March 2021

CBDC Research Center Overview and Conceptual Model

Central Bank Digital Currency Research Center

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Introduction to the R3 CBDC Working Group

The R3 CBDC Working Group has provided a forum for collaboration between the ecosystem participants required for sovereign fiat-denominated digital currency to be launched and operated. The working group's research agenda is focused on three primary objectives:

- Validate first-hand the public sector's various motivations for launching digital currency along with the decision process of the private sector
- Define the use cases for potential CBDC implementations by understanding industry pain points
- Uncover the different options for how the resulting instrument, network, and distribution infrastructure for CBDC may function

Additionally, we are deeply curious about the political, market and infrastructure conditions required for adoption and aim to ground all findings in success criteria—from the point of view of both the public and private sectors.

Given the early nature of many CBDC initiatives, the working group structure provided a useful forum for answering some of these questions and identifying where more work needs to be done. While the answers to each of the above questions differ widely by currency zone and industry segment, over the past few months we have been able to generalize findings we are eager to publish findings and begin a wider conversation. Specifically, one of the earliest achievements of the group was to develop and agree on a conceptual model that could serve as a framework for understanding and categorizing these questions for a given CBDC initiative. The conceptual model is an apt resource for the Research Center's inaugural paper because the additional work being published in 2021 aligns directly to its structure. The remainder of this paper will unpack the conceptual model and outline the forthcoming papers and resources intended to provide more detail on each layer.

The CBDC Working Group's Conceptual Model

We have named the conceptual model's visual representation the 'CBDC Pavilion' as the hierarchy of aspects should build up to a structurally sound and unique monument. Sourced from existing projects and research papers and validated by the working group, we are able to define multiple motivations, use cases, process frameworks, features and implementation options for CBDC. These are represented by the pavilion model below.

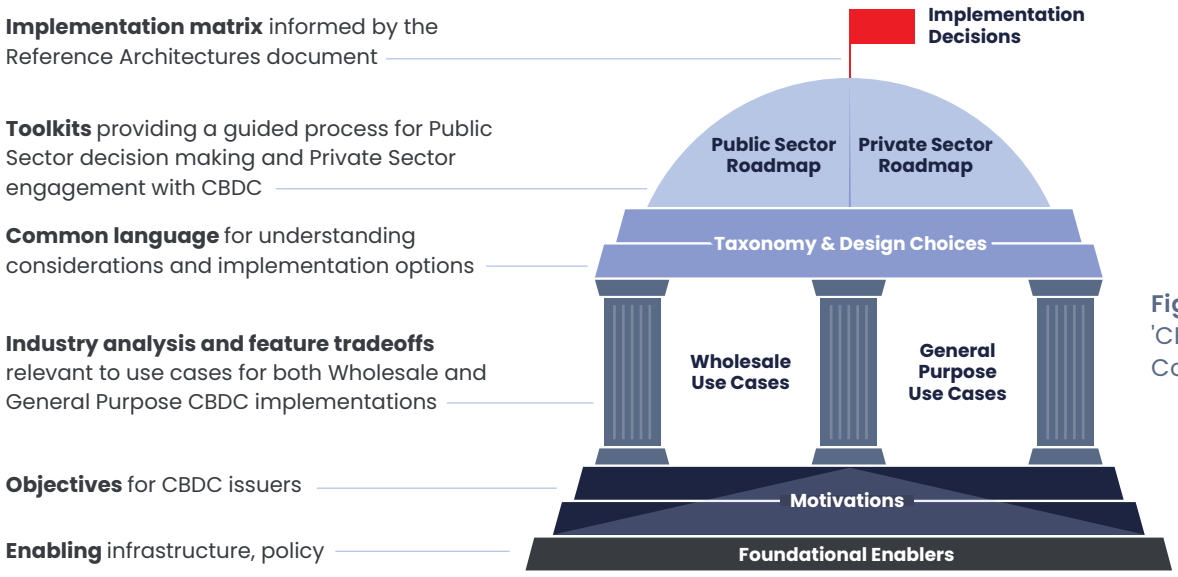


Figure 1: The 'CBDC Pavilion': A Conceptual Model

Just as establishing a foundation is the first step of building any physical structure, the conceptual model is intended to be worked through from the bottom-up:

- Foundational Enablers
- Motivations
- Wholesale & General-Purpose Applicability
- Taxonomy & Design Choices
- Roadmap for the Public and Private Sectors
- Implementation Decisions

This paper will introduce the six layers of the conceptual model. While the conceptual model is a very useful framework for understanding how to evaluate and participate in the digital currency landscape, we highly recommend reading the follow-on papers of this series, which dive deeper into the content within each segment.

Unpacking the Conceptual Model

Foundational enablers

The Foundation Enablers are pre-conditions. As a result they are independent from the decisions of an individual entity, though they are still crucial to consider and understand.

We recognize that the infrastructure and policy in any given currency zone is unique. While it's out of scope to define this in the context of every region, we have identified three core categories that must be considered.

Governance

- Government stability
- Policy stability
- Regulation and compliance maturity

Standards

- Imbedded standards
  - *(telephone, data sharing, TC/IP)*
- Emerging Standards
  - *(stablecoin, crypto, CBDC)*

Infrastructure

- Reliable national infrastructure
- Reliable and affordable internet
- Reliable and affordable mobiles
- Digital Points of Sale (PoS)

Each of the above Foundational Enablers are also impacted by additional local conditions, be they environmental (common weather events capable of destroying national infrastructure) or social and economic (decreasing cash usage). As a result, the existing infrastructure and policies within a currency zone not only show the pre-conditions or obstacles relevant to implementation, but also point directly to the core motivations driving a central bank's exploration of CBDC in the first place.

Motivations: High Level Objectives for CBDC Issuers

Central Bank Digital Currency represents a foundationally new opportunity for the public sector to provide new and improved services and or extend access to the payments system. As a result, motivations are diverse and relate directly to some of the core responsibilities and considerations of not just the central bank, but also governments more broadly, such as monetary policy, financial stability, socio-economic goals and geopolitical realities.

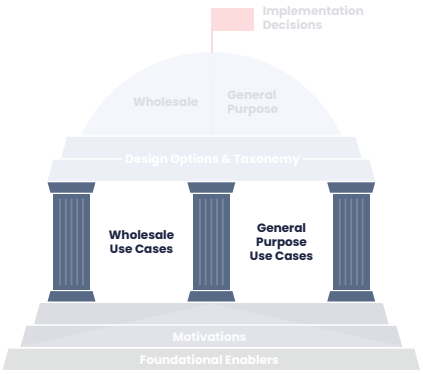
Wholesale

Financial Stability	The absence of legal tender will faciliate the prevelance of alternatives that may create risks or negative impact to the wider economy. For example, counterparty risk could build up if payment instruments are not 100% backed by low risks convertible assest.
Resilient financial system	Introducing an alternative payment rail that could settle atomically against other assets or payment instruments on ledger would help eliminate multiple opened positions, allowing the financial system to scale while minimizing credit risk.
Reducing costs and risk management burden	Banks would save on costs associated with ensuring counterparty risk mitigation for interbank payments.
Accelerate economic growth and expansion	By tightening the delivery versus payment window, banks could lower, or in some cases, even eliminate capital intensive aspects associated with clearing such as liquidity reservation.

General purpose

Monetary Sovereignty	The decline of cash leaves a potential vacuum where the public's options for payments or savings instruments with minimal credit risk are narrowed (or perhaps even exhausted).
Mitigate Concentration Risks	A retail payments system exclusively in the control of private entities providing closed-loop systems presents monopolistic challenges.
Expand participation	Seizing the opportunity that digital innovation provides to extend access and participation in the banking system and formal economy, for instance by unlocking the potential of DLT to support micropayments.
Programmability for effective policy	Establish the mechanisms for fiscal support to be released immediately in times of distress through a new payments rail that can also incorporate real-time analytics for fiscal monitoring and effective calibrations.

Use Cases: Relevant Applications for CBDC



At the highest level, CBDC projects fall into two categories—wholesale and general-purpose. Wholesale CBDC is limited to commercial banks, clearing institutions or other entities that have traditionally had access to central bank reserves. General purpose CBDC would have a potentially much larger user base, and can involve corporates, small businesses, and even individuals. The distinction between the wholesale and general-purpose is useful because different types of end users often have different requirements and preferences.

Wholesale Use Cases	General-Purpose Use Cases
Securities Settlement • Various payment arrangements between banks in exchange for assets • Payment arrangements or accounts between banks, exchanges and custodians • Payment in regional asset networks (e.g. Target2 in the EU)	**General Purpose Payments (B2B/B2C)** • Commercial transactions (e.g. paying a supplier) • Liquidity management • Payroll, short term loans
Cross Border Payments • Forward FX contract • PvP matching • Programmable escrow solutions • Programmable lending products • Liquidity swap lines (somewhat more forward looking idea)	**General Purpose Payments: (General Public)** • Fiscal policy instruments (stimulus payment, welfare, conditional payments, 'programmable money' e.g. food stamps, tax returns/payments, foreign aid) • Remittance • Payment tool connecting to potentially wider array of banking services from government

The forthcoming use case papers dive into the applicability of CBDC across each of the wholesale and general purpose use cases presented above (available in Q2 2021).

Securities Settlement

Securities Settlement

Analyzes the pain points for market participants, highlighting projects addressing each at the FMI level via a DLT-based solution

Cross Border Payments

Cross Border Payments

Outlines the existing networks that facilitate cross-border payments, identifying the legal and governance implications to new models involving CBDC

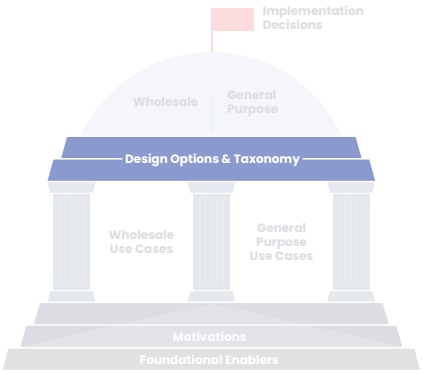
General Purpose Payments

General Purpose Payments

Surveys the potential use cases for a general purpose CBDC, highlighting the existing instruments used to facilitate payment in each scenario

CBDC Taxonomy & Design Choices

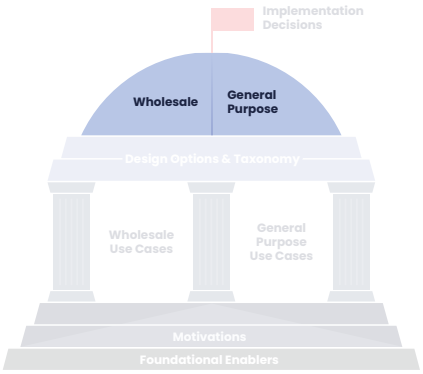
The R3 CBDC Working Group has set out to publish a new taxonomy and augmented set of definitions for digital currency and potential design options, as the intent of this initiative is to provide actionable guidance for issuers of a CBDC. In this section we aim to provide a common language for understanding the considerations and decisions relevant to the building of a CBDC and highlight areas where certain features may complement or cause friction with one another. The below paper also unpacks the key distinctions of CBDC in the context of existing monetary instruments and maps out the range of features and tradeoffs for different CBDC implementations.

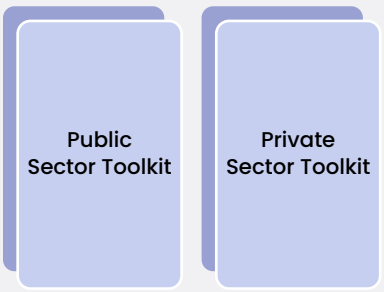


Public and Private Sector Roadmaps

Both public and private sector actors will have unique sets of considerations and processes guiding their CBDC journeys. These roadmaps will be analyzed in the “Private Sector Toolkit” and “Public Sector Toolkit” documents. The toolkits are currently being applied across several institutions.

Contact us for access or to discuss the application of the toolkits to your situation.





Applied to each organization's context

The Public Sector Toolkit and Private Sector Toolkit are developed and designed with the key purpose to guide central banks, other public sector stakeholders and the private sector ecosystem to assess if, how and where CBDC is applicable to their local jurisdiction. Each toolkit also provides actionable guidance on next steps and technical and policy considerations around project building. It is designed with input from the CBDC Working Group and in collaboration with the World Economic Forum, whose existing toolkit is used as a starting point.

CBDC Implementation Decisions

The final step in a CBDC strategy is mapping feature preferences and design choices to concrete technical implementation decisions. For access to the Reference Architecture document, or for specific technical guidance, please **contact us**.

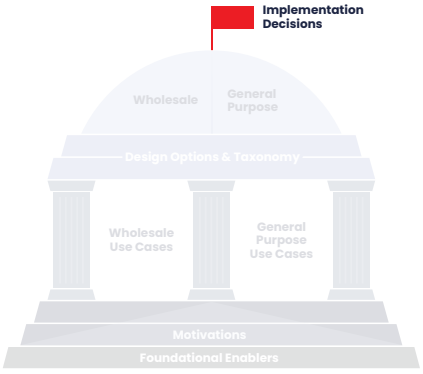
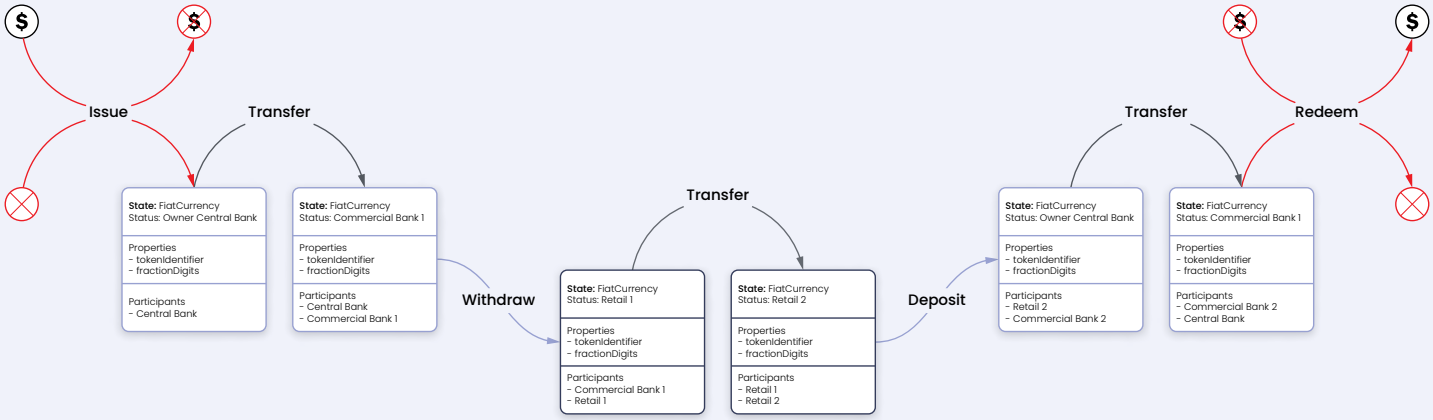


Figure 2: Ledger recordings of potential transactions



Next Steps for the CBDC Research Center

At the end of Q1 2021 the working group will launch the CBDC Research Center, where research findings will be hosted. The first two papers to be published are “CBDC Research Center Overview & Conceptual Model" and “CBDC Taxonomy & Design Options”. During Q2, more papers will be released, including use case analyses .

To continue the discussion, or for access to either the Reference Architectures, Public Secor Toolkit or Private Sector Toolkit—please **contact us**.

Continue the conversation

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About R3

R3 is an enterprise software firm that is pioneering digital industry transformation. With our foundation in enterprise blockchain technology, we power solutions that deliver trust across the financial services industry and beyond.

R3's enterprise blockchain platform Corda is digitalizing the processes and systems that firms rely on to connect and transact with each other and has more than 350 institutions deploying, servicing and building on it. Our Conclave platform harnesses the promise of confidential computing and Intel® SGX technologies. Conclave empowers businesses to develop applications that analyze and process sensitive data from multiple parties—all without compromising on confidentiality.

Our customers and partners have access to an ecosystem of leading systems integrators, cloud providers, technology firms, software vendors, corporates and banks. To ensure our customers derive the greatest value from their investment, we provide services and support to shorten time-to-market, as well as guidance on implementation, integration and building blockchain business networks.

Learn more at **www.r3.com**, **www.corda.net**, and **www.conclave.net**.

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