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Using CBDCs to Transform Global Payment Infrastructures

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Abstract

Central Bank Digital Currencies (CBDCs) represent a specific type of monetary innovation, that can potentially offer avenues for central bank cooperation within the International Monetary System (IMS). This study employs qualitative research to examine the development of multicurrency platforms led by the Bank for International Settlements (BIS) Innovation Hub. Based on collaborative experiments, the Hub initiatives seek to establish new forms of public goods aimed at improving the functioning of the global financial system. By analyzing official reports and statements on technological experiments, particularly those based on Distributed Ledger Technology (DLT), and aimed at addressing various infrastructural challenges in cross-border transactions, this article examines the institutional design and explores the potential of these platforms to mitigate inefficiencies and address inequities in global payment systems. Through enhanced coordination among central banks and guided by "coalitions of the willing and able," the BIS Hub serves as a key forum facilitating this type of monetary cooperation. The qualitative analysis identifies both the opportunities and constraints associated with these systems, shedding light on their capacity to reshape payment architectures and monetary governance. Ultimately, this study emphasizes the role of flexible, experimental governance frameworks based on coalitions of the willing in fostering cooperation among public and private institutions to advance innovation within the IMS.

Keywords: Central Bank Digital Currencies (CBDCs); International Monetary System (IMS); Cross-Border Payments; BIS Innovation Hub; Distributed Ledge Technology (DLT)

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1. Introduction

Central Bank Digital Currencies (CBDCs) are a digital form of sovereign money issued by national monetary authorities. In the last years, they have emerged as a significant monetary innovation, attracting increasing policy attention. As of January 2025, an international CBDC tracker reported that 134 countries and currency unions—accounting for 98% of global GDP—are actively exploring CBDCs at various stages, including research, proof-of-concept development, and pilot programs; in May 2020, this number was only 35 (Atlantic Council, 2025).

The issuance of CBDCs involves the process of "tokenizing" national currencies by converting them into digital tokens[2] on a Distributed Ledger Technology (DLT)-based platform. DLT is a decentralized system that records, verifies, and synchronizes monetary transactions across multiple nodes, with the aim to enhance security, transparency, and efficiency of these transactions. Money, in its different forms, is the cornerstone of financial systems, serving as the unit of account for contracts and the medium of exchange for transactions. Sovereign money, in particular, underpins a countries' monetary systems, providing a stable, trusted, and universally accepted medium for the final settlement of financial transactions.

As reported by a Bank for International Settlements (BIS) study involving a panel of 86 central banks, 63% of them indicated that they had expedited their policy efforts on CBDCs in response to developments in the market of cryptocurrencies, notably the development of stablecoins[3] (Di Iorio, Kosse, & Mattei, 2024, p. 16). Particularly, the wholesale version of CBDCs (wCBDCs)—designed for use by financial institutions and other large-scale market participants in interbank transactions—has been explored for its potential role as a settlement asset within a future tokenized ecosystem (Di Iorio, Kosse, & Mattei, 2024, p. 6), where an increasing variety of financial transactions would be conducted on DLT-based platforms, such as blockchain.

CBDCs have prompted extensive analysis of their economic, geopolitical, and legal implications within both policy circles and academic research (Bindseil, 2019; BIS, 2020; Bossu et al., 2020; Brunnermeier et al., 2021; Bundesbank, 2020; Didenko & Buckley, 2021; Zhang, 2021; Agur et al., 2022; Barrdear & Kumhof, 2022; Bech et al., 2022; Handayani & Yuliana, 2022; Soderberg, 2022; Arner et al., 2023; Huber, 2023; Kuehnlenz & Kaltenbrunner, 2023; Lukonga, 2023; Peruffo et al., 2023; Wang and Gao, 2023; Skinner, 2023; Dionysopoulos et al., 2024; Mayer, 2024). These studies cover a broad spectrum of topics, ranging from monetary policy developments and their role in promoting financial stability and inclusion to the potential risks they may pose to financial intermediation.

This article aims to contribute to the growing body of literature by providing a qualitative and comparative analysis of technological experiments designed to enhance cross-border transactions through multicurrency platforms, with a particular focus on those developed within a key global forum: the BIS Innovation Hub.[4] How are these central bank coalitions organized to enhance monetary cooperation and develop infrastructures for more efficient global transactions? What key technological

[2] Digital tokens are entries in a database that are recorded digitally and can constitute or represent a value, or rights (e.g., currencies, financial assets, or real assets).
[3] Stablecoins are a type of cryptocurrency designed to maintain a stable value by typically being pegged to traditional fiat currencies, commodities, or other types of assets.
[4] In this sense, this article expands the analysis of Bech et al. (2022).

advancements and policy directions have these experiments identified in tackling the inefficiencies of the current global payment system, particularly its reliance on the US dollar? What challenges remain in implementing these solutions?

This article sustains that CBDCs have the potential to expand the range of currencies traded at both regional and global levels, with important geopolitical implications. They could redefine governance frameworks for cooperation within the IMS and fundamentally transform global payment systems.[5] wCBDCs can serve as a strategic settlement asset in the design of DLT-based payment platforms. This type of central bank money can provide heightened security by eliminating credit and solvency risks (Kumhof et al., 2020). Across different jurisdictions, CBDCs hold a unique legal attribute under monetary laws known as legal tender, which obligates creditors to accept them as the definitive means of payment (Skinner, 2023). Therefore, they can provide legal certainty and finality[6] to different types of transactions, including at global levels.

Beyond the CBDCs themselves, the infrastructure enabling their exchange also warrants particular attention. Central banks play a critical role in managing national monetary frameworks through monetary policy and the supervision and development of payment infrastructures. From a geopolitical perspective, the technology underpinning CBDCs has the potential to enable direct cross-border transactions in multiple currencies. wCBDC may pave the way for a payment infrastructure based on DLT platforms that can improve the financial and monetary connections between different jurisdictions.

Currently, the IMS architecture relies on the US dollar as the primary vehicle currency, facilitated by a complex, fragmented infrastructure sustaining cross-border and foreign exchange (FX) transactions. Correspondent Banks[7] enable access to foreign currencies for international payments and act as intermediaries between banks that do not have direct relationships in foreign markets. The Society for Worldwide Interbank Financial Telecommunications (SWIFT) serves as a messaging platform, connecting correspondent banks and transmitting payment instructions between financial institutions. Ultimately, this system is anchored in the United States' framework for settling international wholesale transactions, primarily through the New York Clearing House Interbank Payments System (CHIPS) for large-value USD payments.[8] Another key institution, the Continuous Linked Settlement (CLS), a US-based bank, comes into play when a FX transaction is involved, especially if multiple, eligible currencies are exchanged.

However, this multifaceted payment system faces several challenges, including high costs, slow processing times, lack of transparency, and limited accessibility. It also heavily relies on the US dollar as both an infrastructure backbone and an intermediary currency. Additionally, regulatory complexity—such as compliance with anti-money laundering (AML) and know your customer (KYC) regulations—adds further constraints. Liquidity and solvency concerns remain a persistent challenge, despite the presence

[5] A payment system is a "set of instruments, procedures and rules for the transfer of funds between or among participants" and includes "the participants and the entity operating the arrangement." This definition is provided by the BIS' Committee on Payment and Market Infrastructures and can be found in its glossary available at: https://www.bis.org/pfmi/help/fmitypes.htm [Last access on November 30, 2024].

[6] Finality means that the payment fully settles the debt owed by the payer to the payee.

[7] Correspondent banking is "an arrangement under which one bank (correspondent) holds deposits owned by other banks (respondents) and provides payment and other services to those respondent banks" (Committee on Payments and Market Infrastructures, 2016, p. 9).

[8] CHIPS functions operate in parallel with its public counterpart, the Fedwire system.

of institutional safeguards. Collectively, these challenges hinder the overall effectiveness (and fairness) of the IMS.

Payment infrastructures and the entities operating them are not neutral financial devices. They establish technological, policy, and legal standards, becoming a critical geopolitical tool within the IMS (Scott & Zachariadis, 2014, p. 153; Bernards & Campbell-Verduyn, 2019; Petry, 2020; de Goede, 2021; de Goede & Westermeier, 2022; Duran & Steinberg, 2025). A CBDC-shared platform can potentially provide the technological and policy framework needed to make cross-border financial flows more efficient, eventually superseding this complex US dollar-led payment infrastructure.

An important political impetus for alternative systems came in 2020 when G20 Finance Ministers endorsed a roadmap to reform and enhance cross-border payments (FSB, 2020). Multi-CBDC projects are part of this development. Various groups of countries are currently spearheading joint initiatives to create multicurrency platforms based on DLT, customized to align with their economic priorities, policy objectives, and distinct regulatory frameworks, within the BIS Innovation Hub. Created in 2019, this global forum has played an important role in shaping the global narrative on monetary innovations, fostering central bank cooperation for the development of new public goods with the aim to enhance the functioning of the global financial system. This policy enterprise aims to strengthen coordination among monetary authorities on technological developments, which includes the design of multicurrency platforms. These efforts also involve regulated financial institutions and, in different projects, comprise the issuance of private money in multiple currencies in tokenized forms.

This approach to monetary cooperation appears to depart from the quasi-universal model of intergovernmental organizations such as the International Monetary Fund (IMF), which establishes governance frameworks for a broader group of countries represented by public entities. According to the IMF's Articles of Agreement, among its purposes, are to promote "international monetary cooperation through a permanent institution which provides the machinery for consultation and collaboration on international monetary problems," "to promote exchange stability, to maintain orderly exchange arrangements among members," and "to assist int the establishment of multilateral system of payments in respect of current transactions between members" (Article 1(i), (iii), and (iv)). If requested, the IMF may decide to perform financial and technical services, that align with its purposes (Article V, Section 2(b)). However, aside from offering technical guidance to national central banks under its bilateral and multilateral surveillance mandate and publishing papers on the topic (e.g., IMF, n.d.; Adrian et al., 2022), the IMF is not actively conducting any experiments or providing a centralized forum for policy coordination on CBDC projects.

In contrast, the "coalitions of the willing and able" (Rodiles, 2018) in monetary innovation, supported by the BIS Innovation Hub, are alliances of more restricted groups of like-minded public authorities with shared monetary and financial policy aims. The Hub seems to offer these coalitions a more flexible, technical, experimental, and expedited governance arrangement for monetary diplomacy compared to the slow, incremental, and (often) politically contested processes of traditional treaty-based organizations, such as the IMF.

Within the Hub-led cooperation on developing payment infrastructures, there is a dynamic interplay between formal and informal elements. The Hub gathers central banks that voluntarily engage in specific projects, adopting a pragmatic approach to creating new public goods within the framework of

an established international organization, the BIS. The effort is built on flexible agreements and common rulebook mechanisms that facilitate the operation of customized payment systems.

This article examines these monetary initiatives through qualitative research of projects led by the BIS Innovation Hub aimed at fostering more efficient cross-border transactions and foreign exchange operations based on multicurrency platforms. It provides a comparative analysis of the following initiatives: Agorá, Dunbar, Jura, Mariana, mBridge, Nexus, and Rialto. All of these initiatives bring together diverse coalitions of countries and private sector firms to develop shared platforms based on the issuance of wCBDCs and wholesale transactions, with the exception of Project Nexus. Designed to interconnect domestic instant payment systems (IPS), Nexus is included in this case study due to its alignment with the policy objectives of the wCBDC initiatives mentioned above, i.e., ensuring safe, efficient, and transparent cross-border payments. Recognized as a "key initiative" by the Financial Stability Board's (FSB) 2024 progress report on enhancing cross-border payments (FSB, 2024, p. 15), Nexus can serve as a valuable point of comparison with DLT-based systems, particularly regarding its governance framework for cooperation, management rules, and scalability potential.

This study is organized into four sections, including this introduction. The next chapter outlines the conceptual framework of coalitions of the willing and able, examines the role of the BIS Innovation Hub in monetary innovation, and discusses the key technological features of DLT-based platforms, particularly their capacity to enhance payment infrastructure efficiency in comparison with the current architecture for cross-border transactions. Subsequently, the qualitative analysis investigates and compares the selected seven BIS Innovation Hub-led projects, their institutional designs and correspondent coalitions, policy aims, technical and legal choices, and governance framework. The article concludes with final reflections on the coalitions' lessons and possible future developments on central bank cooperation in monetary innovation.

2. Framing the Policy Initiatives: The Coalitions of the Willing for Monetary Innovation

This section of the article discusses (i) the framework of the "coalition of the willing and able"—a group of states, represented by their central banks, dedicated to advancing the development of cross-border payment systems—along with the infrastructure challenges that need to be addressed, and the design of a global forum that is already making progress through concrete initiatives; and (ii) the technical rationale for adopting Distributed Ledger Technology (DLT) to support policy-driven initiatives in cross-border transactions, particularly the use of wCBDCs.

2.1. The Policy Aims of the Coalitions and the Supporting Role of the BIS Innovation Hub

"Fluctuant informality is the benchmark of the coalitions of the willing" (Rodiles, 2018, p. 250). The "coalition of the willing (and able)" is typically an *ad hoc* group of like-minded states formed to address global or regional threats or challenges. Contrasting with formal multilateral organizations or standing alliances, such coalitions are often more flexible and informal in structure. Historically, this term is often associated with the 2003 Iraq war and subsequent US-led efforts to maintain global military, economic, and financial influence. However, emerging market economies and developing countries are also leveraging similar diplomatic arrangements to pursue shared objectives.

The emphasis on "ability," besides the "willingness," underscores that not all states with a legitimate interest can participate in such initiatives. Membership often requires significant resources, whether

financial, technical, or human, limiting participation to those capable of meeting the demands of this diplomatic strategy. This highlights an inherent exclusivity of coalitions, where resource constraints can prevent some states from engaging in these efforts, despite shared interests.

As the next section illustrates, the absence of certain states from multi-CBDC projects underscores the limitations of cooperation in the field of monetary innovation. Investing in technological advancements requires monetary authorities to develop the necessary capabilities. While the costs of CBDC development can vary significantly across jurisdictions, the highest expenses are expected to be associated with managing personnel and addressing digital risks, including cybersecurity, data protection, and ensuring the integrity and reliability of the CBDC system (Tourpe et al., 2023, p. 18).

Additionally, unlike the informal nature typically associated with coalitions, monetary collaboration for developing DLT-based payment infrastructures has been formalized through an international forum: the BIS Innovation Hub. This global forum employs contractual mechanisms to establish shared platforms for exchanging national currencies, ensuring a more structured approach to developing cross-border payment systems. Central banks seem to collaborate through this Hub to form "CBDC clusters," an alignment based on shared interests, political priorities, and economic strategies (Wang & Gao, 2023).

By tackling inefficiencies in the existing financial architecture, policy initiatives on monetary innovation aim to reshape the global payment landscape. These coalitions seek to establish a more efficient (and potentially more equitable) infrastructure to the current IMS, which is mainly characterized by a US dollar-dominated framework. This system is supported by a complex, fragmented network of privately operated institutional mechanisms, including a web of correspondent banks, SWIFT for financial messaging, and New York CHIPS, which functions as a central clearinghouse and settlement system for large-scale international transactions in US dollars, alongside its counterpart, Fedwire. Additionally, New York-based CLS provides an infrastructure for settling wholesale FX transactions across major currencies (see **Figure 1**).

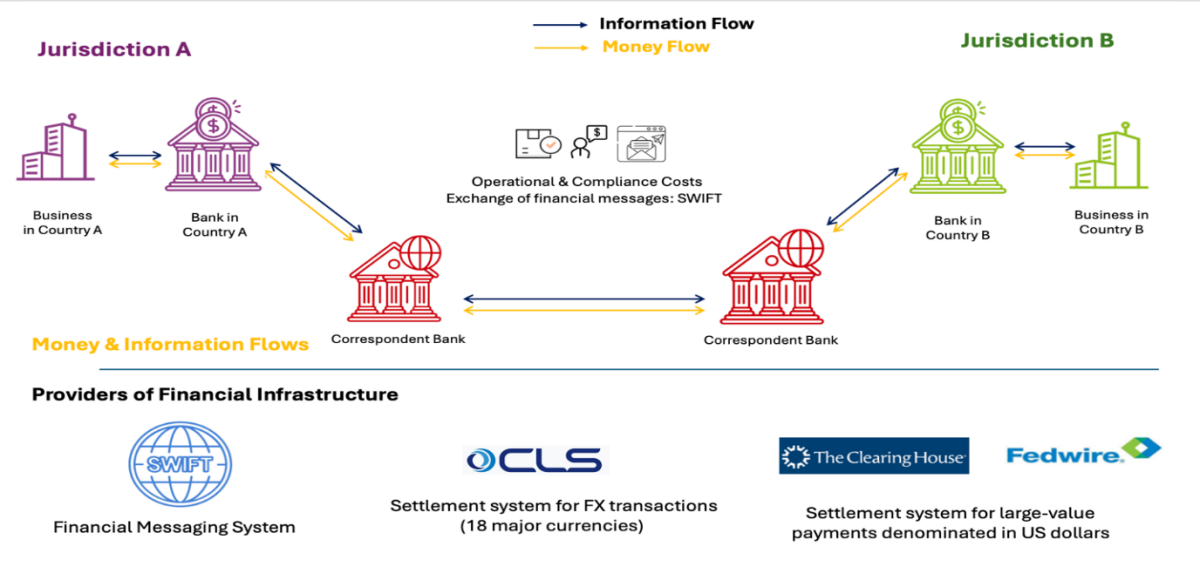
Correspondent banking is a relationship, typically framed by a bilateral contract, where one bank, called the “correspondent bank,” handles payments for another bank by initiating or receiving transactions to or from a designated account in the correspondent's books, which is held in the name of the client bank.[9] This system enables financial institutions to access foreign currencies for cross-border transactions.

SWIFT supports communication between correspondent banks by providing a secure and standardized messaging network for transmitting payment instructions, and other financial messages. It is a private association structured as a cooperative society under Belgian law, positioning itself as the "backbone of global financial communication."[10] It connects over 200 countries and territories, with more than 11,000 institutions involved in this network.

[9] To the correspondent bank, this account is termed a “loro account,” while from the client bank’s viewpoint, it is referred to as a “nostro account.”

[10] See ‘Discover Swift’ and ‘Organization & Governance’ at its official website: https://www.swift.com/ [Accessed on December 17, 2024].

Figure 1. ***Cross-Border Payment Flows in the Correspondent Banking Model: Institutional Mechanisms and Financial Infrastructures within the IMS***



Source: Public sources and author's elaboration.

Global financial institutions may rely on CHIPS to settle wholesale US dollar-denominated transactions. Established in 1853, this New York-based institution is the largest private-sector US dollar clearing system and a key participant in global payments. Owned by US commercial banks, CHIPS clears and settles over US$2 trillion daily, with 95% of its transactions involving cross-border fund transfers in this currency (CHIPS, 2024). Operating alongside its public counterpart, the Fedwire system, CHIPS functions as a real-time, final net settlement system for high-value international transactions (Banque de France, 2018, p. 122).

When a FX transaction is involved, CLS comes into play. Launched in 2002, it is a global financial infrastructure designed as a single purpose US bank, supervised by the Federal Reserve Board (Banque de France, 2018, p. 138). Traditionally, each leg of a FX transaction is settled independently, relying on the network of banks in which each party used its own correspondent banks for the respective currencies, along with interbank payment systems for settlement. Over time, certain multilateral arrangements, such as the CLS, emerged to mitigate the risks associated with FX transactions, with the aim to improve financial stability.

CLS facilitates transactions in (only) 18 eligible currencies[11] and eensures that both sides of a transaction are settled at the same time. Its network comprises over 70 direct members, including monetary authorities and commercial banks, as well as more than 35,000 indirect participants worldwide.[12] According to a BIS report (2022), in April 2022, nearly US$7 trillion of deliverable turnover in FX transactions—settled with multiple payments between counterparties (e.g., spot trades, outright

[11] The 18 currencies eligible for settlement through the CLS system include the Australian dollar, Canadian dollar, Swiss franc, Danish krone, euro, British pound, Hong Kong dollar, Hungarian forint, Israeli shekel, Japanese yen, South Korean won, Mexican peso, Norwegian krone, New Zealand dollar, Swedish krona, Singapore dollar, US dollar, and South African rand.

[12] See 'About' at its official website: https://www.cls-group.com/ [Accessed on March 1, 2025].

forwards, FX swaps, and currency swaps)—was recorded. Of this, US$1.3 trillion of turnover was settled bilaterally using pre-settlement netting, where counterparties offset their obligations before settlement. US$3.5 trillion of FX turnover was settled using risk mitigation mechanisms; of this, US$2.5 trillion was settled via CLS.

Correspondent banks, SWIFT, CHIPS, and CLS are not merely neutral facilitators of cross-border transactions; they serve as key infrastructure providers that wield structural power by establishing the global rules of the game (Scott & Zachariadis, 2014, p. 153; Bernards & Campbell-Verduyn, 2019; Petry, 2020; de Goede, 2021; de Goede & Westermeier, 2022). By design, these systems tend to reinforce the dominance of major vehicle currencies, particularly the US dollar, shaping global financial dynamics. This has significant implications for both private and public entities worldwide, including increased transaction costs and higher fees for currencies outside the major currencies. Due to its exorbitant privilege as the primary vehicle currency in global markets, the US can even "weaponize" money and payments, using them as instruments of economic coercion (Lastra, 2024).

Since Russia's invasion of Ukraine in 2022, the number of cross-border wCBDC projects has more than doubled (Atlantic Council, 2024). Particularly, the BRICS+ countries have vocalized their aim to establish an alternative payment system to reduce their dependence on the US dollar-led infrastructure. This initiative gained momentum following discussions at the BRICS Finance Ministers and Central Bank Governors' meetings. During the Kazan Summit in October 2024, Russia, leading the effort, outlined a vision for an "independent, secure, and sustainable" global payment system. The official report proposed one potential solution for improving cross-border payments: the establishment of a multilateral settlement platform so-called the BRICS Cross-Border Payment Initiative (BCBPI), that would become a new supranational infrastructure (Ministry of Finance of the Russian Federation, Bank of Russia, & Yakov & Partners, 2024, p. 4). The research document also recommended the introduction of "DLT-based solutions or a new multinational platform utilizing modern technologies, which would include a financial messaging component and enable settlements through tokens backed by national currencies or CBDCs, at the discretion of each participating country—this approach would foster a greater degree of decentralization" (Ministry of Finance of the Russian Federation, Bank of Russia, & Yakov & Partners, 2024, p. 32).

Various collective initiatives, including those involving some of the BRICS+ countries, have been carried by the BIS Innovation Hub. Historically, the BIS has been one of the most important organizations supporting central bank cooperation, both in normal times and during crises (Toniolo, 2005). Since 2019, it has established the Innovation Hub, a dedicated global forum for monetary innovation. The Hub has committed multidisciplinary teams located in Frankfurt and Paris (the Eurosystem Centre), Hong Kong, Singapore, Switzerland, London, Stockholm, and Toronto. As emphasized by Agustín Carstens, BIS General Manager, it aims to enhance the understanding of financial technology within the central banking community, serve as a focal point for a network of central bank experts on innovation, and "develop public goods in the technology space geared towards improving the functioning of the global financial system" (Carstens, 2019, p.2). As of January 2025, the Hub has completed 31 projects, with an additional 26 underway (BISIH, n.d.).

Among the various central bank projects supported by the Hub, one policy aim has garnered particular attention: the development of an improved infrastructure for cross-border transactions. The Hub has played a significant role in driving a global discourse towards a common platform for direct currency

exchange among central banks, positioning it as a new type of public good. This policy enterprise involves both central banks and the regulated financial institutions within their jurisdictions, supporting the issuance of public and private money in multiple currencies.

Money, whether issued by monetary authorities (i.e., central bank money) or created privately by financial institutions (e.g., scriptural or electronic money), is an integral part of a hierarchical IMS that operates on both national and global scales. Within the IMS, public and private monies coexist, each functioning at different levels of hierarchy and hybridity (Kapadia, 2023; Mehrling, 2013; Pistor, 2017). Private money, used as a means to settle different types of economic obligations, largely represent liabilities issued by banks and payment entities. Although this money does not enjoy legal tender status, it is used by economic actors as a *de facto* final means of payment.

The BIS refers to it as a product of the “singleness of money,” i.e., "the property that payments denominated in the sovereign unit of account will be settled at par, even if they use different forms of privately and publicly issued monies” (BIS, 2023, p. 86). At the global level, the role of private money becomes especially important in the context of the absence of a global state and a genuinely universal currency.

The pragmatic policy choice to include financial institutions in the Hub projects, under the authority of their monetary authorities, reflects the central banks' hybrid regulatory and financial roles. Central banks are public entities with the legal and economic authority to issue national (public) money and manage the corresponding unit of account. As financial institutions, they also serve as the bankers of the banks, providing a foundational asset (i.e., central bank money) that support the monetary system, which consists of the combination of public and privately issued money and operates within a fractional banking framework. This hybrid structure is replicated at the global level, and as the qualitative analysis of the Hub project illustrates (section 3, below), DLT-based platforms mirror this architecture by combining public money (wCBDCs) and private money (e.g., tokenized deposits). These public-private coalitions resorts to technology as the basis for monetary innovation, guided and supported by the BIS Innovation Hub.

2.2. The Technology as the Basis for Innovation: The BIS Policy Ideas on the Future of Monetary Systems

The various projects supported by the BIS Innovation Hub explore the use of DLT capabilities to achieve the policy goal of more efficient cross-border transactions. The BIS hosts the Hub, playing a dual role not only in its operational functions but also in the diffusion of policy ideas and narratives, particularly regarding the tokenization process of central bank money and collaboration between monetary authorities and private sector firms.

In its "blueprint for the future monetary system" (BIS, 2023), the BIS envisages a new financial market infrastructure centred around DLT technology and tokenization. Tokenization is the process of transforming real or financial assets (e.g., currencies, deposits, bonds, or securities) into digital representations recorded on a platform. These digital tokens function as entries in a database and incorporate programmability, i.e., they can execute actions autonomously based on predefined rules (BIS, 2024). For instance, a token might represent asset ownership and automatically trigger transfers or payments when specified conditions are met. This innovation may enhance efficiency by embedding functionality and logic directly within the token itself.

Tokenization enables the creation, storage, and transfer of value in digital form, thus potentially simplifying cross-border transactions. This technological framework allows tokenized assets to be exchanged and managed with higher efficiency if compared to the current global payment infrastructure. Three key technological features—i.e., cryptography, programmability, and atomic settlement—underpin these technological advantages.

First of all, cryptography can ensure the security and authenticity of digital tokens. By resorting to encryption methods, it provides protection against unauthorized access and tampering. This technology also fosters trust by guaranteeing that transactions are both secure and verifiable. Secondly, programmability enables tokens to perform automated tasks via smart contracts, which are self-executing programs that trigger actions when predefined conditions are met. This capability can streamline processes by minimizing manual intervention, avoiding delays, and allowing complex financial transactions to be executed, enhancing operational efficiency. Thirdly, atomic settlement ensures that all elements of a transaction occur at the same time, minimizing settlement risks. It guarantees that interconnected obligations are only completed if both parties fulfil their legal commitments. This approach also accelerates transaction processing by providing finality once conditions are met.

Table 1. DLT functions and potential efficiencies for global payment infrastructures

Functionality	DLT: potential efficiencies
Cryptography	This functionality fosters trust among international actors by guaranteeing that transactions are both secure and verifiable.
Programmability	Smart contracts can streamline financial processes, minimizing errors, delays, and collateral reliance. When integrated into wCBDC-based global payment systems—backed by legal tender status and central bank policies—they can enhance certainty and finality in cross-border transactions, ensuring the legal settlement of trade and financial obligations. By guaranteeing agreement finality, they also mitigate liquidity and solvency risks.
Atomic Settlement	Tokens enable the simultaneous transfer of payment information and value in DvP and PvP transactions. This ability minimizes the need for intermediaries, facilitating direct peer-to-peer transactions and enhancing efficiency. It mitigates liquidity and solvency risks.

Source: Public sources and author's elaboration.

Examples of atomic settlement include Payment versus Payment (PvP) and Delivery versus Payment (DvP) operations, which ensure that linked transactions are either fully executed or not executed at all, thereby reducing principal risk. PvP is a settlement mechanism that ensures the final transfer of a payment in one currency occurs if, and only if, the final transfer of a payment in another currency or currencies takes place. This mechanism is particularly important in foreign exchange transactions, where

it eliminates the risk that one party might transfer its currency without receiving the corresponding amount in another currency from the counterparty.[13] Conversely, DvP is a settlement mechanism that links an asset transfer (e.g., bonds or securities) and a funds transfer. Therefore, that delivery occurs if, and only if, the corresponding funds transfer occurs. This mechanism ensures that the buyer receives the asset only if the payment is made, and vice versa. **Table 1**, below, identifies the specific efficiencies provided by DLT to payment infrastructures compared to the current fragmented architecture.

The BIS further introduces the idea of "unified ledgers" for monetary systems as a new financial market infrastructure designed to harness the benefits of tokenization (BIS, 2023, p. 85). These ledgers would integrate central bank money (CBDCs), privately issued money (e.g., tokenized deposits), and tokenized representations of other financial or real assets, tailored to specific use cases. Central bank money would exert a central role in unifying components of the financial system, thus sustaining the "singleness of money" (BIS, 2023, p. 86). They have the capacity to enhance financial intermediation by enabling seamless transaction integration through "programmability" and "composability" (BIS, 2023, pp. 86-87).

The architecture based on unified ledgers would facilitate the automation of financial flows while addressing traditional financial inefficiencies, such as the segmentation of messaging, clearing, and settlement processes. By eliminating these separations, unified ledgers could potentially reduce delays, transactional uncertainty, and credit risks. Furthermore, "by having everything in one place" (BIS, 2023, p. 87), the centralized framework would enable the automatic execution of contingent actions, mitigating incentive and informational frictions.

The unified ledger realization, however, depends on a highly concerted policy effort from both central banks and private sector actors, emphasizing collaboration and alignment on governance structures and technological advancement. On the path to create it, an intermediate solution envisaged by the BIS would involve integrating legacy systems and existing infrastructures with new programmable platforms using application programming interfaces (APIs) (BIS, 2023, p 94). In its 2023 annual report, the BIS recognizes that while a "network of networks" would mitigate some of the inefficiencies associated with siloed systems, a "unified ledger" would provide "fully fledged programmability across systems," eliminating drawbacks inherent in fragmented architectures (BIS, 2023, p.87).

As the ledger's scope expands, so do the demands on governance structures. The BIS recognizes that "a unified ledger for cross-border payments would require seamless interoperability across private payment service providers and central banks located in various jurisdictions with different regulatory and supervisory frameworks" (BIS, 2023, p.105).

In 2024, the BIS reinforced this policy idea by referring to the "Finternet" (Carstens and Nilekani, 2024), envisioning a financial system composed of interconnected ecosystems, similar to the internet, in which a central element of its implementation is the unified ledgers. They would "provide a 'common venue' (i.e., a shared programmable platform) where digital forms of money and other financial assets co-exist" and "a quantum leap over existing financial infrastructure by seamlessly integrating transactions and opening the door to entirely new types of economic arrangements" (Cartens and Nielkani, 2024, p. 12).

[13] The PvP approach is already implemented for FX transactions within the CLS, covering the selected 18 eligible currencies.

The Innovation Hub projects' assessment reveals the evolution of these policy ideas within the BIS in the context of cross-border transactions. The technical choices of these projects seem to align with the vision outlined by the BIS (2023), emphasizing the benefits of tokenization and the potential of unified ledgers in advancing the "singleness of money" for each jurisdiction in a future DLT-based IMS.

3. Lessons from the BIS Innovation Hub's Projects on Monetary Cooperation

The main questions of this qualitative research are: how do coalitions of "willing and able" central banks, facilitated by the BIS Innovation Hub, collaborate to strengthen monetary cooperation and build infrastructure for more efficient cross-border payments? What technological innovations and policy strategies have emerged from these initiatives to address inefficiencies in the global payment system? What challenges remain in implementing these solutions?

To answer these questions, this section aims to identify critical institutional aspects of these coalitions formed within BIS-led projects, particularly the following: participant central banks and other stakeholders, monetary and financial policy objectives, technical choices, governance structures for monetary cooperation, jurisdictional and regulatory considerations, data privacy, security, and intellectual property concerns, macroeconomic implications for FX rates, and the role of the BIS Innovation Hub within each project.

3.1. Methodology and Overview of the Projects and their Coalitions

The qualitative investigation encompassed the analysis of official reports, press releases, and statements issued by the BIS and its Innovation Hub on the selected projects. They are listed in the Appendix, and the corresponding references to the documents in this section can also be found in that Appendix. All identified initiatives share the same policy aim, i.e., to provide more efficient cross-border transactions, notably by streamlining international payments and/or FX transactions. All of them are based on DLT and the issuance of wCBDCs, except for Nexus, which it is a unified gateway to connect national IPS. The latter was included in this research due to its shared policy objectives and its institutional design on cooperation, which closely resembles that of wCBDC projects—specifically, a shared-governed, public-private platform connecting multiple jurisdictions.

A typical CBDC project follows five phases: preparation, proof-of-concept, prototyping, piloting, and production (Tourpe et al., 2022, p. 6-7). The BIS-led projects are at different stages: Agora (2024) and Rialto (2024) are in the preparation phase; Jura (2020), Mariana (2022), and Nexus (2022) have completed a proof-of-concept; Dunbar (2021) is focused on the prototype stage; and mBridge (2021) has reached the pilot phase.[14] Three initiatives (Jura, Mariana, and Dunbar) were concluded, and on October 31, 2024, the BIS announced its withdrawal from the mBridge project.[15]

[14] Originally, mBridge was a proof-of-concept launched in 2019 under the name "Project Inthanon-LionRock," an initiative promoted by the Hong Kong Monetary Authority and the Bank of Thailand. In February 2021, with the involvement of the Hong Kong Centre of the BIS Innovation Hub, the Digital Currency Institute of the People's Bank of China, and the Central Bank of the United Arab Emirate, the project advanced to another development phase and was subsequently renamed mBridge (BISIH-mBridge, 2021b).

[15] In his remarks in a fireside chat at the Santander International Banking Conference 2024, Agustín Carstens, BIS General Manager, declared: "[t]he BIS is leaving that project, not because it was a failure and not because of political considerations but instead because we have been involved for four years and it is at a level where the partners can carry it on by themselves. That has happened already with other projects" (Carstens, 2024).

Table 2 identifies all the projects, their aims, and the correspondent stakeholders forming their coalition. These Innovation Hub-led projects bring together diverse group of states, represented by their central banks, from all regions of the world as main participants: Africa (South Africa), the Americas (United States and Mexico), Asia (China, including the Hong Kong Monetary Authority, India, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, and Thailand), Oceania (Australia), Europe (Italy, France, Switzerland, and the United Kingdom), and the Middle East (United Arab Emirates and Saudi Arabia).

Table 2. BIS Innovation Hub-led projects on wholesale, cross-border transactions policy goals and participants

Project (starting year)	Policy Goals	Participants and observers
Rialto (2024)	A new automatic FX settlement layer solution using wCBDC that could be deployed for interlinked instant payment systems or digital asset systems	BIS Innovation Hub Eurosystem and Singapore Centers, Bank of France, the Bank of Italy, the Bank Negara Malaysia (Central Bank of Malaysia) and the Monetary Authority of Singapore
Agorá (2024)	To improve the speed and integrity of cross-border payments within the two-tiered banking system	BIS Innovation Hub, Bank of France (representing the Eurosystem), Bank of Japan, Bank of Korea, Bank of Mexico, Swiss National Bank, Bank of England, the Federal Reserve Bank of New York, and the Institute of International Finance - IIF (convening more than 40 private sector financial firms)
Nexus (2022)	A comprehensive blueprint to standardize communication between instant payment systems through a single connection (the Nexus platform)	First phase: Bank of Italy, Central Bank of Malaysia, Monetary Authority of Singapore, Banking Computer Services in Singapore, and PayNet in Malaysia. Subsequent phases: Bank Negara Malaysia, Bangko Sentral ng Pilipinas, the Monetary Authority of Singapore, the Bank of Thailand, their domestic IPS operators, and the Reserve Bank of India.
Mariana (2022)	Proof of concept for a global interbank market for spot FX (use of automated market-makers)	BIS Innovation Hub, Bank of France, Monetary Authority of Singapore, and Swiss National Bank
Dunbar (2021)	A common shared settlement platform for cross-border settlements in multi-CBDC arrangements	BIS Innovation Hub Singapore Center, Reserve Bank of Australia, Bank Negara Malaysia, the Monetary Authority of Singapore and the South African Reserve Bank. Observers: Bank of France and Hungary's Magyar Nemzeti Bank
mBridge (2021)	A multi-CBDC common platform for wholesale cross-border payments focusing on the use case of international trade	BIS Innovation Hub, Bank of Thailand, Central Bank of the United Arab Emirates, Digital Currency Institute of the People's Bank of China, Hong Kong Monetary Authority, and The Saudi Central Bank. Observers: Asian Infrastructure Investment Bank; Bangko Sentral ng Pilipinas; Bank Indonesia; Bank of France; Bank of Israel; Bank of Italy; Bank of Korea; Bank of Mauritius; Bank of Namibia; Central Bank of Bahrain; Central Bank of Brazil; Central Bank of Chile; Central Bank of Egypt; Central Bank of Jordan; Central Bank of Luxembourg; Central Bank of Malaysia; Central Bank of Nepal; Central Bank of Norway; Central Bank of the Republic of Türkiye; European Central Bank; International Monetary Fund; Magyar Nemzeti Bank; Monetary Authority of Macao; National Bank of Cambodia; National Bank of Georgia; National Bank of Kazakhstan; New York Innovation Centre, Federal Reserve Bank of New York; Reserve Bank of Australia; Reserve Bank of India; South African Reserve Bank; and World Bank.
Jura (2020)	Cross-border settlement using wholesale CBDC (following Helvetia project)	BIS Innovation Hub Swiss Center, Banque de France and the Swiss National Bank in collaboration with a group of private sector firms based on an open call for application

Source: Public sources and author's elaboration.

Asia and Europe are notably well-represented in these initiatives (see **Table 3**). Among the seven selected projects, European central banks participate in five, while Asian monetary authorities are involved in six. In contrast, Africa and Latin America are significantly underrepresented, with only one project, Dunbar, featuring an African participant (South Africa), and one project, Agorá, including a Latin American participant (Mexico).

Agorá is the only cross-border payments project that includes the United States as a member, with representation from the Federal Reserve Bank of New York. Its formation tends to reflect a more Western-aligned coalition, comprising France, Japan, South Korea, Mexico, Switzerland, and the United Kingdom. In contrast, mBridge includes China as a key participant, alongside Thailand, the United Arab Emirates, Saudi Arabia, and the Hong Kong Monetary Authority.

Table 3. BIS Innovation Hub-led projects on wholesale, cross-border transactions: country- and region-based coalitions

		Rialto	Agorá	Nexus	Mariana	Dunbar	mBridge	Jura
Africa	South Africa	☐	☐	☐	☐	☑	☐	☐
America	USA	☐	☑	☐	☐	☐	☐	☐
Asia	Singapore	☑	☐	☑	☑	☑	☐	☐
	Malaysia	☑	☐	☑	☐	☑	☐	☐
	Japan	☐	☑	☐	☐	☐	☐	☐
	South Korea	☐	☑	☐	☐	☐	☐	☐
	Philipines	☐	☐	☑	☐	☐	☐	☐
	Thailand	☐	☐	☑	☐	☐	☑	☐
	India	☐	☐	☑	☐	☐	☐	☐
	China	☐	☐	☐	☐	☐	☑	☐
	Hong Kong	☐	☐	☐	☐	☐	☑	☐
Europe	France	☑	☑	☐	☑	☐	☐	☑
	Italy	☑	☐	☑	☐	☐	☐	☐
	Switzerland	☐	☑	☐	☑	☐	☐	☑
	United Kingdom	☐	☑	☐	☐	☐	☐	☐
	Switzerland	☐	☐	☐	☐	☐	☐	☐
Latin America	Mexico	☐	☑	☐	☐	☐	☐	☐
Middle East	United Arab Emirates	☐	☐	☐	☐	☐	☑	☐
	Saudi Arabia	☐	☐	☐	☐	☐	☑	☐
Oceania	Australia	☐	☐	☐	☐	☑	☐	☐

Source: Public sources and author's elaboration

From the official documents, it appears that each coalition depends on the voluntary participation and initiative of central banks. There is no explicit mention of the criteria for forming them, except for Agorá, where the BIS specifically states that it "invited" central banks that play "a significant role in today's cross-border payment flows and foreign exchange markets." A key goal of Agorá was to ensure "global representation and geographical diversity" (BISIH Agora, 2024, p. 3). Among all the projects, Agorá is the one that explicitly states that the BIS plays a more direct leadership role in the formation of the

coalition. The BIS will also "evaluate the possibility" of adding more members, from different jurisdictions, at a later stage (BISIH-Agorá, 2024e, p. 3).

Among these initiatives, mBridge stands out with an extensive network of over 31 observers worldwide (compared to just two for Dunbar). These include central banks from advanced economies, emerging markets, and developing countries across Asia, Africa, Europe, and the Americas, as well as international organizations such as the IMF, the Asian Infrastructure Investment Bank, and the World Bank. Observers participate in the project without integrating its decision-making processes. Instead, they can contribute to the platform tests, provide feedback, monitor its progress and gain insights into its evolution, enabling them to assess its potential implications for their jurisdictions and the global financial system. According to the reports, they were "invited" to "maximise the value [of the project] to the central bank community and project transparency" (BISIH-mBridge, 2022a, p. 9).

A key feature of the coalition framework is its reliance on selective membership. It seems that the BIS projects reflect this characteristic through the voluntary inclusion of central banks that are both "willing and able" to participate. Membership in these coalitions requires technical and financial capacity, as seen in the inclusion of more advanced economies, such as Switzerland (three projects) and France (four projects), and the limited representation of African and Latin American countries (one country each).

All projects have entities of the private sector as participants of the experiments, notably regulated financial institutions, including but not limited to commercial banks, deposit taking institutions, payment service and market infrastructure providers. This hybrid nature of the partnership highlights the pragmatism of the Hub coalitions: monetary systems are built on the issuance of public and private money, and this feature is similarly reflected in the design of multicurrency platforms. Additionally, private entities contribute to the financial sustainability of the projects by funding development costs. Particularly, Agorá states that private institutions "will fund" the project "via participation fees" (BISIH-Agorá, 2024b, p. 3).

Agorá brings together over 40 private-sector financial firms, selected through a call for participants and convened by the Institute of International Finance (IIF), though not necessarily limited to its members—one selected institution is SWIFT (BISIH-Agorá, 2024f). The IIF is an international association of the financial industry, which was established in 1983.[16] The IIF was selected by the BIS based on its "global presence, diverse membership and subject matter expertise," after a review of "several potential candidates from different jurisdictions" (BISIH, 2024, p. 3). Similarly, for the private sector, Jura relied on a consortium led by a global consulting and digital services provider, which included a diverse range of entities: major financial institutions, a blockchain technology firm, and a digital asset exchange and infrastructure provider (BISIH-Jura, 2021a).

3.2. Monetary and Financial Policy Goals of the Coalitions

The diversity of BIS experiments highlights the coalition framework's adaptability and its potential to achieve targeted policy goals. All projects aim to improve cross-border transactions or international payments by addressing challenges such as high costs, slow speeds, inefficiencies, and risks associated

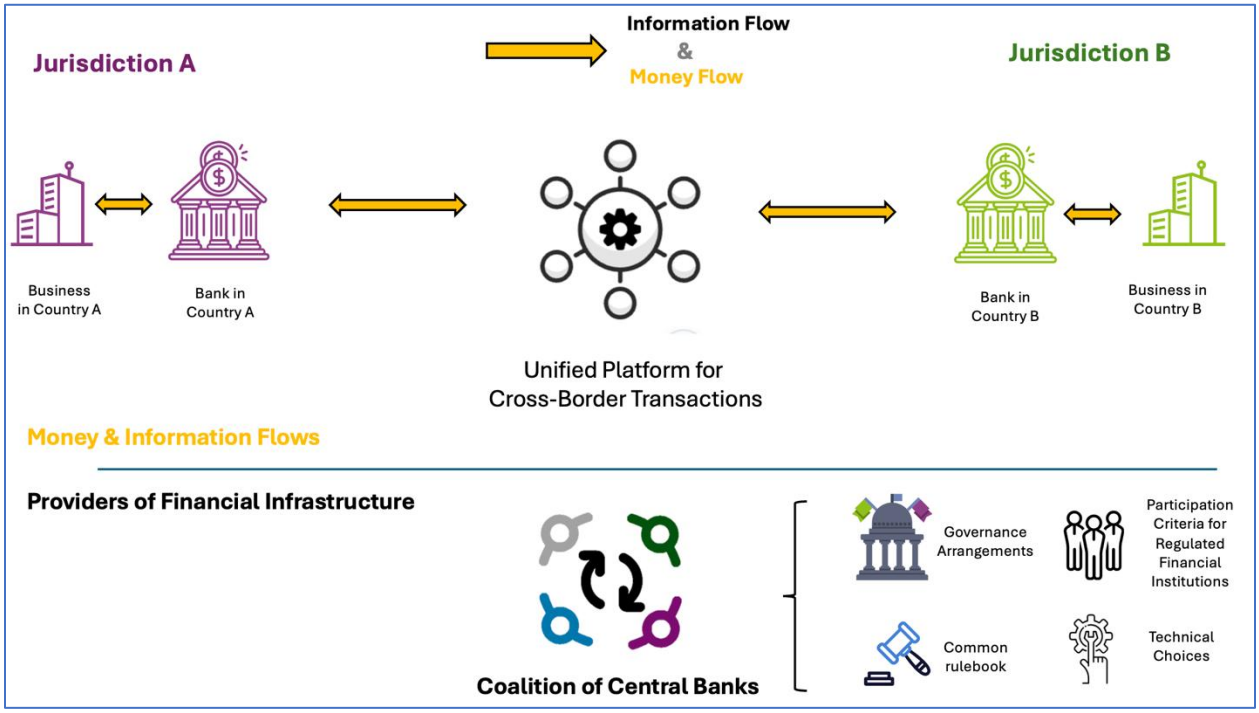
[16] Its members include 400 financial entities from more than 60 countries. In its by-laws, its main purpose is "to form an organization of financial institutions from all countries to promote international financial cooperation" (Article II, Section 1; IIF, 2023).

with settlement, solvency, and liquidity. Notably, mBridge further enhances these objectives by supporting the use of local currencies in cross-border transactions (BISIH-mBridge, 2023a, p. 2), while Nexus emphasizes "inclusivity" as a key feature (BISIH-Nexus, 2024a, p. 62).

As a whole, these initiatives aim to modernize payment infrastructures in alignment with global monetary and financial policy goals, particularly those set by the G20. In particular, Project mBridge emphasizes that emerging market and developing economies face heightened challenges in cross-border payments due to the shrinking correspondent banking network post-financial crisis, limiting their access to the international financial system (BISIH-mBridge, 2022a, p. 11). FX settlement risk has risen, in part, because current payment systems "such as CLS do not support many emerging market and developing economy currencies," even as their trading volumes continue to grow (BISIH-mBridge, 2022a, p. 11).

A central feature shared by these projects is the development of a unified, interoperable platform designed to enhance the efficiency of cross-border transactions while serving as a technological foundation for monetary cooperation among coalition members. This platform would act as a bridge between different jurisdictions, integrating their respective payment systems, supported by a new global payment infrastructure provided by central bank coalitions. **Figure 2** illustrates how this architecture is conceived across different DLT-based projects within the Hub, in contrast to **Figure 1**, which focuses on the current institutions and mechanisms supporting cross-border flows (the technical choices are further developed in the following section).

Figure 2. A Unified Platform for Cross-Border Transactions: Toward a New Global Payment Infrastructure



Source: Public sources and author's elaboration

All projects incorporate advanced technologies such as tokenization, smart contracts, and the use of wCBDC for DLT-based projects, except for the Nexus, which focuses on standardizing connections between domestic IPS (based on a shared platform), a concern also shared by Rialto. Moreover, the initiatives emphasize alignment with public policy objectives, with a commitment to promoting financial stability, regulatory compliance, and innovation within global financial systems.

While all projects aim to streamline cross-border payments, some emphasis other functionalities. For example, Project Jura refers to the tokenization of assets and securities settlement. Project Nexus remains mainly focused on enabling interoperability across IPS systems, making it more payment infrastructure oriented, but with important features for FX transactions. Project mBridge emphasizes the use of local currencies for international trade, highlighting the importance of "safeguarding the currency sovereignty and monetary and financial stability of each jurisdiction" (BISIH-mBridge, 2023a, p. 2). Mariana and Rialto projects target FX market, recognizing the importance of the relation between FX transactions and cross-border payments.

3.3. Technical Choices of the Coalitions

At a foundational level, most of the coalitions employ DLT (with the exception of Nexus) and leverage the programmability of smart contracts with the policy aim to enhance automation and operational efficiency. For instance, Project Agora investigates integrating tokenized commercial bank deposits with tokenized wCBDC on a public-private programmable platform, and Projects Mariana, mBridge, Dunbar, and Jura also use smart contracts for advanced functionalities such as atomic settlement in PvP and/or DvP transactions. Certain projects made the technical choice of relying on third-party DLTs (e.g., Projects Dunbar, Jura, and Mariana) and one pilot developed a native ledger solution (i.e., the mBridge ledger).

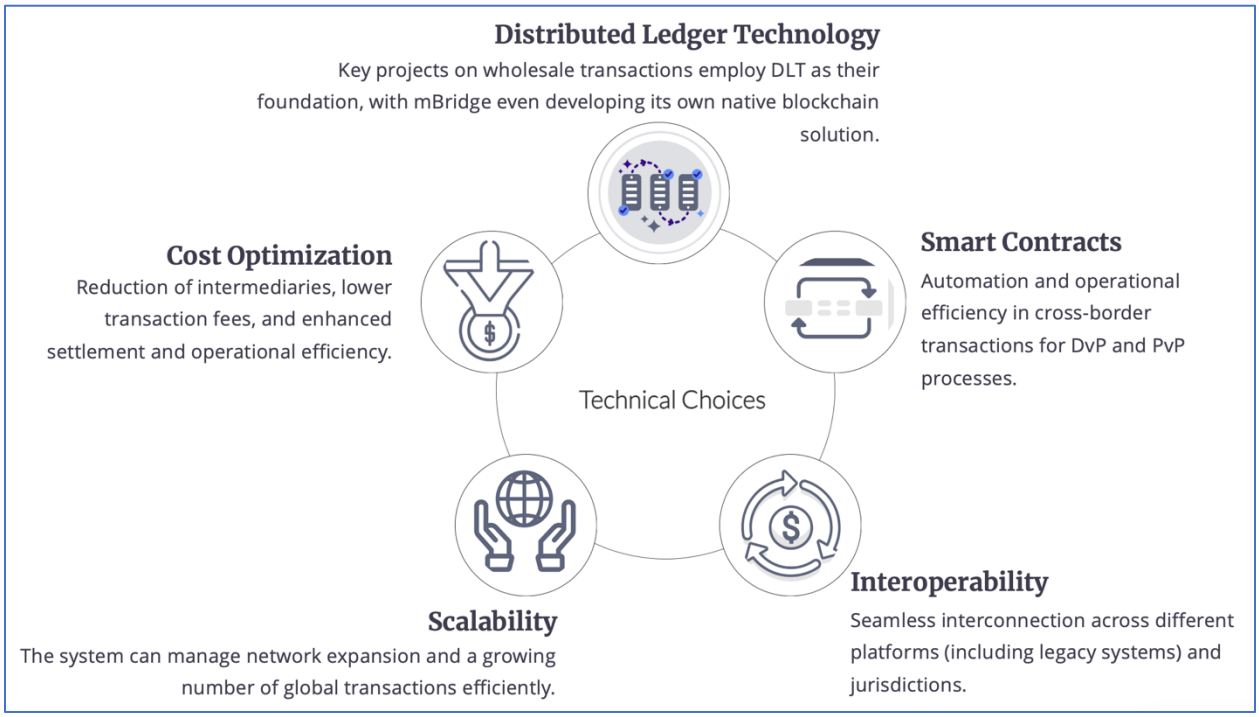
A recurring element on the projects is the emphasis on interoperability. Projects Nexus, mBridge, and Rialto notably focus on creating systems that can seamlessly interconnect across platforms or jurisdictions, using, e.g., APIs and ISO 20022 standards to ensure compatibility. Scalability—both in terms of network expansion and the increasing volume of cross-border transactions—along with cost optimization, are key design principles. This is exemplified by Nexus's modular gateway architecture and Mariana's adoption of open-source Ethereum tools, which streamline complexity and enhance adaptability (see **Figure 3**).

Despite these shared features, the projects diverge regarding certain technical scopes. Agorá stands out for focusing on a public-private platform to maintain the two-tier monetary system, improving "the correspondent banking model" in DLT-based infrastructure (BISIH-Agorá, 2024e, p. 1). Its primary aim is integrating the functionalities of tokenized assets with a unified ledger to enhance systemic operations. It seeks to replicate the design of the existing monetary systems in a tokenized format.

Conversely, Mariana explores functionalities of decentralized finance (DeFi), notably by developing an FX interbank market using an automatic market maker (AMM) and employing the ERC-20 token standard to automate FX transactions and settlements, as well as Ethereum-based platforms (both permissioned versions of Ethereum, Hyperledger Besu, and transitional network built on a public testnet, Sepolia) (BISIH-Mariana, 2023b, p. 10).

AMMs tested by Mariana are smart contracts that hold tokenized assets in a liquidity pool and facilitate trades by acting as the counterparty for liquidity-taken trades (i.e., a constant function market-maker). They aim to provide a reference price for FX transactions, which is calculated through pre-defined algorithms (BISIH-Mariana, 2023a, p. 12-13). Traditional FX markets operate on order book models, where prices are determined by bid-ask spreads, and liquidity is provided by market makers such as banks and traders. In contrast, Mariana introduces a new approach by applying AMM logic to FX trading for a multi-CBDC platform. This innovation has the potential to replace the traditional dealer-based pricing mechanism with a decentralized liquidity pool model, reducing reliance on intermediaries. Yet, this technical approach was not tested by other projects.

Figure 3. Technical Choices of the BIS Innovation Hub Coalitions on DLT-based Cross-Border Transactions



Source: Public sources and author's elaboration

Projects such as mBridge and Jura emphasize custom solutions tailored for specific use cases. mBridge developed its own native blockchain ("mBridge ledger", or mBL) to support multi-CBDC transactions, leveraging a custom Byzantine Fault Tolerance (BFT) consensus algorithm for performance. The mBL is an Ethereum Virtual Machine (EVM)-compatible solution, i.e., it can process transactions using smart contract codes that operate on broadly adopted blockchain platforms (BISIH-mBridge, 2023a, p. 4). The focus on interoperability in its technical design also extends to integration with RTGS systems, ensuring that the mBL platform does not require a domestic CBDC as a prerequisite for cross-border transactions.

Similarly, Jura's use of Corda's dual-notary signing capability exemplifies a degree of customization to enable atomic transactions between different subnetworks, involving wCBDCs and tokenized commercial paper (BISIH-Jura, 2021a, p. 12). Dunbar resorts to prototype developed by the technology

providers R3 and Partior, using the DLTs of Corda and Quorum respectively (BISIH-Dunbar, 2022b, p. 2). In contrast, Rialto aims at exploring new layers of FX settlement using wCBDCs, although it remains relatively less technically detailed in comparison to the other projects, since it is on early stages of development (BISIH-Rialto, 2024).

Finally, Nexus does not use blockchain entirely. Instead, it leverages APIs and ISO 20022 messaging to standardize communication between IPS via the Nexus Gateway software. These gateways handle addressing, proxy resolution, FX conversion, and payment processing. Comprehensive technical documentation, including detailed guides for each type of Nexus participant, is available to central banks and payment system operators upon request to BIS Innovation Hub (BIS-Nexus, 2024a, p. 63).

3.4. Governance Structure for Monetary Cooperation

Governance structures are clearly identified in the official documents of six projects: namely Agorá, Mariana, mBridge, Nexus, Dunbar, and Jura. Governance within these projects balances formal elements, such as common rulebooks and steering committees in structured arrangements (e.g., mBridge and Nexus), with more flexible experiments (e.g., Mariana). These configurations feature the Innovation Hub's adaptability and flexibility as a forum for coalitions of willing participants.

Similarities across these projects include a commitment to participant collaboration and frameworks to ensure legal and operational clarity. Differences emerge in the scope and complexity of governance structures. Each project reflects its unique goals and contexts, resulting in nuanced governance models.

Project Mariana notably excludes governance models for its AMM and broader transnational networks. This choice signals a focus on technical experimentation rather than a comprehensive governance framework, contrasting with other projects that emphasize structured oversight and management mechanisms. Governance concerns, such as operator roles and integration with existing financial systems, remain outside Mariana's scope (BISIH-Mariana, 2023a, p. 9).

In contrast, Project mBridge incorporates a detailed governance and legal structure, with the aim to ensure legal certainty and collaborative platform management. The mBridge initiative operates with a decentralized governance framework comprising a Steering Committee and four subcommittees—Compliance, Technology, Legal, and Policy. The Steering Committee is responsible for formulating strategies and policies, overseeing business management, and providing guidance on the design, development, and operation of mBridge (BISIH-mBridge, 2023a, p.8). This layered structure has the aim to ensure that strategic, policy, and operational oversight is collaborative, involving multiple stakeholders. Additionally, mBridge emphasizes detailed legal documentation, such as platform operating terms and currency-specific agreements, to define participant roles, responsibilities, and settlement procedures.[17]

Before issuing the call for private-sector participants, Agorá had already established its governance structure. The Project Agorá Committee, composed of a senior official from each participating entity, from public and private sectors, will oversee and guide all project activities. It will be co-chaired by the BIS and the IIF. These senior officials will have the mission to bring the necessary expertise for the project and have the legal authority to allocate appropriate resources within their respective institutions. The design and development of the project is structured into three main workstreams:

[17] These documents, however, are not publicly accessible. Only participant central banks can have access to them.

business requirements, technology, and legal matters. Additionally, a communications workstream will oversee and coordinate all public-facing communications. Each workstream will include representatives from all participating institutions (BISIH-Agorá, 2024b, p. 3).

Project Nexus also adopts a hybrid public-private ownership model, but with a unique legal design: the proposed Nexus Scheme Organisation (NSO). The NSO would operate as a not-for-profit entity, jointly owned by participating entities, that would foster "the right balance between public and private sector interests to achieve the public policy goals, whilst ensuring the long-term financial sustainability of Nexus" (BISIH-Nexus, 2024a, p. 37). Nexus emphasizes regulatory compliance across jurisdictions and includes a Joint Oversight Forum to address potential conflicts between domestic and cross-border regulatory requirements. Its governance involves a corporate-style structure, with decision-making roles divided among a Board of Directors and an executive management team led by a Chief Executive Officer, that would ensure accountability and alignment with public policy goals (BISIH-Nexus, 2024a, p.37).

Project Dunbar proposed the constitution of a federated governance model to respect the autonomy of central banks while sustaining collaboration on a shared multi-CBDC platform. At the conceptual level, its governance structure would integrate "strategic and platform decisions, tactical decisions; and day-to-day operational decisions," with committees ensuring representation of stakeholders (BISIH-Dunbar, 2022a, p. 19). Finally, Project Jura took a more minimalist approach compared to other initiatives, focusing primarily on legal frameworks governing private-sector participants' interactions. The governance aspects mainly centre on rulebooks drafted by legal experts to manage financial commitments and operational responsibilities in euro and Swiss franc transactions. This limited governance scope seems to reflect Jura's emphasis on transactional experimentation over institutional or regulatory innovation.

3.5. Jurisdictional and Regulatory Considerations

Jurisdictional and regulatory considerations are relevant to the coalitions on monetary innovation. The governance structure must strike a balance between establishing common rules for cooperation and adhering to national regulatory requirements for cross-border transactions. In comparing these projects, similarities include a shared emphasis on settlement finality, AML/CFT compliance, and addressing jurisdictional differences. Yet, their policy focus diverges.

mBridge and Nexus develop comprehensive frameworks to address multi-jurisdictional challenges, whereas Mariana and Jura remain more exploratory or experimental in their regulatory integration, due to their narrowed scopes. Dunbar tries to strike a middle ground by combining universal rules with a vocalized concern on jurisdictional autonomy, while Agorá prioritizes identifying regulatory gaps in its early stage of development. Rialto has not yet publicized the considerations of the project with jurisdictional issues. Collectively, these projects seem to highlight the coalition's concern to reconciling jurisdictional complexities within the landscape of cross-border financial systems.

Agorá exploratory approach emphasizes settlement finality and regulatory compliance, suggesting a broad, jurisdiction-specific analysis to harmonize cross-border financial activities. Project mBridge appears to take a proactive approach by explicitly referencing detailed legal rulebooks designed for its multi-jurisdictional platform, indicating a more advanced stage of development. These mentioned rulebooks would address key legal issues, "including the mBridge Platform terms, jurisdiction- and CBDC-specific terms, external terms and a fit-for-purpose governance structure" (BISIH-mBridge, 2023a,

p. 8[18]). The project would integrate these considerations into its governance structure, highlighting the need of jurisdiction-specific legal evaluations for central banks' participation and platform operation.

Nexus relies on its NSO for defining and updating the "Nexus Scheme Rulebook," that would establish the eligibility criteria, along with the rights and obligations of various Nexus participants, including the provision of a mechanism for dispute resolution. However, "[e]ach participant in Nexus is responsible for complying with the laws and regulations that apply in their respective jurisdiction, such as AML/CFT rules" (BISIH-Nexus, 2024a, p. 40). While Nexus allows for participant autonomy within their respective jurisdictions, it requires universal compliance with the scheme's rules, aiming at facilitating cross-border transactions without undermining local regulatory mandates.

Project Dunbar highlighted the challenge of balancing universal platform features with jurisdictional autonomy. Project Mariana did not explore legal and regulatory aspects, acknowledging them as a "future work" area that could be deepened and broadened (BISIH-Mariana, 2023a, p. 28). Lastly, Jura operated under existing legal frameworks, avoiding a regulatory sandbox approach. The transactions on its test platform achieved settlement finality through established RTGS systems, reflecting a preference for leveraging current legal infrastructures rather than developing new paradigms. Notably, the wCBDCs and tokenized assets used in Jura held "no legal force," emphasizing its experimental nature within established regulatory boundaries (BISIH-Jura, 2021a, p. 14).

3.6. Data Privacy, Intellectual Property, and Security Concerns

When designing coalitions for monetary innovation, concerns about data privacy, intellectual property, and security emerged from the analysis of relevant documents. Since the Hub mission is to develop "public goods," open to central bank community (BISIH, n.d.), these considerations seem to be particularly important. Privacy-preserving mechanisms seems to be a widespread concern. To address intellectual property issues, adopting open-source approaches seems to be preferred. Security approaches may vary from centralized deployments in mBridge's initial phase to decentralized consensus mechanisms in Mariana. The projects seem to converge in their emphasis on tailored solutions to jurisdictional complexities involving those specific issues.

Privacy mechanisms are an important issue across the projects, with particular emphasis on a "need-to-know" principle, though their implementation varies. As a "future work," Project Mariana stresses the need to employing privacy-preserving mechanisms such as stealth addresses, aimed at balancing transparency for regulatory oversight with "the privacy needs of participants" (BISIH-Mariana, 2023a, p. 26, 28). Project mBridge adopted pseudonymous addresses with self-issued key pairs to ensure that only transacting parties, their central banks, and the CBDC issuer can access financial transaction details. Sensitive and confidential data are stored off-chain in local databases within each jurisdiction, ensuring compliance with local data protection regulations. Additionally, mBridge explored advanced cryptographic techniques, such as zero-knowledge proofs, to enhance privacy further (BISIH-mBridge, 2022a, p. 33-34).

In the same token, within the Project Nexus, visibility of personally identifiable information is limited to those with a "need-to-know" basis. The Nexus rulebook mandates that each participant must obtain

[18] As mentioned previously, these documents are not publicly accessible. Only participant central banks can have access to them.

adequate consent or have a valid legal basis to collect and process personal data. Regarding the transfer of personal data to another country, participants are required to enter into a data-sharing agreement. This agreement obliges them to adhere to applicable data protection, sovereignty, and residency requirements, whether acting as a data importer or exporter (BISIH-Nexus, 2024a, p. 44).

Project Dunbar integrated Corda's data-centric design to share transaction data only with those who need it, using privacy models such as key randomization and hardware-based confidential computing to enhance security (BISIH-Dunbar, 2022a, pp. 44-45). Meanwhile, Project Jura built on Corda's privacy-centric design by minimizing data sharing through a notary node (BISIH-Jura, 2021a, p. 12). Each of these approaches reflects tailored strategies to safeguard privacy within distinct operational frameworks.

The **intellectual property** dimension underscores the motivation to support open collaboration among coalition participants. Projects such as Mariana and mBridge emphasize leveraging open-source technologies. Mariana, for example, employs Hyperledger Besu and Ethereum testnets to develop proof-of-concept systems (BISIH-Mariana, 2023a, p.16). Similarly, mBridge envisioned evolving into a production-ready network that "can serve the broader central banking community as a public good through open-sourcing" (BISIH-mBridge, 2021a, p. 8). According to a BIS Innovation Hub advisor and solution architect, speaking at a 2023 conference organized by the Digital Pound Institute, the DLT protocol used to customize mBridgre ledger was developed by the Digital Currency Institute of the People's Bank of China (PBoC), making it intellectual property owned and operated by the Chinese central bank.[19]

Lastly, **security** is also a key concern across all projects, with diverse approaches to ensuring resilient systems. Mariana implements a relayer architecture with a consensus mechanism to mitigate risks from cyberattacks, requiring multiple confirmations for transactions - specifically, "six relayers" per bridge, "where three were dedicated to each direction," i.e., from the domestic to transnational network and vice-versa, and "two out of three must confirm the initiating transaction" (BISIH-Mariana, 2023, p. 18-19). This decentralized security approach contrasts with other projects. For instance, the mBridge adopted a centralized high-security cloud deployment in Hong Kong SAR, "[t]o simplify the technical operation of the platform for the purposes of the pilot" (BISIH-mBridge, 2022a, p. 16). Nexus, designed at a proof-of-concept level, acknowledges the need for further work to meet real money payments' resilience and security demands (BISIH-Nexus, 2024a, p. 69).

3.7. Macroeconomics of Foreign Exchange Rates

In coalitions of willing participants aiming to create new payment infrastructures, a key policy consideration is how to determine exchange rates between currencies on shared platforms to enable cross-border transactions. From the analysis of relevant documents, all projects, except Mariana, emphasize that the determination of the FX rate (i.e., the price of a currency pair) is left to the participants of the initiative and takes place off-chain. This shared approach delegates the responsibility

[19] See the conference entitled "Project mBridge: connecting economies through CBDCs, Cross-Border Payments, and FX," Digital Pound Foundation, 17 May 2023, available at: https://www.youtube.com/watch?v=dhEtBfponKA (see minutes: 13'17''-13'31''; last access on 31 January 2025). A professional media report also indicates that China has played a significant role in the development of the mBridge ledger by contributing with proprietary components, including a unique blockchain consensus mechanism (Ledger Insights, 2024).

of agreeing upon currency exchange rates to the transacting parties, avoiding the DLT system's direct involvement in FX price discovery or definition mechanisms.

Among these projects, both Project Nexus and Project Agora explicitly recognize the potential role of a vehicle currency in facilitating transactions. As "future support for intermediary currencies," Nexus anticipates that as it scales, less commonly used currency pairs may require payments to flow through a third currency, such as the "euros," to ensure effective and seamless currency conversion (BISIH-Nexus, 2024a, p. 34). Similarly, Agorá acknowledges the possibility of incorporating a vehicle currency to enable atomic cross-border wholesale payments "leveraging a single currency pair or a vehicle currency in a way that preserves depositor-bank relationships" (BISIH-Agorá, 2024e, p. 2). Project Jura operated through over-the-counter (OTC) transactions, where terms, conditions, and rates are agreed upon *ex ante* (BISIH-Jura, 2021a, p. 10). This approach also reflected a traditional model of FX trading and settlement.

In the Project Dunbar, while FX rate determination and trading were performed outside the platform during the initial phase, its official documents highlighted a specific area of interest for central banks regarding the use of AMMs (BISIH-Dunbar, 2022a, p. 25). Project Mariana was the key initiative exploring this DeFi mechanism and employed an entirely different approach using AMM, to algorithmically determine FX rates within a liquidity pool (BISIH-Mariana, 2023a, p. 12-13). Therefore, it integrated on-chain mechanisms for pricing and settlement rather than relying on participants to establish rates off-chain.

However, no subsequent or parallel projects have emerged since Mariana adopted this approach, suggesting that central banks, within the Hub, may still be hesitant to use DeFi methodologies for pricing less commonly traded currency pairs. More recent initiatives, such as Nexus and Agorá, emphasize the use of an intermediary currency as a key factor in sustaining scalable projects. The reliance on third currencies to determine exchange rates between local currency pairs may hinder the scalability of cross-border projects seeking to bypass the US dollar or other major currencies as intermediary monetary references. This issue is particularly relevant for mBridge, given its explicit objective of facilitating cross-border transactions using local currencies (BISIH-mBridge, 2023a, p. 2). Achieving this policy goal may require not only enabling direct value exchanges through local CBDCs but also minimizing, as much as possible, the dependence on major currencies as units of account.

3.8. The BIS Innovation Hub: Key Roles for Monetary Cooperation

The BIS Innovation Hub’s various projects demonstrate diverse approaches to monetary cooperation, with each initiative emphasizing unique roles, governance structures, and collaborative dynamics. The diversity in these projects showcases the Hub’s adaptability and flexibility in addressing complex monetary issues within these coalitions.

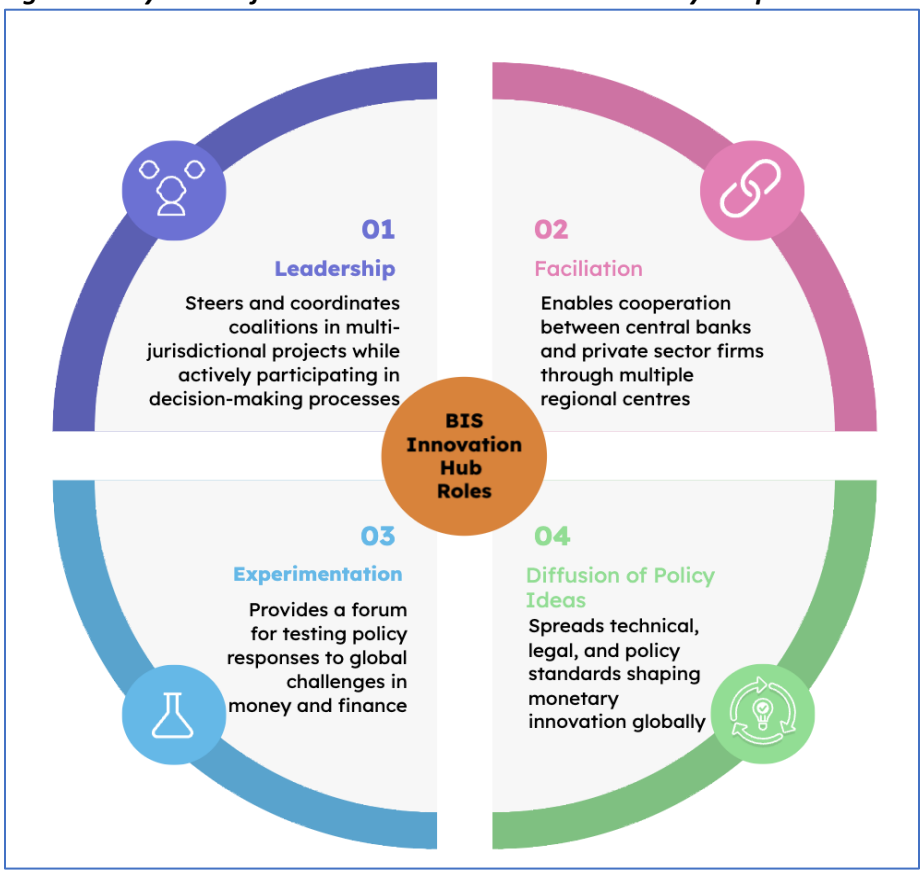
The Hub's role across projects includes leadership and coordination, dialogue facilitation through regional centres, policy diffusion and knowledge sharing, and experimentation (see **Figure 4**). In Project Agorá, it seems that the BIS has a more active role by "inviting" central banks to join this initiative and provides the ideational framework for the project, i.e., "to test the feasibility of a multi-currency ledger for cross-border payments, *based on the vision* laid out in Chapter 3 of the 2023 BIS Annual Economic report" (BISIH-Agorá, 2024b, p.8; emphasis added). In this context, the Hub is more than just a forum; it

explicitly and actively represents the BIS's interests and policy ideas throughout the project's development and coalition governance.

mBridge highlights the BIS as a coordinator, with its Hong Kong Centre chairing a Steering Committee that includes central banks from Asia and the Middle East, but the reference of the use of local currencies, as one of the project's aims, seems to represent the views of the central bank participants. Before the Hub's involvement, mBridge began as "Project Inthanon-LionRock" in 2019, led by the Hong Kong Monetary Authority and the Bank of Thailand (BISIH-mBridge, 2021b). In 2021, with support from the Hub's Hong Kong Centre, the People's Bank of China's Digital Currency Institute, and the Central Bank of the United Arab Emirate, the project entered a new phase of development.

Within the Jura, the BIS acts as a key facilitator in a multi-jurisdictional experimental environment between two European central banks and private institutions. Mariana and Dunbar highlight the Hub's role in enabling innovation through experimentation, emphasizing learning over immediate outcomes, between central banks from Asia and Europe (Mariana), and Asia, Oceania, and Africa (Dunbar). Nexus's ambition to connect domestic IPS globally exemplifies the Hub's role in fostering coordination in scalability and standardization; the documents expressly reveal that the BIS "will support a coalition of countries interested to implement Nexus" (BISIH-Nexus, 2024a, p.6).

Figure 4. Key Roles of the BIS Innovation Hub in Monetary Cooperation



Source: Public sources and author's elaboration

From an institutional perspective, these projects exhibit varied collaboration structures. Agorá, mBridge, Nexus, and Jura underscore structured partnerships among public and private entities, emphasizing shared decision-making and resource allocation. The systematic inclusion of private sector firms in all projects further demonstrates the public-private hybridity of monetary and financial systems, and the pragmatic approach of the Hub as a coordinator of coalitions on innovation.

Mariana and Dunbar's exploratory nature offers insights into designing flexible governance structures for early-stage innovation. These projects provide a blueprint for prioritizing experimentation. Jura, bridging experimentation and production, calls for more robust legal, technological, and oversight frameworks for transitioning from proof of concept to operational systems, which seems to be further developed in the mBridge Project. In this context, Nexus and mBridge stand out with a vision for global real-world implementation, focusing on interoperability and scalability. Their approach could inspire similar efforts to integrate regional and global systems into a cohesive framework, albeit requiring extensive coordination and cooperation among diverse stakeholders within these coalitions.

The BIS Innovation Hub's policy actions highlighted the importance of defining tailored roles that align with the specific needs of each initiative and its corresponding coalition. Depending on the project's design and stage, the Hub can serve as a knowledge-based leader, technical coordinator, or facilitator. From the analysis of the projects, it engaged in fostering knowledge sharing, promoting mutual learning, and facilitating decision-making through governance mechanisms.

The Hub's projects also emphasized the value of public-private hybridity, highlighting the need for structured partnerships with shared decision-making protocols and resource allocation. Projects such as the Nexus demonstrate how multi-stakeholder coordination, including private actors, can be designed as an external non-for-profit structure for achieving interoperability, scalability, and financial sustainability.

Another critical factor in the Hub's achievements appears to be its ability to balance the specificity of each coalition with broader global aspirations. The Hub's organization is based on local representations that can address regional needs while contributing to a cohesive shared vision on monetary innovation. Notably, different projects showed the importance of the Hub's representation in Asia (Hong Kong and Singapore) and Europe (Eurosystem Centre and Switzerland).

4. Conclusion

This article explored the policy, technological, and legal lessons of the central bank-centred coalitions for monetary innovation through a qualitative and comparative analysis of seven BIS Innovation Hub-led projects. It highlighted how technological innovations, notably anchored in DLT, can serve as the foundation for a more decentralized and efficient (possibly, more inclusive) global payment infrastructure.

By adopting the lens of the "coalitions of the willing and able," this research has explored how states, represented by their central banks, and regulated private actors are leveraging monetary innovations to sustain cooperation within a specific global forum, the BIS Innovation Hub. The monetary experiments contributed to advancing the theoretical framework of the coalition of the willing by illustrating the Hub utility as an innovation incubator within IMS. Characterized by flexibility, voluntary participation, shared policy goals and interest, pragmatism, experimentalism, and a certain degree of formality, the Hub-led

projects illustrate how central bank coalitions can bypass the slow, politically contentious processes of more traditional multilateral organizations to achieve targeted policy outcomes. This shift toward coalition-led multicurrency platforms, based on more flexible and contractual arrangements, represents a significant departure from the centralized monetary governance embodied by international institutions such as the IMF.

A critical insight from this study is the significant role central banks play in shaping the governance and technological frameworks underpinning cross-border initiatives. The Hub-led projects—Agorá, Dunbar, Jura, Mariana, mBridge, Nexus, and Rialto—demonstrated the feasibility of such monetary experimentations and highlighted their potential to reconfigure payment infrastructures. The technological dimension of these initiatives, particularly the integration of DLT, offers an expanded perspective on the coalition framework, emphasizing the importance of technological capabilities as a driver of monetary collaboration.

All of the Hub-based initiatives provided practical policy and technical solutions for future collaborations attempting to establish payment systems at global levels that would eventually transcend the US dollar-led framework, including the embryonic BRICS+ Cross-Border Payment Initiative. These Hub's coalitions reveal a collective policy ambition to create a new form of public good: a decentralized, multicurrency platform for cross-border payments that aligns with the shared objectives of efficiency and financial stability.

The findings presented in this article demonstrate that shared multicurrency platforms can potentially address critical shortcomings in the current IMS. Among the most pressing challenges are the high costs, slow processing times, limited accessibility, and regulatory redundancies associated with existing systems. By leveraging cryptography, programmability, and atomic settlement, multicurrency platforms can reduce the number of intermediaries and offer a paradigm shift, characterized by potentially greater transparency, and enhanced operational efficiency for international transactions.

Governance structures for organizing cooperation have emerged as a critical factor in the success of the coalitions on monetary innovation. The BIS Innovation Hub has demonstrated a pragmatic approach, balancing formal and informal mechanisms to foster collaboration among central banks and private-sector actors. The governance frameworks established for projects such as Nexus and mBridge emphasize the importance of legal certainty, operational oversight, and stakeholder representation. These models can provide valuable lessons for designing governance structures that accommodate jurisdictional diversity while ensuring alignment with shared policy objectives. Moreover, the emphasis on public-private partnerships underscores the hybridity of modern financial systems, where public authorities and private entities collaborate to achieve common goals.

However, certain challenges persist across various Hub-led projects. The findings of this study emphasise shortcomings that must be addressed to realize their full potential. Firstly, one key concern, raised by coalitions in different initiatives, is balancing common rules to support cooperation within shared platforms with national regulatory requirements for cross-border transactions. Specific technological features can allow for the combination of both, but not without adding complexity to the system and refined legal work from the supporting teams of each initiative. In addition, the development of harmonized frameworks that address issues such as data privacy and security seem to be essential to fostering trust and ensuring the sustainability of these platforms.

Secondly, the exclusionary nature of "coalitions of the willing and able" raises concerns about equity and inclusivity. While these coalitions enable expedited decision-making and targeted collaboration, they also risk marginalizing certain states (and their central banks) with limited financial and human resources. Efforts to expand participation and integrate diverse perspectives will be essential to ensure that multicurrency platforms, as a new type of public good, contribute to a genuinely inclusive IMS. For instance, Nexus clearly vocalizes "inclusivity" as a key outcome for enhancing cross-border transactions.

Thirdly, from a geopolitical perspective, the emergence of these monetary innovations could indicate a shift toward a more fragmented IMS. Over time, these distinct clusters of countries have adopted varied approaches, as seen in the differences between Agorá (2024) and mBridge (2021) in terms of coalition formation and underlying concepts. mBridge places a strong emphasis on expanding the range of currencies traded globally, signalling its intention to eventually reduce the dominance of the US dollar as the primary global money. In contrast, Agorá seeks to improve the role of traditional correspondent banking, integrating SWIFT and other established actors within a new, potentially more efficient infrastructure. Geopolitical tensions were further highlighted by the departure of the BIS from the mBridge Project in October 2024.

Fourthly, scalability of cross-border initiatives remains an open question. While pilot projects have demonstrated technical feasibility, scaling these platforms to accommodate a broader range of currencies, jurisdictions, and use cases will require significant investment in infrastructure, governance, and regulatory harmonization. Interoperability with existing systems and alignment with international standards (e.g., RTGS and ISO 20022, respectively) seem to be critical to achieving widespread adoption and seamless integration. In addition, at least two Hub-led projects (Agorá and Nexus) identified another key scalability requirement: the use of intermediary currencies, such as the US dollar or the euro, as monetary references for determining FX rates between less-traded currency pairs.

While current central bank coalitions in the Hub did not reassess the AMM approach used in DeFi (explored originally by Mariana), future platform developments could integrate this functionality at a later stage. By redefining AMM protocols to better align with the coalition’s objectives and operational requirements, these projects could offer an alternative to traditional order book-based FX systems, potentially reshaping the structure of FX markets. However, the integration of AMMs also brings distinct risks that coalitions must evaluate and mitigate.

Another policy option is the adoption of a common unit of account among willing participants. Unlike AMMs, which could be considered as a more technical choice, this approach would demand a greater degree of political consensus. The new unit could be anchored to a basket of currencies or other real-world assets, such as commodities. Historical and institutional precedents, such as the former European Currency Unit (ECU), offer policy insights into the required conditions and potential implementation at regional levels. Although the ECU was eventually supplanted by the euro, it remains a notable example of cooperation aimed at mitigating currency instability through multilateral efforts. Alternatively, coalitions could leverage the Special Drawing Rights (SDR), an existing IMF-managed unit of account.[20]

[20] During the 1970s, several units of account based on baskets of currencies were introduced, but only the SDR and the ECU proved enduring. The SDR, created by the IMF, continues to serve as a global unit of account and a supplementary reserve asset for IMF member countries. The ECU, initially conceived as a precursor to the euro,

Finally, a key development and policy question that emerges from the analysis of these projects is whether the role of the Hub could be replicated by other alternative forums, such as the BCBPI proposed by BRICS+. From this article's analysis, it seems that an alternative forum must integrate the flexibility, adaptability, and collaborative governance structures exemplified in the Hub's projects, while maintaining a certain degree of formality based on contractual mechanisms to ensure legal certainty for the public and private entities involved in the projects. Establishing such a forum requires careful attention to defining roles, fostering public-private collaboration, supporting technical experimentation, and ensuring scalability and interoperability for future platforms. Pathways can be designed to move projects from proof-of-concept stages to operational systems, addressing legal, regulatory, and oversight frameworks to ensure sustainability and participants' engagement. By learning from the Hub's diverse projects and the coalitions formed within it, such a forum can design solutions that are globally relevant while remaining adaptable to regional and local contexts. Beyond the BIS Innovation Hub, these developments will be critical in leveraging the transformative potential of coalitions to create a more efficient and possibly equitable IMS.

circulated until 1999. The evolution of both the public and private ECUs provides a valuable case study in the role of public authorities and private actors in fostering the success of a regional monetary reference. For an analysis of the role of the BIS supporting the institutional development of the ECU, see Giovanoli (1992).

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Appendix

List of BIS documents by Innovation Hub-led project

All the official project documents were organized and classified in this analytical table.

Project Rialto (2024)

BISIH-Rialto. (2024). *Project Rialto - Improving instant cross-border payments using wholesale CBDC settlement*. URL: https://www.bis.org/about/bisih/topics/cbdc/rialto.htm

Project Agorá (2024)

BISIH-Agorá. (2024a). *Private sector partners join Project Agorá*. URL: https://www.bis.org/about/bisih/topics/fmis/agora.htm

BISIH-Agorá. (2024b). *Project Agorá – Call for Participation*. URL: https://www.bis.org/innovation_hub/projects/agora_application_package.pdf

BISIH-Agorá. (2024c). *BIS, central banks and the IIF invite private financial institutions to join Project Agorá*. URL: https://www.bis.org/press/p240514.htm

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