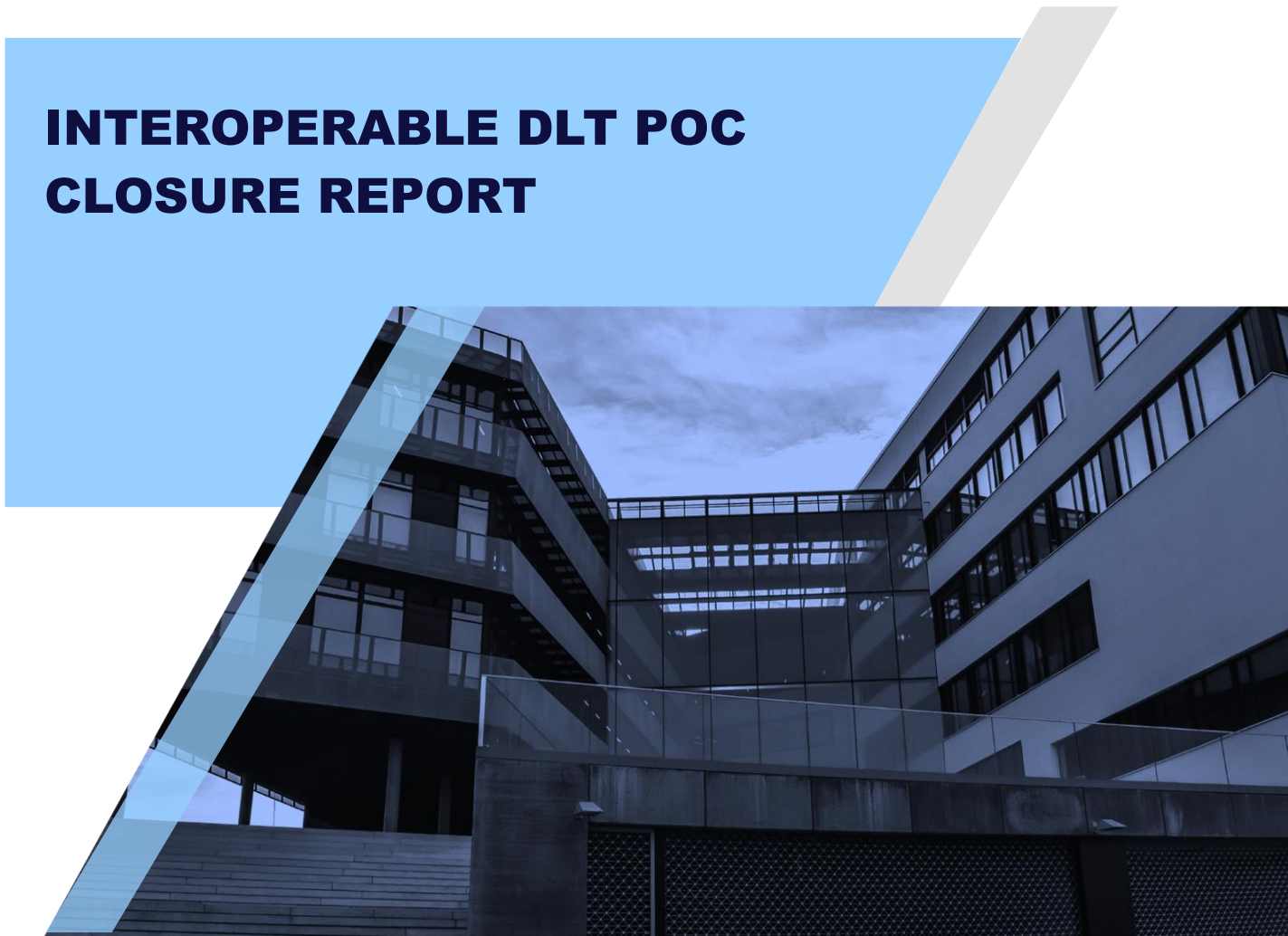# Reserve Bank Innovation Hub

A wholly-owned subsidiary of the Reserve Bank of India (RBI)

RBiH

INTEROPERABLE DLT POC CLOSURE REPORT

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RBiH Reserve Bank Innovation Hub

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Executive Summary

Financial entities across the globe have been working on adopting emerging technologies like Distributed Ledger Technology (DLT) to improve existing banking processes and to also enable a seamless banking experience for their customers. DLT allows stakeholders to digitally share accurate and reliable information. Smart contracts supported by DLT allow for automated execution of conditions on meeting pre-set criteria, which reduces manual intervention and paperwork. However, adoption of DLT at scale has been limited.

RBIH consulted with leading public and private sector banks to identify key issues with adoption. Major concerns that were identified were vendor lock-in with a single DLT fabric and lack of live use cases at scale. To address industry's concern, RBIH conceptualized the idea of an interoperable DLT platform for the financial ecosystem.

To identify a suitable use case for Proof-of-Concept (POC) exercise to demonstrate the capabilities of DLT, RBIH organized a virtual roundtable in Jan'22 that was attended by major public and private sector banks. Inland Letter of Credit (LC) was chosen by banks as a use case for the POC. End-to-end flow of LC is paper intensive, time consuming, requires human intervention at multiple level, and prone to fraud. DLT allows stakeholders to digitally share accurate and reliable trade information in real-time. Smart contracts supported by DLT, allow for automated execution of payments on meeting pre-set conditions of the contract.

In June 2022, RBIH conducted a successful POC exercise with 11 banks, DLT fabric partners, DLT application layer partners, and fintech startups. The POC received generally positive response from the participating banks with an overall positive rating of 8.5/10 from the participants. Based on the insights from POC, RBIH is facilitating the adoption of DLT at scale by working with Indian Banks' Blockchain Infrastructure Co Pvt Ltd (IBBIC).

During the course of POC, RBIH and Fabric Partners addressed more than 100+ queries raised by banks.

Criteria for successful execution of POC
- Demonstration of DLT platforms on the defined Key Performance Indicators (KPIs)
- Interoperability Demonstration
- Hands-on training and experience to participants to evaluate the fabric layers

RBIH – POC Participants & Milestones

RBIH Interoperable DLT Project Milestones

Oct-2021 — Research & Stakeholder Consultation

Jan-2022 — Virtual Roundtable & POC Use case

Mar-2022 — Interoperability Demo

Apr-2022 — Presentation to Industry Experts

Jun-2022 — POC Workshop

Jun-2022 — Training to participants on DLT Fabric

Jun-2022 — POC Kickoff

Jul-2022 — POC Closure

Technology Partners:

- **Hyperledger (IBM)**
- **Corda (R3)**
- **Unified Enterprise (Billon)**

DLT -Applications:

- **We.Trade**
- **Contour**
- **FIS**
- **Settlemint**
- **Digiledge**

POC Banks:

- **Axis Bank**
- **Bank of Baroda**
- **Federal Bank**
- **HDFC Bank**
- **ICICI Bank**
- **IDBI Bank**
- **RBL Bank**
- **State Bank of India**
- **South Indian Bank**
- **Union Bank of India**
- **Yes Bank**

Background & Scope of POC

Several initiatives have been undertaken by banking entities to introduce a DLT platform. In June 2021, 18 banks came together to form a Consortium - Indian Banks' Blockchain Infrastructure Co Pvt Ltd (IBBIC) with the aim to move the domestic Trade Finance process on to a single fabric layer-based DLT Platform. Similar efforts were undertaken in 2018 which led to the forming a consortium- 'BharatChain' in 2018 to leverage DLT capabilities.

RBIH expanded on industry's continued efforts, and brought together various key stakeholders like banks, DLT Fabric partners, FinTechs and other relevant industry players to introduce, the first of its kind Interoperable DLT Platform for the Indian financial ecosystem.

a) Solution:

RBIH did extensive research and stakeholder consultation to identify areas of improvement for several banking processes, under the larger vision of introducing a DLT platform that meets the needs of the Indian Financial Sector. Following a virtual Roundtable attended by major public sector and private sector banks, Inland Letter of Credit was chosen by banks as a use case for the POC exercise. DLT enables real-time transaction with simultaneous confirmations sent to each participant, replacing face-to-face exchanges of multiple documents over a number of days. Criteria for shortlisting DLT Fabric Layers were:

- **Permissioned**
- **Active Developer Community**
- **Industry Acceptance**

b) Platform:

Based on the criteria, research and stakeholders' consultations, the following Fabric Layers were shortlisted:

- **IBM - Hyperledger:** Hyperledger Fabric is a proven, enterprise-grade, distributed ledger platform. A consortium of 16 European banks developed – We.Trade Portal for Trade Finance; Another live use case is Tradelens - A shipping portal for Maersk (Singapore).
- **R3 - Corda**: Corda is a scalable, permissioned peer-to-peer (P2P) platform that leverages DLT and confidential computing technologies to enable the development of next-generation multi-party applications to foster and deliver digital trust between parties. Live use case is SPUNTA - Interbank reconciliation for over 100 Italian banks (Italian Banking Association).
- **Billon-FIS:** Billon Unified Enterprise is a scalable, Distributed Architecture. Billon's protocol leverages the computing power and capabilities of nodes which can be small enough to fit on a mobile device, creating the capability to have a more scalable architecture. It has been deployed by BIK (Polish credit reporting agency).

The following FinTech start-ups were also part of the POC:

- **Digiledge:** They are Start-up India registered; woman led start-up. Based out of Bengaluru, India, they primarily use Corda Fabric for their solutions. They have worked with financial institutions like Canara Bank, Federal Bank, South Indian Bank, SBI Life Insurance, NPCI on blockchain projects.
- **Settlemint:** The start-up was founded in 2016. They support both Hyperledger Fabric and Corda Fabric based solutions. State Gov. of Jharkhand launched their blockchain based seed distribution system using their application. Other clients include ITC Agri Division and Standard Chartered.
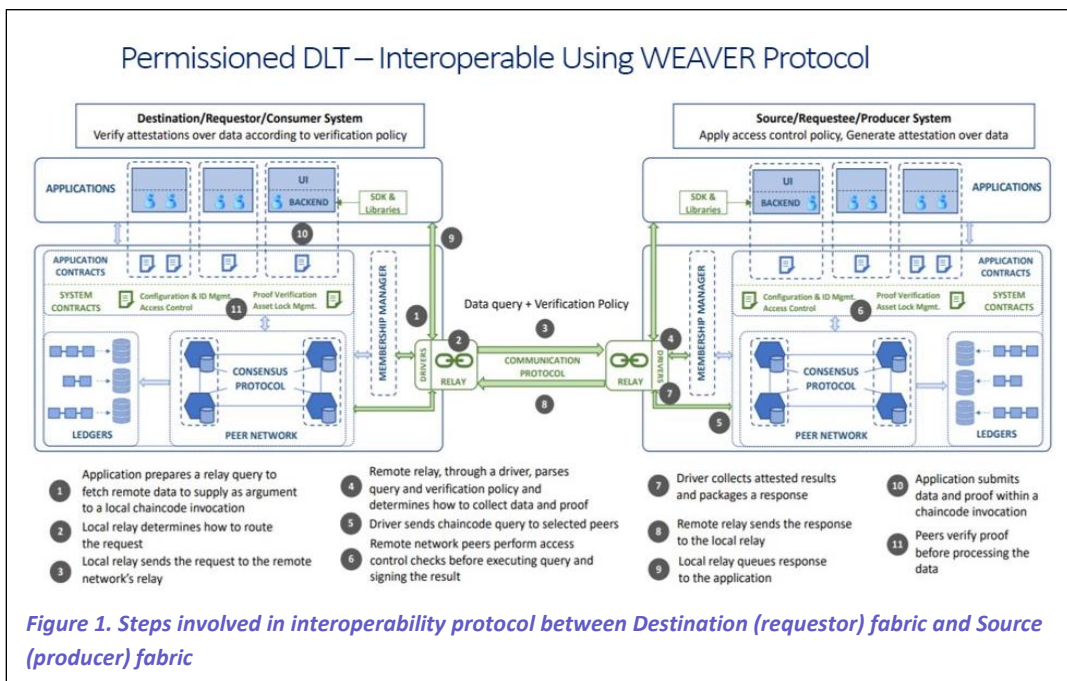
c) Proof of Concept (POC)

- **Scope:** Standalone DLT Platform access to banks for Onboarding, creation of corporate clients and LCs, modification of LCs and Interoperability demo between fabrics and performance.
- **Key Performance Indicators (KPIs):**
  1. Performance and Scalability
  2. Security and Access Control
  3. Robustness and Maturity
  4. Availability and Fault Tolerance
  5. Conformance to standards and Interoperability

POC – Round 1 (2 weeks)

In Round 1, various steps of selected use case and demonstrations were carried out by participating banks on the allocated DLT Application & Fabric. POC covered hands-on experience on DLT, onboarding, creation of users and clients, Letter of Credit (LC) /LC equivalent, creation/modification, creation of users and clients. Round 1 also witnessed successful real-time data transfer between fabrics.

Hyperledger (IBM)	• Axis Bank • State Bank of India • Union Bank of India • Yes Bank	Two Nodes created for each bank on **We.Trade** which enabled access to the DLT application. Both Intra & Interbank transactions were tested.
Corda (R3)	• Bank of Baroda • Fedral Bank • HDFC Bank • ICICI Bank	Two Nodes created for each bank on **Contour** which enabled access to the DLT application.
Billon (FIS)	• IDBI • RBL Bank • South Indian Bank	Two Nodes created for each Bank on **Billon (FIS)** which enabled access to the DLT application.

Figure 1. Steps involved in interoperability protocol between Destination (requestor) fabric and Source (producer) fabric

All 11 banks attended a live-demonstration on Interoperability and Data Transfer. Interoperability and data-sharing between Hyperledger and Corda, and vice-versa was demonstrated.

This was followed by a Q&A session to address bank queries with respect to Interoperability Protocol and Data Transfer.

POC – Round 2 (2 weeks)

In Round 2, queries raised by banks were resolved by the fabric partners. In this round, the 11 participating banks also evaluated the capability (performance testing), fault tolerance, and interoperability exception handling demonstrations.

➢ Quick resolution of issues reported by banks during the POC

➢ Standalone Performance Testing and Fault tolerance technical demonstration on each fabric with default tech stack of each Fabric.

➢ Exception Handling was demonstrated to banks with reference to Interoperable Data Transfer

Throughput Per Second (TPS)

Observed during POC
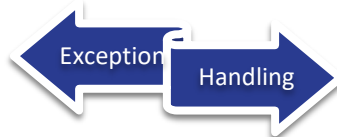
External benchmarking as per industry

HYPERLEDGER FABRIC 990 (8 CPU, 32 GB RAM)

r3. 650 (8 CPU, 16 GB RAM)

billon 83 (6VM, 8 core (Ryzen 9), 32GB)
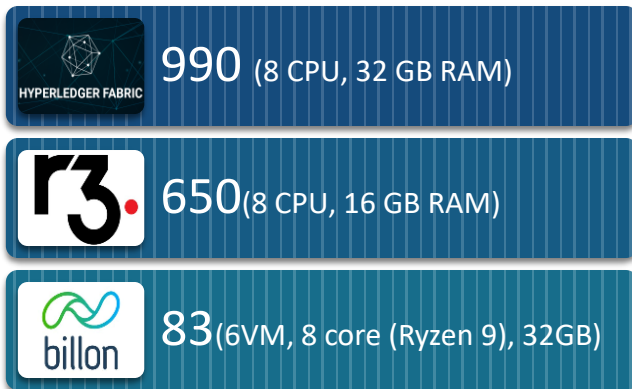
Figure 2A. Overserved TPS during POC

HYPERLEDGER FABRIC 3000^1
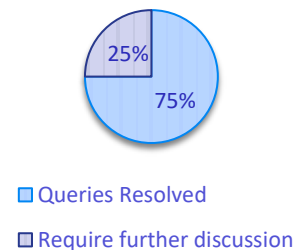
r3. 2580^2

billon 3000^3

Figure 2B. Fabric TPS based on external benchmarking by industry

Exception Handling

Fabric partners were quick in query resolution. 75% of all queries raised were promptly resolved, resulting in quick Turn-Around-Time.

Query Resolution

25%

75%

☐ Queries Resolved
☐ Require further discussion

1. IBM-Hyperledger: Nakaike, Takuya & Zhang, Qi & Ueda, Yohei & Inagaki, Tatsushi & Ohara, Moriyoshi. (2020). Hyperledger Fabric Performance Characterization and Optimization Using GoLevelDB Benchmark. 1-9. 10.1109/ICBC48266.2020.9169454.
2. R3-Corda: https://docs.r3.com/en/platform/corda/4.9/enterprise/performance-testing/performance-results.html
3. Billon Performance Report: Tests performed under supervision of PWC (Oct'21)
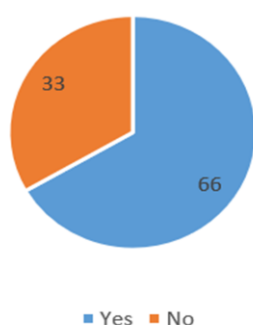
Fintech Applications

Figure 3A. Ease of configuring DLT Application for business use case

➤ Using Fintech Application Layer, banks were able to create Corporate Clients under 5 min. All banks agreed that Fintech Applications were faster than their existing Trade Finance Portals.

➤ All banks using Fintech Applications agreed that Fintech applications were easy to configure and use for business.

➤ Amendments/changes made to the LCs reflected to the other party within 10 min as compared to existing bank application where it took longer.

➤ Fintech partners resolved majority of issues that reported during POC by the banks.

Figure 3B. Percentage of query resolution by FinTechs during POC

POC – Closure & Metrics

POC was evaluated on the following KPI metrics:

1. Performance and Scalability

Comparison of DLT Platforms with Banks' Trade Finance Portals
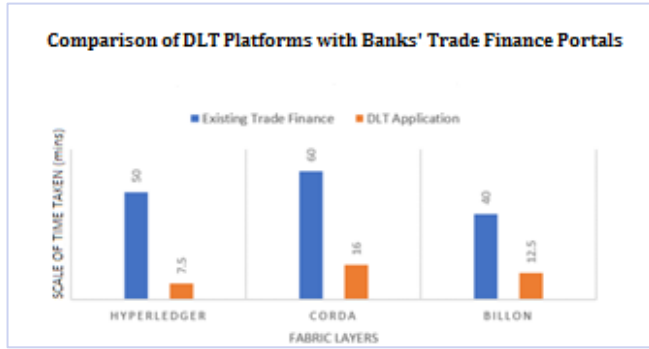
DLT platform performed faster as compared to existing bank portal for Corporate Client Creation. DLT took less time than existing Bank Portals.
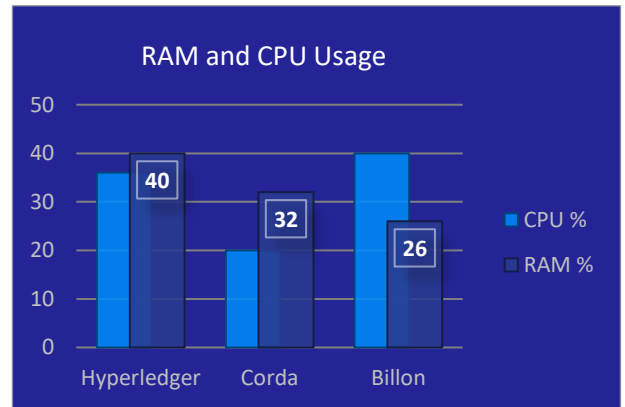
2. Security and Access Control
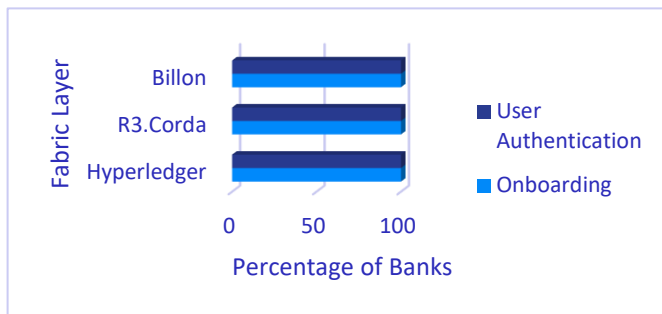
All the banks agreed that the DLT platform had secure access and only authorized users can be onboarded.

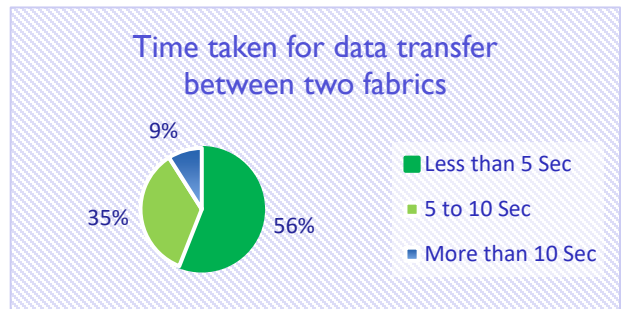## 3. Availability and Fault Tolerance
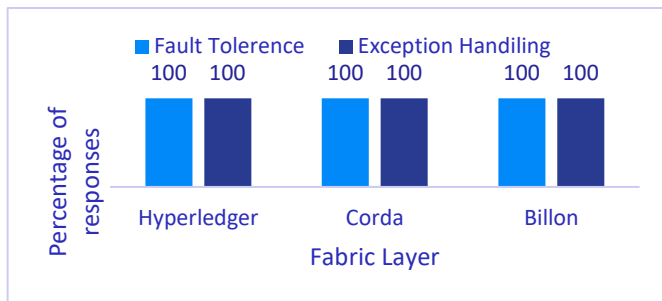
100% banks felt the platform had the right exception handling & fault tolerance capabilities.

4. Robustness and Maturity

Each fabric partner demonstrated their robustness by injecting multiple transactions into the fabric.

5. Conformance to standards and interoperability

Time taken for data transfer between two fabrics

Interoperability and data transfer between Hyperledger and Corda and vice-versa was demonstrated to all the banks as part of Interoperability KPI.
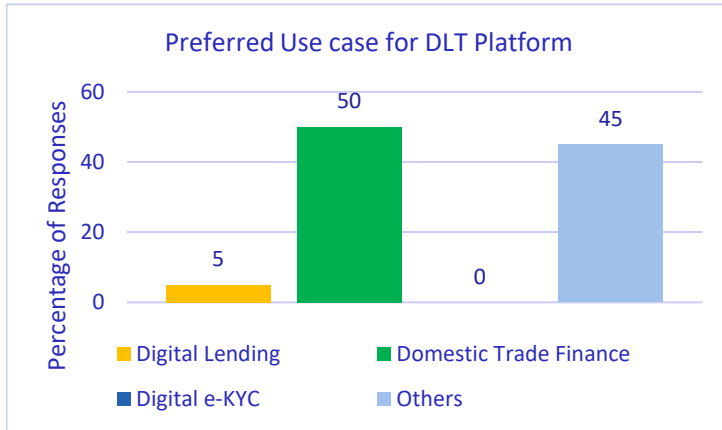

Risk in Data transfer
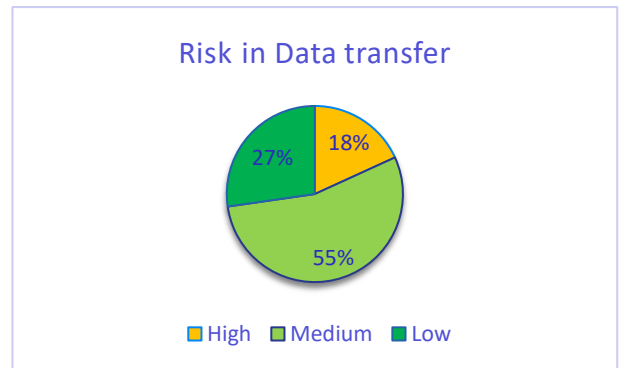
82% of respondents provided risk category as either **Medium or Low**.

Way forward based on insights from Banks' POC Feedback

Use Case

Preferred Use case for DLT Platform

- **Domestic Trade Finance** was the most preferred use case, chosen by **50%** of respondents.
- CBDC was the most prominent option under 'Other' use cases, chosen by 36% of bank IT Teams and overall, 32% among all responses.

Finance Model

Refers to the most preferred option by participants to finance the setting up of platform

- **68%** of all bank responses opted for **Equity Model Sharing** among banks
- **18%** banks opted for **Equal Sharing** among banks
- **14%** banks opted **Budgetary Allocation** by banks via **SPV Model**

Governance Model

Refers to the most preferred option by participants wrt to governing the platform

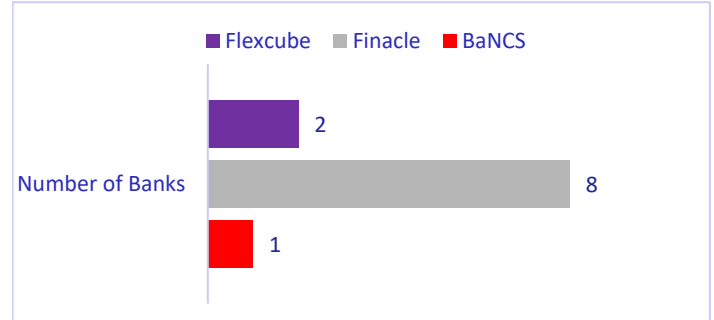- **55%** banks opted for **Centralized Governance Model**

Process Definition

Refers to the most preferred option by participants to define processes for the identified use case

- **100%** banks opted for **Banking Federated** Engagement to define process

Bank CBS

Among the 11 participating banks, 73% use **Finacle** Core Banking System.

Engagement Framework

- ➢ IBBIC will work with RBIH on:
  - Identifying use case for the ecosystem on DLT platform
  - Defining end-to-end process flow for elected use case
  - Defining Process and Governance model for DLT in the financial ecosystem

- ➢ Finalising architecture discussion with engagement from industry:
  - **Application Architecture**
  - **Security Architecture**
  - **Deployment Architecture**
  - **Integration Architecture**

- ➢ **RBIH CEO & CTO-IBBIC Board Meeting:** Indian Banks' Blockchain Infrastructure Co Pvt Ltd (IBBIC) will work with RBIH to set up an interoperable DLT Platform for the financial ecosystem under the thought leadership of RBIH.

Locate Us

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About us

The Reserve Bank Innovation Hub is a wholly owned subsidiary of the Reserve Bank of India (RBI) set-up to promote and facilitate an environment that accelerates innovation across the financial sector.

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