FOREWORD

The global financial industry is experiencing a Cambrian explosion of digital money and payments-related innovation, led by both the public and private sectors, taking the form of central bank digital currencies ("CBDCs"), deposit tokens ("DTs"), and stablecoins ("SCs"), amongst others.

Given the use of infrastructure in traditional finance that separates messaging and settlement, thereby resulting in delayed settlement and cost, it is no surprise that experimenting with blockchain and distributed ledger technology ("DLT") to achieve Payment versus Payment ("PvP"), Delivery versus Payment ("DvP"), and programmability is a key driver of innovation in the global payments landscape, and precisely where this type of innovation shows the highest promise.

Nevertheless, given the experiment in this space is still very new, benefits are being carefully weighed against key risks and challenges. Common challenges include identifying unmet current and future commercial needs, the most suitable technology stacks, the optimal legal classification and terms and conditions, the challenges in meeting regulatory compliance, and the challenges associated with building and governing new consortia and networks that don't compromise the safety and efficiency of financial market infrastructures.

It goes without saying that these uncertainties need to be addressed for this innovation to take root in a more sustainable manner. Against this backdrop, and in the context of project Dynamo which involves the use of digital trade tokens, the BIS Innovation Hub Hong Kong Centre partnered with Quinlan & Associates to develop an in-depth landscape study of the current state of play of CBDCs, DTs, and SCs, underpinned by interviews with 29 leading global market participants and stakeholders active in one or more of these explorations.

We hope that policy-makers and industry players can leverage the content of this study to foster closer cooperation among the public and private sector, while also enabling the Cambrian explosion to reach a desired end destination – namely, well-rooted innovation that is spurred by unmet commercial needs and characterised by robust regulatory compliance.

Bénédicte N. Nolens
Head of Hong Kong Centre
BIS Innovation Hub

Benjamin Quinlan
CEO & Managing Partner
Quinlan & Associates
The data set forth in this report is derived from the findings of both primary interviews and facts gathered via secondary research efforts.

The views in this report are predominantly based on interviews conducted with high-profile market stakeholders and facilitators who are actively involved in experimentation with CBDCs, DTs, and SCs.

Certain statements made within this report reflect an aggregated view, based on our interview findings, and should not be interpreted as the opinion or endorsement of the Bank for International Settlements (‘BIS’) or BIS Innovation Hub (‘BISIH’).

As both the technology (i.e. blockchain / DLT) and the assets (i.e. CBDCs, DTs, and SCs) are currently in their early stages of development, the report’s objective is to provide context for various market adoption exploration efforts across the wider industry. The report does not assume there will or shall be widespread adoption of either the technology or the assets across financial markets.

This report only showcases the adoption of both the technology and the assets within the context of wholesale financial market operations. As such, applications of the technology and the assets for retail use cases (e.g. peer-to-peer transfers, for the purposes of / access to investment in the digital assets market by retail investors) is not within the scope of this report.

This study is explicitly focused on the adoption exploration of "blockchain representations of sovereign currency" that are either fully or partially collateralised / backed by sovereign currency or its equivalent. Alternative forms of ‘blockchain representation of sovereign currency’, such as those backed by other digital assets (e.g. BTC, ETH, XRP, etc.) or software-based algorithms (e.g. Terra / Luna), are not considered within the scope of this report.

As regulations, standards, and frameworks continue to rapidly evolve, the definitions and insights presented in this report represent our findings at the time of its drafting. Hence, certain findings may become outdated or subject to change.

Despite the possibility that certain stablecoin issuers may not be fully compliant with local, regional, or global standards / regulations at the time of writing, this report presumes that all stablecoin issuers are subject to relevant regulations in their operating jurisdictions and are recognised entities holding an e-wallet license (e.g., Stored Value Facility License in Hong Kong) or its equivalent.
ACRONYMS

List of Abbreviations
(By alphabetical order)

- AML: Anti-money Laundering
- ADGM: Abu Dhabi Global Market
- CASP: Coordinated Activities on the Safety of Products
- CBDC: Central Bank Digital Currency
- CTF: Counter-Terrorist Financing
- DIFC: Dubai International Financial Centre
- DLT: Distributed Ledger Technology
- DT*: Deposit Token
- DTT: Digital Trade Token
- DvP: Delivery-versus-Payment
- EPI: Electronic Payment Instrument
- FI: Financial Institution
- FTSP: Fund Transfer Service Provider
- HKMA: Hong Kong Monetary Authority
- MAS: Monetary Authority of Singapore
- MiCA: Markets in Crypto-Assets
- MPI: Major Payment Institution
- MTL: Money Transmission License
- NBFI: Non-banking Financial Institution
- PSA: Payment Services Act
- PvP: Payment-versus-Payment
- SC: Stablecoin
- SCA: Securities and Commodities Authority
- SPI: Standard Payment Institution
- SVF: Stored Value Facility
- VARA: Virtual Assets Regulatory Authority
- VASP: Virtual Asset Service Provider

Deposit tokens are also referred as tokenised deposits or regulated liabilities.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1</td>
<td>Project Overview</td>
<td>11</td>
</tr>
<tr>
<td>Section 2</td>
<td>Definition</td>
<td>14</td>
</tr>
<tr>
<td>Section 3</td>
<td>Adoption Explorations</td>
<td>18</td>
</tr>
<tr>
<td>Section 4</td>
<td>Market Development</td>
<td>28</td>
</tr>
<tr>
<td>Section 5</td>
<td>Regulatory Perspectives</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Existing Regulations</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>New Regulations</td>
<td>40</td>
</tr>
<tr>
<td>Section 6</td>
<td>Looking Ahead</td>
<td>46</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY (1/5)

PROJECT OVERVIEW

• The focus of this landscape study is on wholesale adoption explorations of CBDCs, DTs, and SCs, including adoption challenges and the broader market development outlook for key market participants.

• The following topics were covered: (1) definition and prospective use cases, (2) industry adoption outlook, (3) adoption challenges, (4) organisational positioning, (5) the use of blockchain, and (6) regulatory development outlook.

• Our methodology included both primary and secondary research to ensure a comprehensive understanding of various wholesale use cases for CBDCs, DTs, and SCs.

• For our primary research efforts, we interviewed 47 leading executives with relevant expertise across 29 organisations covering potential issuers of stablecoins and / or deposit tokens [7], infrastructure providers [9], payment companies [3], intergovernmental organisations [3], law firms [3], professional services firms [2], and academic institutions [2].

• The objective of this landscape study is to provide practical and applicable reference frameworks, an overview of key trends, and detailed primary market intelligence to help steer continued healthy development of the financial markets.

DEFINITIONS

• To converge on definitions of CBDCs, DTs, and SCs we explored their underlying characteristics, including technology, price stabilisation mechanism, and issuing entity.

• For the purposes of this landscape study, we decided to focus our definitions specifically on DLT-based digital representation of sovereign currency issued by central banks, regulated banks, and non-bank financial institutions.

• We excluded any other DLT-based assets that are neither being collateralised by nor directly referencing sovereign currencies, such as algorithmic stablecoins.

1Given the ongoing discussion regarding the taxonomy and definitions of CBDCs, DTs, and SCs; the concluded definitions from the research findings are used solely for the purposes of this study and may be used as one of the reference points.
ADOPITION EXPLORATIONS

• The commonality between CBDCs, DTs, and SCs is that they can be used for straight-through processing and end-to-end instant payments / settlement, including PvP and DvP, combined with programmability.

• The adoption of blockchain / DLT has the potential to materially change the existing method of settlement for payments and regulated assets (e.g. securities), both of which are key pillars of the financial markets.

• At the same time, well-rooted methods tend to be highly sticky and the incentives of self-disruption by existing incumbents and stakeholders in traditional financial markets remains low.

• Despite this, many incumbents and stakeholders have shown willingness to explore blockchain / DLT for PvP and DvP to address existing pain points, such as lengthy settlement times, lack of transparency, and high transaction costs.

• Other forms of programmability of money and payments are also an area of active experimentation, both by disruptors and incumbents.

• There is significant interest in adopting blockchain / DLT for wholesale financial operations across both public and private sectors.

• BIS initiatives such as Project mBridge (multilateral payment platform using CBDC), Jura (cross-border PvP and DvP using CBDC), Helvetia (Domestic DvP using CBDC), Dynamo (programmability of SC in the trade finance context), and Genesis (tokenised bonds with programmed delivery of carbon credits) are examples of such explorations.

• Many financial institutions are actively exploring the adoption of DLT-representations of fiat currency in both PvP and DvP scenarios, with promising developments being observed in the trade finance and fixed income space.

• Non-banking industry players, particularly those involved in international trade, are also actively exploring wholesale use cases of CBDCs, DTs, and SCs to address existing pain points associated with working capital.
MARKET DEVELOPMENT

- As with any new technology, institutions tend to execute their technology initiatives in silos, given fundamental differences in corporate strategies and operating procedures.
- Recognising this challenge, various initiatives are underway to connect these “walled gardens” – in short, leading financial market infrastructure players and technology providers are looking to address challenges around limited interoperability, including by offering aggregation platforms, standardised messaging guidelines, and relay chains, among various other initiatives.
REGULATORY PERSPECTIVES

• While there is significant interest in the adoption of blockchain / DLT for wholesale financial operations, there are several regulatory challenges that need to be addressed.

Existing Regulations

• For example, one of the first steps in blockchain / DLT adoption is the selection of a blockchain / DLT protocol, in which we identified limited industry converge, stemming from different views on the potential of various blockchain types and, ultimately, how the development of the industry will unfold.

• One of the key regulatory considerations hindering adoption is how compliance with anti-money laundering (“AML”) and counter-terrorist financing (“CTF”) sanctions rules can be effectively achieved, given the universal availability of these digital assets.

• Entities we spoke with generally preferred entity-level AML to be implemented (vs. asset-level AML) in order to limit operational complexities, while better controlling the legal responsibilities / consequences across the ecosystem.

New Regulations

• CBDCs and DTs benefit from existing legal and regulatory frameworks that provide market participants with sufficient regulatory clarity; in contrast, SCs are a relatively new concept, necessitating the development of new regulations or the adaptation of existing ones.

• Given that CBDCs, DTs, and SCs are often discussed in parallel, regulatory clarification across all three is necessary for organisations to further explore wholesale use cases. And we are seeing more regulators around the world actively endorsing real-world use cases, ensuring investor protection, etc.

• Despite these efforts, inconsistencies in legal taxonomies and licensing requirements are hampering adoption efforts, with organisations calling for greater regulatory convergence and cross-jurisdictional harmonisation.

• While achieving regulatory harmonisation may be idealistic, it is important for regulators and policymakers to foster closer cooperation and coordination support greater interoperability with respect to final settlement for cross-jurisdictional wholesale cases involving PvP and DvP.
NEXT STEPS

Market Facilitators: Regulators / Policymakers

• Regulatory bodies have been actively publishing consultation papers outlining their approach to digital assets. However, notable discrepancies in terms of legal taxonomies, definitions, and responsibilities persist across jurisdictions, particularly with respect to stablecoins.

• Greater regulatory cooperation and coordination efforts to support cross-jurisdiction interoperability remains extremely important, enabling more responsible and sustainable progress by market participants.

Market Stakeholders: Banking Institutions / Non-Banking Institutions / Financial Market Infrastructures / Payments Companies

• We have observed a growing interest in the adoption of CBDCs, DTs, and SCs by major banking and non-banking institutions across various jurisdictions.

• We recognise that both technology and regulation are in their early stages of development, which may lead to siloed initiatives within individual "walled gardens".

• Despite industry convergence challenges, we encourage institutions to keep a close eye on potential interoperability solutions that could unlock the full potential of this new asset class in the years to come.
SECTION 1
PROJECT OVERVIEW
RESEARCH APPROACH

By conducting interviews with key industry stakeholders from across the globe, from banks to academic institutions, supplemented by detailed secondary research, we were able to capture a wide range of perspectives on the wholesale adoption explorations of CBDCs, DTs, and SCs.

**Interview Participants**

By Organisation, Count = 29*

<table>
<thead>
<tr>
<th>Participants</th>
<th>Count</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Issuers of SCs / DTs</td>
<td>7</td>
<td>Gain insights into the current initiatives, priorities of, and challenges facing key market participants around blockchain asset adoption</td>
</tr>
<tr>
<td>Infrastructure Providers</td>
<td>9</td>
<td>Understand the current role and future plans of payment companies around upcoming changes related to blockchain adoption</td>
</tr>
<tr>
<td>Payment Companies</td>
<td>3</td>
<td>Comprehend the perspectives of regulators, policymakers, and central banks towards CBDCs, DTs, and SCs</td>
</tr>
<tr>
<td>Intergovernmental Organisation</td>
<td>3</td>
<td>Obtain insights into regulatory developments and legal classifications driving the outlook of CBDCs, DTs, and SCs</td>
</tr>
<tr>
<td>Law Firms</td>
<td>3</td>
<td>Digest the complexities of CBDCs, DTs, and SCs from a professional services perspective (e.g. accounting, bookkeeping, etc.)</td>
</tr>
<tr>
<td>Professional Services</td>
<td>2</td>
<td>Discuss high-level perspectives on CBDCs, DTs, and SCs from a regulatory, business, and other relevant standpoints</td>
</tr>
<tr>
<td>Academic Institutions</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Interview Participants**

By Individuals & Jurisdiction, Count = 47

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>12</td>
</tr>
<tr>
<td>France</td>
<td>1</td>
</tr>
<tr>
<td>U.K.</td>
<td>9</td>
</tr>
<tr>
<td>Australia</td>
<td>4</td>
</tr>
<tr>
<td>China</td>
<td>1</td>
</tr>
<tr>
<td>Hong Kong SAR</td>
<td>14</td>
</tr>
<tr>
<td>Philippines</td>
<td>1</td>
</tr>
<tr>
<td>Singapore</td>
<td>5</td>
</tr>
</tbody>
</table>

*The project team shortlisted and conducted interviews with the most relevant organisations: high-profile market stakeholders and intermediaries that are pioneering the exploration of potential use cases for CBDCs, DTs, and SCs.

Source: Interviews, Quinlan & Associates analysis.
Our research focused specifically on the wholesale adoption explorations of CBDCs, DTs, and SCs, covering a range of key topics; from the definition of these digital assets to the broader regulatory development outlook.

**Source:** Interviews, Quinlan & Associates analysis

---

**Research Focus**

**Prospective Wholesale Use Case**

**Definition**

We have defined DTs as DLT representations of fiat currency that are issued, managed, and governed by a commercial bank. Do you agree with this definition?

**Prospective Use Cases**

Could you share any initiatives pertaining to the wholesale uses of CBDCs, DTs, and SCs?

**Adoption Outlook**

Out of public, private, and consortium blockchains, which do you think will be most popularly deployed for wholesale SC / DT use cases and why?

**Adoption Challenges**

How would you rank the following business-specific adoption challenges for wholesale use cases of CBDCs, DTs, and SCs by their potential level of difficulty?

**Organisational Positioning**

How do you envision your organisation to be positioned if the broader adoption of wholesale CBDC / SC use cases takes place?

**The Merits of Blockchain**

Why do you believe blockchain / DLT technology, despite its technological complexity and lack of compatibility with the existing infrastructure, should be leveraged?

**Regulatory Outlook**

What are the regulatory clarifications or frameworks that need to be put in place to facilitate responsible adoption of SC / DTs?

---

**Key Topics & Questions**

**Source:** Interviews, Quinlan & Associates analysis
SECTION 2
DEFINITION
This scope of this study was limited to blockchain / DLT representation of digital forms of sovereign currency issued by central banks, regulated banks, and non-bank financial institutions.

**Defining Criteria**
Technology, Fundamentals, and Issuer

1. **Technology**
   - **DLT BASED**
     - Usage of blockchain technology to power the underlying infrastructure
   - **NON-DLT BASED**
     - Usage of non-blockchain technology to power the underlying infrastructure

2. **Price Stabilisation Mechanism**
   - **FULLY FIAT-BACKED**
     - A 100% reserve ratio, in the form of cash or other satisfactory securities
   - **FRACTIONALLY FIAT-BACKED**
     - A partially backed offering, with a reserve ratio of below 100%
   - **PRINCIPAL-BASED**
     - Commodity- / cryptocurrency-pegged / reserved offering
   - **ALGORITHMIC**
     - A cryptocurrency-supported offering, governed by an algorithm

3. **Issuing Entity**
   - **PUBLIC INSTITUTION**
     - Issued and governed by a government / quasi-government authority
   - **PRIVATE INSTITUTION**
     - Issued and governed by a non-governmental organisations
   - **BANKING INSTITUTIONS**
     - A well-regulated and recognised banking institution
   - **NON-BANKING**
     - Private institution offering financial services without a banking license

Source: Interviews, BISIH, Quinlan & Associates analysis

---

**KEY OBSERVATIONS**
Before arriving at a definition of: (1) CBDCs; (2) SCs; and (3) DTs, the underlying characteristics, spanning: (a) technology; (b) price stabilisation mechanism; and (c) issuing entity, which set them apart, were explored:

- **Technology**: using blockchain / DLT or not.
- **Price Stabilisation Mechanism**: (1) fiat-based; (2) principal-based; or (3) algorithmic; and
- **Issuing Entity**: (1) public institution or (2) private institution.

This report focuses on blockchain / DLT based digital forms of sovereign currency issued by central banks, regulated banks and non-bank financial institutions.
DEFINITION: BY ISSUING ENTITY

KEY OBSERVATIONS
Stakeholders generally agreed on the definition of CBDCs, DTs, and SCs, and that the liability must lie with the respective issuing entity. Beyond the original scope of the definition, there are further aspects to consider that were shared by the interviewees, including:

- Level of asset backing (i.e. collateralisation);
- Variations in issuing entities by jurisdiction; and
- Interest / non-interest-bearing nature.

RELEVANT QUOTES
By a Law firm
“CBDC(s) represent a claim against the central bank reserve.”

By a Digital Assets Player
“DTs represents a claim on the bank’s reserve and SCs represents a claim on the NBFI’s reserve.”

By a Payment Company
“There are examples of bank-issued SCs, so issuance is not restricted to NBFIs.”

Blockchain / DLT representation of regulated assets
CBDCs, DTs, and SCs

There is broad alignment on the definition of CBDCs, DTs, and SCs, in that the liability must lie with the respective issuing entity, albeit with some variations (e.g. the level of backing, jurisdiction-dependent issuing entity, and interest / non-interest-bearing nature).


Source: Interviews, Quinlan & Associates analysis
DTs are different from CBDCs and SCs in that they are commercial bank liabilities. This inherent difference makes DTs more challenging to implement compared to the other two digital assets.

**Structural Differences**

**CBDCs & SCs vs. DTs**

- **CBDC**: Fully-backed (e.g. CBDCs, SCs)
- **Fiat Cash**: Liquidity: Locked, Settlement: Atomic (T+0)

- **Stablecoins**: Fractionally-backed (e.g. DTs)
- **Fiat Representation**: Liquidity: Unlocked, Settlement: Dependent (T+1 or less)

- **DTs**: Fractionally-backed (e.g. DTs)
- **Liability**: Liquidity: Not available, Settlement: Atomic (T+0)
- **Promissory Note**: Return: Available

**Business Implications**

<table>
<thead>
<tr>
<th>CBDCs &amp; SCs vs. DTs</th>
<th>Fully-Backed (e.g. CBDCs, SCs)</th>
<th>Fractionally-Backed (e.g. DTs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Liquidity</strong></td>
<td>Locked</td>
<td>Unlocked</td>
</tr>
<tr>
<td><strong>Settlement</strong></td>
<td>Atomic (T+0)</td>
<td>Dependent (T+1 or less)</td>
</tr>
<tr>
<td><strong>Float</strong></td>
<td>Not available</td>
<td>Available</td>
</tr>
</tbody>
</table>

- DTs could be structured with similar types of ‘liabilities’, such as loan products or promissory notes, which are not protected / guaranteed by deposit schemes.

- Notes may be viewed to constitute securities, in which case securities regulation, including licensing and approval requirements as well as restrictions on circulation may apply.

*Only applicable to deposit taking institutions.

Source: Interviews, BIS, Quinlan & Associates analysis
SECTION 3
ADOPTION EXPLORATIONS
OVERVIEW OF PVP AND DVP

KEY OBSERVATIONS

PvP and DvP settlement arrangements require both parties involved in a transaction to fulfil their obligations prior to settlement as a way to mitigate settlement risk.

The commonality between CBDCs, DTs, and SCs is that they can be used for straight-through processing and end-to-end instant payments/settlement, including PvP and DvP use cases.

The adoption of blockchain / DLT has the potential to materially change key pillars of the financial markets by:

• Automating obligations fulfilment between entities by way of smart contracts, without requiring intermediaries to step in and take charge; and/or
• Enabling real-time / near real-time settlement of money, as well as other assets (e.g. securities) that are tokenised.

By leveraging the capabilities of CBDCs, DTs, and SCs in PvP and DvP settlement, banks and corporate clients stand to gain from increased efficiency, transparency, and a host of other benefits.

As CBDCs, DTs, and SCs may perform the functions of account-based money in a more efficient manner, the key wholesale use cases of these digital assets centre primarily around PvP and DvP settlement and programmability.

Payment vs. Payment ("PvP")
Illustrative Diagram

Delivery vs. Payment ("DvP")
Illustrative Diagram*

1. **Obligation Fulfilment**
   Bank A intends to buy Euros with USD, so it sends the necessary amount through the correspondent banks and RTGS system (e.g. Fedwire) while Bank B sends an equivalent amount in Euros through the same system.

2. **Final Money Movement**
   As Bank A and B meet the conditions for payments and pass AML / CTF / sanctions checks, FX settlement occurs simultaneously, with Bank A receiving Euros and Bank B receiving an equivalent amount in USD.

*Assuming Securities Company / Clearing Participant A and B only have the transaction above.
Source: Interviews, Quinlan & Associates analysis
Although the adoption of blockchain / DLT technology may be met with resistance from intermediaries that stand to lose some of their current fees, increased flows (as a result of reduced frictions) and new products and services can benefit innovative intermediaries.

**KEY OBSERVATIONS**

From a PvP perspective, the adoption of CBDCs, DTs, and SCs could tackle major pain points faced by FIs and their corporate clients, especially in the context of cross-border transactions, through the following:

- **Near Instant Settlement Time:** Enables 24/7, instant, and direct transfer;
- **Increased Transparency:** Customers can gain end-to-end transaction visibility; and
- **Reduced Transaction Cost:** Fees, such as intermediary access fees, could be significantly reduced

**RELEVANT QUOTES**

*By a Payment Company*

“The current system suffers from a lack of transparency, which blockchain can resolve.”

*By a Digital Assets Player*

“Traditional financing operates on the correspondent model, making it more expensive than using SCs, which allow for direct P2P transactions.”

**PAIN POINTS**

- **LENGTHY SETTLEMENT TIME**
  Varying payment cut-off times across regions and the long wait in sequential batch processing may delay settlement

- **LACK OF TRANSPARENCY**
  Delivery times often vary when multiple intermediaries are involved, making it difficult to provide real-time traceability

- **HIGH TRANSACTION COST**
  Intermediary access fees are often passed on by banks and hence incurred directly by end customers

Source: Interviews, Quinlan & Associates analysis
Similarly, the adoption of blockchain technology for DvP settlement could be inherently disruptive to certain market stakeholders, such as brokers and clearinghouses, but it has the potential to bring significant improvements to current settlement processes.

**KEY OBSERVATIONS**

From a DvP perspective, the adoption of CBDCs, DTs, and SCs can reduce the same pain points faced by FIs and corporates around PvP through:

- **Near Instant Settlement Time**: By tokenising money and other assets (e.g. securities), atomic settlement is possible;
- **Increased Transparency**: Blockchain provides visibility on transactions; and
- **Reduced Transaction Costs**: Enjoy cost savings from cutting down fees.

**RELEVANT QUOTES**

**By a Banking Institution**
“The difference between the cut-off time for securities settlement in one location from that in another location ultimately leads to delays in final settlement.”

**By a Digital Assets Player**
“Visibility of the settlement process is an issue that can be solved through tokenisation.”

**Worthy Endeavour**
WholeSale Operation Pain Points

<table>
<thead>
<tr>
<th>PAIN POINTS</th>
<th>LENGTHY SETTLEMENT TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Since securities exist on different systems / networks, it takes a longer time to settle transactions (i.e. up to 2 working days)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PAIN POINTS</th>
<th>LOW TRANSPARENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With many more intermediaries involved (e.g. clearinghouse, banks), investors and brokers are often kept out of the loop</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PAIN POINTS</th>
<th>HIGH TRANSACTION COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Securities are on a different ledger from money, creating additional costs (e.g. settlement instruction fee, clearing fee) than a single-ledger PvP</td>
</tr>
</tbody>
</table>

Source: Interviews, Quinlan & Associates - *Cracking the Code: The Outlook for Digital Securities (2021)*
There are four notable potential benefits that blockchain technology can bring to traditional financial markets, with the enablement of programmability being the most impactful one in terms of addressing existing industry pain points.

**Notable Potential Benefits**

**Blockchain Adoption**

<table>
<thead>
<tr>
<th>Key Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Integrity</strong></td>
</tr>
<tr>
<td>Maintain a single source of truth by cross-validating information and preventing any manipulation</td>
</tr>
<tr>
<td><strong>Cybersecurity</strong></td>
</tr>
<tr>
<td>Provide a solid immunity cover against external cyberattacks through a ledger update mechanism</td>
</tr>
<tr>
<td><strong>Divisibility</strong></td>
</tr>
<tr>
<td>Tokenise assets, which can then be fractionalised in a simple manner for ease of trade</td>
</tr>
<tr>
<td><strong>Programmability</strong></td>
</tr>
<tr>
<td>Execute transactions automatically upon fulfilment of pre-set conditions on smart contracts</td>
</tr>
</tbody>
</table>

---

**RELEVANT QUOTES**

**By a Banking Institution**
"Blockchain is a game-changer; everything can be represented as a standard token and can be exchanged."

**By a Digital Assets Player**
"Blockchain enables the triggers for conducting settlement, where value and title transfer(s) can take place."

---

1 May not be applicable to permissioned blockchains with a single party having majority control; 2 The level of immunity can vary depending on whether the blockchain has a quantum-resistant feature.

Source: Interviews, Quinlan & Associates - *Cracking the Code: The Outlook for Digital Securities (2021)*
Despite the benefits of smart contracts in addressing transaction inefficiencies / costs, some stakeholders (e.g. central banks) remain hesitant to accept the risks associated with programmability. This aspect can be left to the private sector.¹

**KEY BENEFIT: PROGRAMMABILITY**

**KEY OBSERVATIONS**

The following layers of programmability are built upon one another:

- **Policy Level**: Regulation / policies that govern the behaviour of participants;
- **Protocol Level**: Blockchain protocol that allows for smart-contract transactions; and
- **Asset / Token Level**: Code that is embedded directly on the digital asset to behave in a certain way.

Although programmability is issuing-entity agnostic, the level of difficulty in embedding it may depend on the issuing organisation’s level of risk tolerance.

**RELEVANT QUOTES**

**By a Payment Company**

“As programmability is dependent upon the technology and not on the issuing entity, all tokens using the same technology would have an equal level of programmability.”

**By a Banking Institution**

“Central banks are naturally more risk averse, resisting to place programmed wrappers around CBDCs, as they are unwilling to bear the associated responsibility.”

---

¹See for example BISH Project Rosalind demonstrating the use of APIs in the context of CBDC; ²The level of risk aversion between NBFIs and commercial banks may converge if the same regulation is enforced. Source: Interviews, Quintan & Associates analysis
An increasing number of institutions are exploring the adoption of CBDCs, DTs, and SCs across a wide range of wholesale use cases, including PvP and DvP. Industry players are focusing on PvP use cases, particularly for trade / SME finance, micro-payment, and remittance.

### Key Observations

The number of CBDC projects initiated by public entities has surged in the past few years, with slightly less than one-third of jurisdictions across the globe having explored or currently exploring the use cases of CBDCs:

- Out of the 131 CBDC projects tracked to April 2023, 42 of them have a focus on wholesale adoption.

Meanwhile, the private sector has endeavoured to adopt CBDCs, DTs, and SCs to enhance their existing offerings / propositions:

- **ANZ**: A$DC, issued by the bank, is aimed at automating supply chains, providing near real-time liquidity in a cost-effective manner.

- **Tokyo Kiraboshi Financial Group, Minna no Bank, and the Shikoku Bank**: Three major Japanese banks are exploring the issuance of their own SCs on a public blockchain.

Amidst these ongoing developments, both the public and private sector have been eager to capitalise on the opportunities presented by CBDCs, DTs, and SCs.

### Public Sector

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot</td>
<td>-</td>
<td>1</td>
<td>10</td>
<td>9</td>
<td>14</td>
<td>19</td>
<td>62</td>
<td>71</td>
</tr>
<tr>
<td>PoC²</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>11</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Research</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>13</td>
<td>40</td>
<td>52</td>
<td>7</td>
</tr>
</tbody>
</table>

1. The graph below shows a total of 198 initiatives, which accounts for the initiatives that have progressed from research to either PoC or pilot stage; ²Proof-of-concept.

### Private Sector

Many financial institutions are actively exploring the adoption of CBDCs, DTs, and SCs for both PvP and DvP scenarios. Promising outcomes are being observed in their application in both trade finance and fixed income markets.

Industry participants are leaning towards adopting CBDCs, DTs, and SCs for trade and SME finance. In the case of SCs, cost reduction and efficiency may be gained in the areas of micro-payment and remittance.

---

Source: CBDC Monitor, Interviews, GSBN, Linklogis, Sygnum, CoinDesk, MakerDAO, NAB, HSBC, Credit Suisse, Quinlan & Associates analysis
Considering the vast potential associated with the adoption of CBDCs, DTs, and SCs, the BISIH is actively experimenting with and piloting different initiatives focused on various wholesale use cases.

**Key Observations**

There are a host of wholesale use cases that industry participants are currently exploring, with the BISIH playing a catalyst role.

Most PvP use cases are related to cross-border payment settlement, while DvP use cases cover issuance and settlement of various securities (e.g. bonds, swaps, etc.).

The financial institutions we interviewed stressed the importance of digital money to settle digital assets efficiently. In tandem, they expressed concerns around adopting digital money that is not issued by central banks or regulated financial institutions.

**Wholesale Use Cases**

**BISIH Projects & Applications**

<table>
<thead>
<tr>
<th>BIS Innovation Hub Centre</th>
<th>Central Bank Participants</th>
<th>Relevant Currencies</th>
<th>Main Use Case</th>
<th>PvP</th>
<th>DvP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jura (Link)</td>
<td>Switzerland</td>
<td>EUR, CHF</td>
<td>Cross-border settlement using wholesale CBDC</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Helvetia (Link)</td>
<td>Switzerland</td>
<td>CHF</td>
<td>Settling tokenised assets in wholesale CBDC</td>
<td>✔️</td>
<td>✗</td>
</tr>
<tr>
<td>Genesis (Link)</td>
<td>Hong Kong</td>
<td>HKD</td>
<td>Tokenised green bonds with programmed delivery of carbon credits</td>
<td>✗</td>
<td>✔️</td>
</tr>
<tr>
<td>mBridge (Link 1 &amp; Link 2)</td>
<td>Hong Kong</td>
<td>HKD, CNY, THB, AED</td>
<td>Multilateral payment platform using multiple CBDCs</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Dynamo (Link)</td>
<td>Hong Kong</td>
<td>HKD</td>
<td>Programmability in trade finance using smart contracts for SMEs</td>
<td>✗</td>
<td>✔️</td>
</tr>
</tbody>
</table>

1The list of wholesale use cases is not exhaustive; use cases showcased here are select examples only; 2Project examples are not exhaustive; 3assuming stablecoin is issued by commercial banks / financial institutions.

Source: Interviews, BIS, Quinlan & Associates analysis
As part of BISIH project Dynamo, the Digital Trade Token ("DTT") explored how to tackle the SME trade financing gap through programmability and improved data transparency.

**Case Study**

**Linklogis**

**ACTION**
- Accept
- Reject
- Validate

**TIME**
- Specific Date
- Within set period

**CAPTURED DATA**
- KYC Data
  (e.g. identity verification, whitelisting controls etc.)
- Shipment Data
  (e.g. eBL holder, vessel tracking, inspection, customs clearance status, IoT location tracker, etc.)
- ESG Data
  (e.g. ESG performance, labour management, pollutants, material consumption, greenhouse gas emissions, etc.)

**Industry Pain Points & Outcome**

**Linklogis**

**PAIN POINTS**
- ✗ FINANCING GAP
  SMEs have difficulties in securing trade financing, with over 40% of their applications getting rejected globally

**OUTCOME**
- ✓ REDUCED COUNTERPARTY RISKS
  The transparency of supply chain ecosystem data allows for better risk assessment by banks and investors
- ✓ IMPROVED RESILIENCY
  Upstream suppliers can better secure financing riding on the anchor buyer’s creditworthiness (i.e. transferability)
- ✓ BETTER CAPITAL ACCESS
  Allows for a wider range of investors that are not originally eligible or interested in trade financing, to provide funding

*Negotiate on financing ratio and discount amount.
Source: BISIH Project Dynamo [link], Asia Development Bank, Interviews, Quinlan & Associates analysis
As a follow-up to BISIH project Genesis, Goldman Sachs, in collaboration with the HKMA, facilitated the primary issuance of HKD 800 million of tokenised green bonds for the HKSAR government, which was settled on a DvP basis, leveraging its tokenisation platform, GS DAP.

---

**Case Study**
Goldman Sachs - GS DAP™, Green Bond Issuance

---

**FEATURES**

**OPERATED WITH DAML**
GS DAP is a tokenisation platform developed on top of Digital Asset’s Daml smart contract language

**POWERED BY PRIVATE CHAIN**
GS DAP is also powered by Digital Asset’s privacy-enabled enterprise blockchain, Canton

**TOKEN SUPPORTED BY HKMA**
Cash tokens adopted in the process represent a claim for HKD fiat against the HKMA (i.e. CBDCs)

---

**BENEFITS**

**GREATER TRANSPARENCY**
Investors have real-time visibility of bond information, and the obligations and rights are also captured transparently

**REDUCED COSTS**
Sales information and ownership records are automated, which reduces sales and reconciliation costs dramatically

**ENHANCED EFFICIENCY**
While a typical bond issuance settlement operates on a T+5 basis, GS DAP shortens it to T+1
SECTION 4
MARKET DEVELOPMENT
Developing a consistent, industry-wide view on technological initiatives can be challenging, given it requires significant alignment across various organisations’ priorities. As such, siloed development and experimentation is common in early phases of technology development.

**The Inevitable Challenge**

**Key Observations**

Institutions often end up exploring and executing technology initiatives in silos due to differences in corporate priorities and operational practices. Expecting technology adoption to happen in a unified manner, with standardised technology and practices, is highly idealistic.

As such, it is evident that current blockchain initiatives, especially those focused on wholesale use cases, are being developed independently / in silos.

There are a number of examples across:

- **Single-jurisdiction CBDCs.**
- **Cross-jurisdiction CBDCs.**
- **Intrabank blockchain initiatives; and**
- **Interbank blockchain initiatives.**

**Relevant Quotes**

*By a Payment Company*

“Developing a house view is impossible because each organisation would have to consider a fit-for-purpose technology that meets their own privacy, scalability, and overall performance needs.”

---

**Industry Convergence**

**Technological Initiatives**

- **Corporate Strategy**
  - Financial institutions have varying levels of understanding and differing objectives associated with technological initiatives that are aligned with their internal and external business needs.

- **Operating Procedures**
  - Variances in decision-making processes and resource allocation can lead to differences in operational procedures, which can result in varying implementation timelines.

- **Level of Risk Tolerance**
  - Financial institutions are inherently risk-averse due to their obligation to maintain a high level of security and compliance, resulting in differences in system maturity and internal standards.

- **Legacy Systems**
  - Many FIs have legacy systems that are difficult to integrate with new technologies, which can lead to differing opinions on how to prioritise various technological initiatives.

- **Reluctance to Share Proprietary Information**
  - Sharing proprietary information on internal technological initiatives may discourage industry-wide alignment because institutions may be hesitant to give up their competitive edge.

**Siloed Experimentation & Development Examples**

**[Single-Jurisdiction] CBDC Initiatives**
- United States: Project Hamilton
- Switzerland: Project Helvetia
- Singapore: Project Orchid

**[Cross-Jurisdiction] CBDC Initiatives**
- France & Switzerland: Project Jura
- Hong Kong, Thailand, UAE1, and PRC: Project mBridge
- UAE & Saudi Arabia: Project Aber
- Australia, Malaysia, SG, and South Africa: Project Dunbar

**[Intrabank] Blockchain Initiatives**
- J.P.Morgan: For internal corporate banking activities
- Santander Bank: For cross-border payment solutions
- HSBC: For payment within its balance sheet

**[Interbank] Blockchain Initiatives**
- J.P.Morgan: Onyx
- Marco Polo Network
- Contour
- Project Ubin: Singapore
INTEROPERABILITY SOLUTIONS

As interoperability is key to the broader adoption of CBDCs, DTs, and SCs, a number of FMIs that facilitate settlement, as well as leading technology providers, are developing their own interoperability platforms.

KEY OBSERVATIONS
Given the difficulty in developing a consolidated “house view”, coupled with the siloed nature of projects (and varying preferences on the types of blockchain technology), interoperability solutions will be essential in helping to unlock the full potential of CBDCs, DTs, and SCs through enabling scalability.

Many existing market infrastructure participants, messaging platforms, and technology solution providers are actively developing interoperability platforms to connect various independent networks and institutions together.

RELEVANT QUOTES

By a Digital Assets Player
“Interoperability is a crucial component in bringing together different systems, platforms, entities, and rails, embracing both new and existing payment rails and minimising friction, whenever possible.”

By a Payment Company
“By launching an interoperability platform, we are helping central banks and commercial banks explore a wider range of use cases and the design of bilateral experiments.”

INTEROPERABILITY INITIATIVES
CBDC, DTs, and SCs

**Examples**

<table>
<thead>
<tr>
<th>Examples</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulated Liability Network (“RLN”)</td>
<td>Citi, SWIFT, SETL</td>
</tr>
<tr>
<td>CBDC Interoperability Experiment</td>
<td>Citi, SETL, Capgemini</td>
</tr>
<tr>
<td>Universal Payment Channel</td>
<td>VISA</td>
</tr>
<tr>
<td>DLT-based Messaging Network</td>
<td>UDPN</td>
</tr>
<tr>
<td>Digital Currency Single-window Platform</td>
<td>UDPN, Freeflow Finance, fnality</td>
</tr>
<tr>
<td>Blockchain World Wire</td>
<td>IBM</td>
</tr>
<tr>
<td>Decentralised Financial Market Infrastructure (“FMI”) Network</td>
<td>FNALITY</td>
</tr>
<tr>
<td>Blockchain-based Clearing &amp; Settlement Network</td>
<td>PARTNIR</td>
</tr>
</tbody>
</table>

**Stakeholders**

- CBDC: ✓
- DT: ✓
- SC: ✓
- Not Applicable: ❌
- Dependent: –

1May be included, dependent upon the scope of digital assets facilitated in the initiatives; 2Only regulated stablecoins.

Source: Interviews, Citi, SWIFT, SETL, Visa, UDPN, Freeflow Finance, fnality, Quinlan & Associates analysis
The concept of an RLN aims to achieve finality of settlement between participants (e.g. commercial banks, central banks, etc.) over a shared ledger, which is to be operated by a regulated FMI.

**Value Chain**

**Process Flow**

1. **Currency Conversion**
   - A customer of Commercial Bank A transfers a part of their deposit balance to an RLN balance.

2. **Payment Instruction**
   - The customer instructs a payment to a counterparty at Commercial Bank B.

3. **Instruction Evaluation**
   - The RLN evaluates Commercial Bank A’s ability to execute the end-to-end transaction.

4. **Treasury Check**
   - Commercial Bank A ensures that sufficient wholesale CBDC is available in its RLN Wallet.

5. **Value Transfer by Commercial Bank A**
   - The wholesale CBDC is transferred within the RLN, away from Commercial Bank A’s master account.

6. **Value Transfer to Commercial Bank B**
   - Commercial Bank B has real-time visibility of the amount being transferred to it.

7. **Balance Update**
   - The balance is automatically updated in the relevant partitions and a single settlement record is created.

8. **Payment Receipt**
   - The transaction beneficiary may transfer the RLN Token balance to its deposit account.

**Key Observations**

The RLN is currently in the PoC stage and is a joint project involving major institutions such as Citi, HSBC, Mastercard, and SWIFT.

If the RLN comes to fruition, all regulated liabilities, including central bank money, commercial bank money, and electronic money, would co-exist and be tokenised on a shared ledger.

**Relevant Quotes**

**By a Banking Institution**

“By bringing all liabilities on-chain in a single, shared ledger, the RLN can effect transactions between accounts in different ecosystems via atomic settlement, which does not exist today.”

**By a Digital Assets Player**

“The RLN brings a host of benefits to the ecosystem including a faster settlement approach, being applicable to different currencies for different assets, as well as reducing fragmentation since everything becomes a token.”

*Wholesale CBDC
Source: RLN Whitepaper (link), Quinlan & Associates analysis
The UDPN aims to solve the issue of interoperability by establishing a regulated payments network on a permission-based blockchain that can support regulated digital currencies on all technical platforms.

**Value Chain**

**Process Flow**

**Proof-of-Concept & Development Timeline**

**2022**

**Proof of Concept**

<table>
<thead>
<tr>
<th>Asset Issuance &amp; Circulation</th>
<th>Kick-off</th>
<th>Closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank Stablecoin</td>
<td>25th Mar</td>
<td>15th Jun</td>
</tr>
<tr>
<td>CBDC (Hybrid Model)</td>
<td>1st Jun</td>
<td>31st Dec</td>
</tr>
</tbody>
</table>

**Core Functionalities**

<table>
<thead>
<tr>
<th>Digital Currency Transfer &amp; Swap</th>
<th>15th Mar</th>
<th>15th Jun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Currency Payment Gateway for E-Commerce</td>
<td>5th Apr</td>
<td>15th Jun</td>
</tr>
<tr>
<td>Digital Asset Tokenisation</td>
<td>20th Apr</td>
<td>30th July</td>
</tr>
</tbody>
</table>

**User Experience**

| Enabling Gasless Transactions using Stablecoins* | 20th Mar | 15th Jun |
| Purchasing Digital Currencies with Fiat Money   | 1st Apr  | 15th Jun  |
| Facilitating Foreign Exchange on Digital Currencies | 31st Apr | 31st Oct |

**Compliance-related Functionalities**

| Travel Rule | 10th Mar | 15th Jun |
| Cross-institution KYC Verification | 15th Apr | 15th Jun |

---

**KEY OBSERVATIONS**

The UDPN is a permissioned blockchain network designed to connect various digital currency systems across multiple platforms and protocols, facilitating seamless and efficient payments for regulated SCs and, eventually, CBDCs. It operates as a co-governed platform, enabling third-party smart contract deployment and execution for enhanced transparency and time / cost efficiency. Although the UDPN does not directly serve end-users, it grants relevant entities access to its system that equips them with capabilities, such as digital currency transfer, swaps, and many more.

As the UDPN is linked with accounts and wallets on other SC and CBDC systems for facilitation purposes, all transactions are executed and recorded within their respective CBDC or stablecoin systems.

---

*Those available on public blockchain environment (e.g., USDT, USDC, etc.).
Source: UDPN, Interviews, Quinlan & Associates analysis
CASE STUDY: PARTIOR

As a globally interoperable and open platform, Partior enables atomic clearing and settlement of programmable money across jurisdictions, linking with RTGS and other networks that may not be operating 24/7.

Value Chain
Process Flow

KEY OBSERVATIONS
Partior is a live blockchain network that is interoperable with existing RTGS and RTP systems, with the potential to be interoperable with forthcoming CBDC networks.

By being a part of the Partior network, financial institutions can perform around-the-clock, atomic settlement of currencies and securities, with end-to-end transaction visibility.

As a result, joining Partior allows financial institutions to tackle major pain points experienced by their end corporate clients in cross-border settlements.

INITIAL ONBOARDING
Partior onboards global transaction banks that handle most of the cross-border clearing services, as well as a settlement bank for each of the major currencies, into its network.

PAYMENT INSTRUCTION
When Corporate A sends an instruction to Bank B to pay a certain amount to Corporate B, the same standard message is instantly directed to the Partior network, the two settlement banks, and Bank B.

INSTRUCTION EVALUATION
Bank A conducts the necessary sanction checking on Corporate A, Bank B and Corporate B (intended recipient), and holds the amount of deposit balance of Corporate A.

REAL-TIME SETTLEMENT
Upon checking, Partior enables Bank A to send money to Bank B in real time without having to go through correspondent banks, therefore shortening the settlement time with centralised clearing in the Asian time zone.

FINAL MONEY MOVEMENT
After receiving the funds from Bank A, Bank B transfers the amount to Corporate B’s deposit account, thus completing the final settlement.

Source: Partior, Vulcan Post, Interviews, Quinlan & Associates analysis
CASE STUDY: ISO 20022

Interoperability can be achieved in various ways (and by various means), such as by standardising messages, with several FIs working closely with SWIFT to replace its MT messaging standard with ISO 20022, facilitating real-time, cross-border payment settlement.

**Key Observations**

Interoperability applies not only to different technologies and networks, but also to messaging standards, which ensures consistency in communication between financial institutions in order to facilitate speedy payment settlement.

Although the Swift’s Message Type (“MT”) format has long been the standard for financial communication, many financial institutions are actively deploying the ISO 20022 standard in conjunction with SWIFT.

**ISO 20022 Highlight**

- **Compatibility:** XML based, which allows easier straight-through processing (“STP”) for IT systems.
- **Comprehensiveness:** Relevant data (e.g. unique invoice identifier, conditions, involved agents, etc.) of more than one associated transaction can be embedded in a single message for reconciliation.

ISO 20022 can be adopted as a standardised messaging protocols for digital assets transactions.

### Key Differences

**SWIFT MT vs. ISO 20022**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>SWIFT MT</th>
<th>ISO 20022</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Language</strong></td>
<td>Proprietary</td>
<td>XML</td>
<td>Compatibility of XML language allows easier STP across various IT systems</td>
</tr>
<tr>
<td><strong>Information Coverage</strong></td>
<td></td>
<td></td>
<td>Relevant single or multiple transaction(s) data can be embedded for enhanced reconciliation</td>
</tr>
<tr>
<td><strong>Group Header</strong>¹</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creation Date / Time</td>
<td>✗</td>
<td>✔</td>
<td>Date and time at which the message was created</td>
</tr>
<tr>
<td>Number of Transactions</td>
<td>✗</td>
<td>✔</td>
<td>Number of individual transaction(s) contained in the (single) message</td>
</tr>
<tr>
<td>Settlement Information</td>
<td>✗</td>
<td>✔</td>
<td>Specifies the details on how the settlement of the transaction(s) between parties is complete</td>
</tr>
<tr>
<td><strong>Settlement Information</strong>²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credit Transfer Information</td>
<td>✗</td>
<td>✔</td>
<td>Set of elements providing information specific to the individual credit transfer(s)</td>
</tr>
<tr>
<td>Payment Type Information</td>
<td>✗</td>
<td>✔</td>
<td>Set of optional elements used to further specify the type of transaction</td>
</tr>
<tr>
<td>Previous Instructing Agent</td>
<td>✗</td>
<td>✔</td>
<td>Agent immediately prior to the instructing agent</td>
</tr>
<tr>
<td>Previous Instruction Agent Account</td>
<td>✗</td>
<td>✔</td>
<td>Unambiguous identification of the account of the previous instructing agent</td>
</tr>
<tr>
<td>Intermediary Agent Account</td>
<td>✗</td>
<td>✔</td>
<td>Unambiguous identification of the account of the intermediary agent at its servicing agent</td>
</tr>
<tr>
<td>Creditor Agent Account</td>
<td>✗</td>
<td>✔</td>
<td>Unambiguous identification of the account of the creditor agent at its servicing agent</td>
</tr>
<tr>
<td>Ultimate Debtor</td>
<td>✗</td>
<td>✔</td>
<td>Ultimate party that owes an amount to the (ultimate) creditor</td>
</tr>
<tr>
<td>Initiating Party</td>
<td>✗</td>
<td>✔</td>
<td>This can either the debtor or a party that initiates the credit transfer on behalf of the debtor</td>
</tr>
<tr>
<td>Ultimate Creditor</td>
<td>✗</td>
<td>✔</td>
<td>Ultimate party to which an amount money is due</td>
</tr>
</tbody>
</table>

¹Set of characteristics shared by all individual transactions included in the message; ²Specifies the details on how the settlement of transaction(s) between the instructing agent and the instructed agent is completed.

Source: Interviews, ISO, SWIFT, Citi, Quinlan & Associates analysis
SECTION 5
REGULATORY PERSPECTIVES
SECTION 5.1
EXISTING REGULATIONS
Across the eight key activities identified by the FSB for SCs, many of which are relevant to DTs, many jurisdictions across the globe have already established regulations, supplemented by global standards endorsed by prominent IGOs.

<table>
<thead>
<tr>
<th>Activities in a Stablecoin Arrangement</th>
<th>Operational Design Element</th>
<th>FATF1</th>
<th>Basel</th>
<th>PFMI4</th>
<th>IOSCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establishing rules governing the stablecoin arrangement</td>
<td>The rules covering the types of entities, the protocol for validating transactions, and the management / ownership of the reserve assets.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Issuing, creating, and destroying stablecoins</td>
<td>The mechanism through which stablecoins may be issued or created, and subsequently destroyed by one or more entities / protocols.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Managing reserve assets</td>
<td>The activities of managing the underlying assets (e.g. financial assets, crypto assets, etc.) that are “backing” the value of a stablecoin.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Providing custody / trust services for reserve assets</td>
<td>The activity of holding the assets that are “backing” the value of a stablecoin by either the issuer or other entities.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Operating the infrastructure</td>
<td>A blockchain / DLT protocol determining roles in and access to the system: permissioned-based vs. permissionless.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Validating transactions</td>
<td>The mechanism by which a transaction is authorised and validated by validator nodes (e.g. proof-of-work, proof-of-stake, etc.).</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Storing the private keys that gives access to stablecoins</td>
<td>Cryptographic wallets storing private and public keys that are used to digitally sign transaction instructions.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Exchanging, trading, reselling, and market making of stablecoins</td>
<td>The activity of purchasing and exchanging a stablecoin with fiat currencies (or a stablecoin) with other stablecoins or crypto-assets.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>


Source: FSB - Addressing the regulatory, supervisory and oversight challenges raised by “global stablecoin” arrangements: Consultative document
Throughout our interviews, we have observed a preference for private / consortium blockchains in the context of wholesale adoption, primarily due to the greater ease to comply with existing standards and control measures imposed on various wholesale financial activities.

### Key Observations

One of the key initial stages in blockchain adoption is the choice of a blockchain protocol, and it is here where we have observed a lack of industry convergence begins, given the divergence in views on the potential benefits (and limitations) of different types of blockchains and how the wider industry will evolve.

One of the key differences between (1) private / consortium blockchains and (2) public blockchains is that ‘blockchain native (i.e. on-chain) activities’ on the latter are anonymous in nature, which makes regulatory compliance challenging. Considering that regulation is activity rather than technology based, the principle of “same risk, same regulation” is emphasised by policy setters.

### Interview Findings

<table>
<thead>
<tr>
<th>Level of Preference</th>
<th>Supporting Views</th>
<th>Opposing Views</th>
<th>Ownership of Network</th>
<th>Participation</th>
<th>Level of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Protocol</td>
<td>Node &amp; Network</td>
<td>On-chain Activities</td>
</tr>
<tr>
<td><strong>Private / Consortium Blockchain</strong></td>
<td><strong>48%</strong></td>
<td>Most enterprise adoption explorations could be supported by private blockchains, which are relatively easier to maintain and manage.</td>
<td>Building a consortium or working with a vendor can be a time-consuming and expensive process. Scalability is also highly questionable.</td>
<td>Single Entity (Private)</td>
<td>Only verified by a single or selected group of entities.</td>
</tr>
<tr>
<td><strong>Public Blockchain</strong></td>
<td><strong>24%</strong></td>
<td>Public blockchains have high resilience and robust governance, with low costs and the ability to process transactions quickly.</td>
<td>Public blockchain may fall short in complying with AML regulations, as they lack necessary tools and/or mechanisms</td>
<td>Nobody (Theoretically)</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Blockchain Agnostic</strong></td>
<td><strong>28%</strong></td>
<td>Since the technology is still in its early stages of development, it is important to remain cautious when drawing conclusions. However, we remain open to exploring new technologies to meet the evolving demands of the market.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notable Characteristics

- **High**: Through greater centralisation of governance / control, at the cost of potential manipulation of on-chain data and activities.
- **Low**: On-chain activities are, by nature, irreversible and anonymous - with the option to create new compliance protocols (see example on travel rule on the next slide).

Source: Interviews, Quinlan & Associates - *Cracking the Code: The Outlook for Digital Securities (2021)*
**CASE STUDY: ENTITY-LEVEL AML**

**KEY OBSERVATIONS**

With the aim to achieve KYC compliance in the context of the use of public blockchains, there are several compliance solutions available in the market, including:

1. **(1) Hosted Wallet:** The selected solution provider offers corporates access to a range of compliance functions through its ‘Institutional Wallet’ offering.

2. **(2) Data Privacy Solution:** The selected solution provider provides information on a transaction, regardless of when the receiving Virtual Asset Service Provider (“VASP”) signs up, enabling compliance with the travel rule.

**RELEVANT QUOTES**

*By a Digital Assets Player*

“What makes these privacy solutions extremely secure is that VASPs are the only stakeholders who have access to the data and possess the legal responsibility under data protection laws to store and hold information.”

---

To adhere to FATF guidance on AML / CTF and Travel rules, some wallet providers have introduced a hosted wallet with various functionalities, while other solutions enable the automated verification of KYC information.
SECTION 5.2
NEW REGULATIONS
Interviewees acknowledged the presence of gaps in the present regulatory regime, emphasising the importance of – and the urgent need for – further clarity around legal taxonomies and responsibilities, as well as regulatory harmonisation across jurisdictions.

**Industry Response**

*Aggregate View*

**LEGAL TAXONOMY**

If regulators provide a clear definition of instruments, such as stablecoins as a medium of exchange, it could facilitate greater adoption of stablecoins and drive further evolution of the industry. The accounting of digital assets can be challenging due to the lack of standardisation, which makes it difficult to determine the appropriate accounting model for certain tokens.

**LEGAL RESPONSIBILITY**

It is essential to consider the legality of electronic transactions and smart contracts and to determine the responsible party for addressing legal disputes. The legality of these digital assets remains highly uncertain in many jurisdictions, which poses challenges for businesses looking to facilitate their adoption.

**REGULATORY COORDINATION**

There is limited alignment between countries in terms of regulations pertaining to SCs. The same is true for CBDCs and DTs which are more recent developments. Fragmented and inconsistent regulations across different jurisdictions may encourage some market participants to engage in regulatory arbitrage.

Continued regulatory cooperation and coordination is needed to ensure a certain level of interoperability to support cross-jurisdictional wholesale adoption.

RELEVANT QUOTES

*By a Professional Services Provider*

"Accounting for digital assets is messy because the terms of the coins are different (i.e. not standardised). (The industry is) not sure which accounting model should be pushed for certain tokens."

*By a Supranational Organisation*

“It is important to note the legality of electronic transactions and smart contracts, determining who should be taking up responsibility for legal disputes.”

Source: Interviews, Quinlan & Associates analysis
NEW REGULATORY DEVELOPMENT

While there are established regulatory frameworks in place for CBDCs and DTs, SCs are a relatively new area of focus, with governments around the world actively investigating ways to establish appropriate regulatory frameworks for SCs.

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Description</th>
<th>Consultation Papers &amp; Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>In a recent release of the conclusion to a discussion paper, Hong Kong highlighted its regulatory stance on SCs (e.g. aiming for an activity-based approach, allowing non-authorised institutions to issue), with even greater clarity anticipated later this year</td>
<td>• Conclusion of Discussion Paper on Crypto-assets &amp; Stablecoins (2023)</td>
</tr>
<tr>
<td>-</td>
<td>While a regulatory framework for SCs is still in the consultation phase, Singapore has clearly mapped out regulations in a detailed manner</td>
<td>• Consultation Paper on Proposed Regulatory Approach for Stablecoin-Related Activities (2022)</td>
</tr>
<tr>
<td>-</td>
<td>Japan’s regulations on domestic SCs1 are now comprehensive. Amendments to the Payment Services Act and other statutes were passed in 2022 for purposes of introducing a new regulatory framework for SCs, which came into effect on June 1, 2023 with respect to the relevant regulations, public notices, and guidelines.</td>
<td>• Amended Payment Service Act (Passed: 2022, Effective: 2023)</td>
</tr>
<tr>
<td>-</td>
<td>While there is currently no comprehensive nationwide2 regulatory framework for SCs in the U.S., federal lawmakers have been introducing various bills to Congress. Uncertainties remain with respect to whether SCs should be regulated as securities under the current federal securities regulatory regime3 or regulated as virtual currencies pursuant to a tailor-made new regulatory regime for digital assets.</td>
<td>• SEC’s potential investigation on Binance USD (2023) • NY DFS’ Virtual Currency Guidance (2023) • Stablecoin Trust Act (2022-)*</td>
</tr>
<tr>
<td>-</td>
<td>The U.K. has been proactive in its efforts to establish clearer regulations for digital assets, specifically stablecoins. These efforts include making significant progress both through amending existing e-money and payment legislation, recent consultations, and the introduction of the Financial Services and Markets Bill 2022 which, if adopted, will further amend the existing financial services regime.</td>
<td>• Future Regulatory Regime for Cryptoassets (2023)* • Financial Services and Markets Bill 2022 (Not yet adopted)</td>
</tr>
<tr>
<td>-</td>
<td>The European Union has clearly stated its support for the development of Euro-backed SCs, as outlined in MiCA - one of the most comprehensive sets of regulations expected to be enforced this year - alongside other initiatives</td>
<td>• Markets in Crypto-assets (“MiCA”) Regulations (2022-*)</td>
</tr>
<tr>
<td>-</td>
<td>In the absence of a specific regulation in relation to SCs in the UAE, the classification of SCs under the legislation depends on the structure and intended use of the SC. In a recent guidance issued by the Abu Dhabi Global Market (“ADGM”) on virtual assets, SC is described as a blockchain-based token that is valued by reference to an underlying fiat currency or basket of assets.</td>
<td>• Stablecoin Regulations for Payments (2023-*) • Virtual Asset Issuance Rulebook (2023)</td>
</tr>
</tbody>
</table>

1SCs are categorised as Electronic payment instruments (“EPIS”), which comprise of (a) payment instruments, (b) prepaid payment instruments; (c) securities (including trust beneficial interests) and (d) crypto-assets; 2On the state level, several states, including New York, Texas, and Nebraska, promulgated their own regulations and / or guidance on SCs. In the absence of dedicated national regulations and clear regulatory landscape, stablecoin issuers have relied on state-based money transmission licenses; 3regulated in a way akin to bank regulation; *three-month consultation ended in April with the UK government’s response expected shortly. According to the ADGM guide, the Financial Services Regulatory Authority position in relation to stablecoins is as follows: (a) permit only those stablecoins which constitute a fully backed 1:1 fiat token backed only by the same fiat currency it purports to be tokenising, (b) fiat tokens are to be treated as a mechanism for storing value (e.g. e-money), and (c) issuers of fiat tokens for the purposes of facilitating or effecting payments are treated as money services businesses. KWM expect the onshore regulatory position to follow the same position described above. In this case, SCs would fall under the licensable activities of the UAE Central Bank and not the Virtual Assets Regulatory Authority (“VARA”) or the Securities and Commodities Authority (“SCA”).

Source: KWM (Hong Kong, New York, and London), Allen & Gledhill (Singapore), Nishimura & Asahi (Tokyo), Al Tamimi & Company (Dubai), Interviews, Quinlan & Associates analysis.
STABLECOIN REGULATIONS (1/2)

KEY OBSERVATIONS
While CBDCs and DTs stand to benefit from clear and established banking regulations, SCs are a new instrument that may necessitate new regulations.

Regulators around the world have been actively establishing regulatory frameworks. Despite their efforts, there are still notable discrepancies with respect to regulations governing SCs, particularly on aspects such as legal taxonomy and licensing requirements.

SCs are facing different legal taxonomies, licensing requirements, and business limitations across jurisdictions.

### Stablecoin Regulatory Framework

#### Key Jurisdictions

<table>
<thead>
<tr>
<th>Regulation in place</th>
<th>Relevant Licenses</th>
<th>Legal Taxonomy</th>
<th>Licensing Requirement</th>
<th>Circulation / Volume Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong</td>
<td>SPI / MPPI License</td>
<td>Virtual Asset</td>
<td>E-Money / SVF* License</td>
<td>On Domestic SCs</td>
</tr>
<tr>
<td>Singapore</td>
<td>Type II / III FTSP under the PSA** / Banking license</td>
<td>Security</td>
<td>Payment License</td>
<td>On Non-domestic SCs</td>
</tr>
<tr>
<td>Japan*</td>
<td>MTL*** / Charter under state banking laws</td>
<td>Stored Value Facility</td>
<td>SC-specific License</td>
<td></td>
</tr>
<tr>
<td>U.S.</td>
<td>E-money / Payment Institution License</td>
<td>Liability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.K.</td>
<td>Electronic Money Institution License / MiCA License</td>
<td>Money</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAE*</td>
<td>Onshore VARA (Dubai) / Onshore SCA (Federal) / DIFC**** / ADGM.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Legal Taxonomy

<table>
<thead>
<tr>
<th>Virtual Asset</th>
<th>Security</th>
<th>Stored Value Facility</th>
<th>Liability</th>
<th>Money</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Licensing Requirement

<table>
<thead>
<tr>
<th>E-Money / SVF* License</th>
<th>Payment License</th>
<th>SC-specific License</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Circulation / Volume Limitation

<table>
<thead>
<tr>
<th>On Domestic SCs</th>
<th>On Non-domestic SCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

1. AMLO VA exchange licence likely for exchanges; some remains unregulated; 2. Subject to greater clarity in 2024; 3. E-Money Licensees are expected to acquire stablecoin-specific license to issue stablecoin; 4. The table is only applicable to type II / III FTSP registrations that issues (a) payment instruments and (b) prepaid payment instruments classified as EPIS; 5. Dependent on state-level requirements; 6. In discussion to set up a single licensing regime across the EU; 7. The table below only feature VARA (Dubai). UAE Central Bank may issue relevant licence, which will become clear when relevant regulations are issued in relation to the treatment of SCs. 8. Stored Value Facilities; 9. Standard Payment Institution; 10. Major Payment Institution; 11. Fund Transfer Service Providers; 12. Payment Services Act; 13. Money Transmission License; 14. Dubai International Financial Centre. Source: KWM (Hong Kong, New York, and London), Allen & Gledhill (Singapore), Nishimura & Asahi (Tokyo), Al Tamimi & Company (Dubai), Quinlan & Associates analysis

### KEY OBSERVATIONS

While CBDCs and DTs stand to benefit from clear and established banking regulations, SCs are a new instrument that may necessitate new regulations.

Regulators around the world have been actively establishing regulatory frameworks. Despite their efforts, there are still notable discrepancies with respect to regulations governing SCs, particularly on aspects such as legal taxonomy and licensing requirements.
While SC reserve requirements are generally consistent across multiple jurisdictions, the majority of these jurisdictions have not consistently outlined specific disclosure requirements on SCs.

### Stablecoin Regulatory Framework

**Key Jurisdictions**

<table>
<thead>
<tr>
<th>Reserve Requirements</th>
<th>Hong Kong</th>
<th>Singapore</th>
<th>Japan</th>
<th>US</th>
<th>U.K.</th>
<th>EU</th>
<th>UAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Ratio</td>
<td>1:1</td>
<td>1:1</td>
<td>1:1</td>
<td>1:1</td>
<td>1:1</td>
<td>1:1</td>
<td>1:1</td>
</tr>
<tr>
<td>Currency</td>
<td>Same as Pegged Currency</td>
<td>Same as Pegged Currency</td>
<td>Same as Pegged Currency</td>
<td>Same as Pegged Currency</td>
<td>Same as Pegged Currency</td>
<td>Same as Pegged Currency</td>
<td>N/A</td>
</tr>
<tr>
<td>Asset Type</td>
<td>Cash / cash equivalents / short-dated sovereign debt securities</td>
<td>Cash / cash equivalents / Security deposits of cash of bonds with an official guarantee</td>
<td>Cash / cash equivalents / Security deposits of U.S. Treasury notes, and/or U.S. Treasury bonds on an overnight basis, government money-market funds, and deposit accounts at U.S. state or federally chartered depository institutions</td>
<td>Cash / cash equivalents / level 1 high-quality liquid assets</td>
<td>N/A</td>
<td>Partly Deposits</td>
<td>N/A</td>
</tr>
<tr>
<td>Custodian institution</td>
<td>N/A</td>
<td>Licensed banks, merchant banks, finance companies / capital market services licensees</td>
<td>Japanese government / Deposit taking institutions</td>
<td>U.S. state / federally-chartered depository institutions or asset custodians</td>
<td>Authorised credit institution / custodian</td>
<td>Credit institutions, regulated investment firms, or Coordinated Activities on the Safety of Products (“CASP”)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disclosure Requirements</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Underlying Assets Value</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Reserve Composition</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Rights of Holders</td>
<td>-</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Redemption Policies</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Conflict of Interest</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Amount in Circulation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

1Subject to greater clarity in 2024; 2As proposed in the Consultation Paper on Proposed Regulatory Approach for Stablecoin-Related Activities (2022); 3Linked to only a single fiat currency - either SGD or one of the G10 currencies; 4This assumes that this information will be covered in the proposed monthly disclosure (independently attested) and yearly audit of reserve assets; 5Typically required to explain the total issued amount and the maximum issuable amount (if any); 6This is state-specific (New York) and included as an example of regulatory frameworks of a state in the U.S., as there is currently no federal regulations on stablecoins; 7Examples include U.S. Treasury bills acquired by the Issuer three months or less from their respective maturities, reverse repurchase agreements fully collateralised by U.S. Treasury bills, U.S. Treasury notes, and/or U.S. Treasury bonds on an overnight basis, government money-market funds, and deposit accounts at U.S. state or federally chartered depository institutions; 8May be a component of the attestations by a registered accountant.

Source: KWM (Hong Kong, New York, and London), Allen & Gledhill (Singapore), Nishimura & Asahi (Tokyo), Al Tamimi & Company (Dubai), Quinlan & Associates analysis
Another notable regulatory challenge is the difference in the legal definition of settlement finality, which affects atomic, cross-border settlement through fiat-backed tokens in case of payment revocation / insolvency issues.

Finality of Settlement
Cross-border Transaction

1. Corporate A sends out payment instruction to Bank A, to pay Corporate B
2. Bank A sends out payment to Bank B, but then forwarded a request to cancel the payment due to insolvency
3. Bank B records the settlement as final and makes the necessary transaction arrangements to Corporate B
4. Bank A could return the money to Corporate A, as legal transfer of money did not take place

Finality of settlement is not achieved, where payment on a multi-currency, multi-asset basis does not proceed

By an Academic Institution
"Finality of settlement is not a capability of the commercial / central banks, but it is a legal issue as it is recognised differently by different jurisdictions, which disrupts mass adoption."

By a Banking Institution
"Technology cannot overcome legal and regulatory issues associated with finality of settlement as some currencies may not recognise finality, while others may not be accepted by one jurisdiction due to the perceived lack of finality."

By a Payment Company
"The world lacks a global settlement layer that can achieve legally certain settlement finality, where transaction may not be unwound through insolvency proceedings."
SECTION 6
LOOKING AHEAD
SUMMARY OF KEY FINDINGS

KEY OBSERVATIONS

• **CBDCs**: Conceptually, given that CBDCs are M0, while DTs and SCs are M1, DTs and SCs carry higher counterparty risk.

• **Stablecoins**: Due to unclear legal taxonomies and responsibilities across jurisdictions (coupled with recent risk events), banking institutions and payment companies remain more hesitant to proactively explore stablecoins for their operations, although digital assets players remain open to further explore their use.

• **DTs**: While banking institutions may prefer DTs for liquidity and intraday float benefits, the appropriate use and legal taxonomy of deposit tokens in the context of wholesale financial markets is still being investigated.

It is likely that these three assets will continue to evolve in tandem, with new adoption explorations and use cases emerging in the coming years.

Given that CBDCs are M0, while DTs and SCs are M1, DTs and SCs carry higher counterparty risk.

<table>
<thead>
<tr>
<th></th>
<th>CBDCs</th>
<th>Stablecoins</th>
<th>Deposit Tokens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issuer</strong></td>
<td>Central Bank</td>
<td>Commercial Banks &amp; NBFIs</td>
<td>Commercial Banks</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Money</td>
<td>M0</td>
<td>M1</td>
<td>M1</td>
</tr>
<tr>
<td>Type</td>
<td>Liability</td>
<td>Liability</td>
<td>Liability</td>
</tr>
<tr>
<td>Equivalent Asset</td>
<td>Fiat Cash</td>
<td>Fiat Representation</td>
<td>Bank Liabilities / Debt securities</td>
</tr>
<tr>
<td><strong>Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:1 Backing</td>
<td>✓ (Backed by Central Bank)</td>
<td>✓ (Likely)</td>
<td>✗ (Unlikely)</td>
</tr>
<tr>
<td>Liquidity</td>
<td>✗ (Central Bank Liquidity)</td>
<td>✗ (Locked)</td>
<td>✓ (Unlocked)</td>
</tr>
<tr>
<td>Intraday Float</td>
<td>✗ (Unavailable)</td>
<td>✗ (Unavailable)</td>
<td>✓ (Available)</td>
</tr>
<tr>
<td>Atomic Settlement</td>
<td>✓ (Likely)</td>
<td>✓ (Likely)</td>
<td>- (Dependent)</td>
</tr>
<tr>
<td><strong>Wholesale Use Case</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payment-versus-Payment</td>
<td>✓ (Applicable)</td>
<td>✓ (Applicable)</td>
<td>✓ (Applicable)</td>
</tr>
<tr>
<td>Delivery-versus-Payment</td>
<td>✓ (Applicable)</td>
<td>✓ (Applicable)</td>
<td>- (Dependent)</td>
</tr>
<tr>
<td><strong>Regulation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject to Reg. Compliance</td>
<td>✓ (Existing regulations applied)</td>
<td>✓ (Existing regulations applied)</td>
<td>✓ (Existing regulations applied)</td>
</tr>
<tr>
<td>Regulatory Clarity</td>
<td>✓ (Existing regulation applied)</td>
<td>✗ (Further development needed)</td>
<td>- (Clarification needed)</td>
</tr>
<tr>
<td><strong>Observed Preference</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banking Institutions</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Payment Companies</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Digital Assets Player</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Stablecoin Issuers</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Current Level of Preference (Based on the interviews)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Interviews, Quinlan & Associates analysis
Similar to any other technology-driven innovations, the advancements in wholesale financial operations through the adoption of CBDCs, DTs, and SCs are in their nascent stages; hence, it will require extensive coordination by market facilitators and exploration by stakeholders.

**Market Facilitators**

To foster wholesale adoption of emerging digital currencies, cross-jurisdictional cooperation and coordination efforts remain essential, as it addresses discrepancies in legal definitions and responsibilities across jurisdictions. It will enable sustained progress for market participants and boost the competitiveness of jurisdictions aiming to become modern financial hubs.

**Market Stakeholders**

Growing interest in CBDCs, DTs, and SCs among banking and non-banking institutions indicates considerable potential of this emerging asset class. Institutions should continue to pay close attention to potential interoperability solutions, which will help to unlock the full potential of this asset class in the future.

- Regulatory bodies have been actively publishing consultation papers that outline their approach to digital assets.
- However, notable discrepancies in terms of legal taxonomies, definitions and responsibilities persist across jurisdictions, particularly with respect to SCs.
- Regulatory coordination remains critical, enabling more responsible and sustainable progress by market participants while enhancing the competitiveness of jurisdictions seeking to establish themselves as new-age financial hubs.

Source: Interviews, Quinlan & Associates analysis

**Market Facilitators**

(IGOs, Regulators, Policy Makers, etc.)

**Market Stakeholders**

(Banking Institutions, NBFIs, Industry Players, etc.)

- We have observed a growing interest in the adoption of CBDCs, DTs, and SCs by major banking and non-banking institutions across various jurisdictions.
- We recognise that both technology and regulation are in their early stages of development, which may lead to siloed initiatives within individual “walled gardens”.
- Despite industry convergence challenges, it is important for institutions to keep a close eye on emerging interoperability solutions that are being developed, given their ability to unlock the full potential of this new asset class.
PROJECT PARTICIPANTS

BIS Innovation Hub
- Bénédicte N Nolens, Head of Hong Kong Centre
- Lucy Wong, Advisor, Hong Kong Centre (Project Lead)

We would like to thank the following colleagues at the Bank for International Settlements for their valuable feedback on this publication:
- Leonardo Gambacorta, Head of Innovation and Digital Economy, Monetary and Economic Department
- Rodney Garratt, Senior Advisor, Financial Stability Policy, Monetary and Economic Department
- Anneke Kosse, Senior Economist, Committee on Payments and Infrastructures, Monetary and Economic Department
- Sebastian Doerr, Economist, Financial Stability Policy, Monetary and Economic Department
- Tirupam Goel, Economist, Hong Kong Economics, Monetary and Economic Department
- Morten Bech, Head of Swiss Centre, BIS Innovation Hub
- Mike Alonso, Advisor, Swiss Centre, BIS Innovation Hub

We would also like to acknowledge the team at King & Wood Mallesons (Hong Kong, New York, and London), Allen & Gledhill (Singapore), Nishimura & Asahi (Tokyo), and Al Tamimi & Company (Dubai), for their legal input on the Regulatory Perspectives section of this report.

Quinlan & Associates
- Benjamin Quinlan, CEO & Managing Partner
- Justin Chung, Engagement Manager
- Alison Hu, Senior Consultant
- Jeanny Ang, Senior Consultant
- Grace Liu, Consultant