UPI has already tailored solutions for financial inclusion. The CBDC's (e-rupee's) potential to overcome the challenge of fragmentation of transaction data in the UPI system is therefore one potential unique advantage. The e-rupee is also uniquely positioned as a hybrid

between physical cash, mobile money and UPI: UPI directly uses funds from bank accounts for transactions, whereas, like a mobile money wallet, a CBDC wallet can be uploaded at multiple access points through non-bank actors like mobile network operators and it carries central bank guarantee akin to physical cash. The RBI can leverage this unique proposition to further the financial inclusion goal.

Finally, a key risk is the adoption and acceptance of the CBDC. Three factors are critical to that end. One, creation of an "acceptance ecosystem" which allows users to seamlessly exchange physical cash, CBDC and other forms of electronic money. Fungibility is an important feature of a sovereign currency. Two, its perceived usefulness to consumers and incentives for commercial banks to participate. As Kiff (2022) notes, "insufficient incentives for commercial banks" and "mis-targeted consumer messaging" were among the key reasons for low adoption of Nigeria's e-naira in the early stages. Three, security and trust: central bank money is the safest form of money. Therefore, protecting a CBDC's infrastructure from both internal and external threats should be a top priority for regulators. In January 2022, the Eastern Caribbean Central Bank (ECCB)'s CBDC, also known as D cash, suffered a power outage which left users on the platform in limbo. This raised important concerns: a CBDC outage similar to the current D cash situation might invoke a currency collapse because of it being a single point of failure. A CBDC outage would also dent consumer confidence in the currency and put its credibility into question.

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