



Interoperability: Bridging the Cross-Border Gap in a Faster Payments World

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Executive Summary

This report examines the current state of the end-to-end cross-border payment journey through the lens of interoperability. Despite significant advances in faster payments, ISO 20022 adoption, and emerging digital settlement models, cross-border payments remain fragmented, costly, and operationally complex. In the middle mile, these gaps surface as disjointed payment systems, inconsistent messaging standards, and disconnected settlement arrangements; at the first and last mile, they appear as access and delivery challenges. These challenges are further compounded by the complexity of coordinating liquidity across markets.

The analysis evaluates two emerging architectural approaches. Shared connectivity models, such as Project Nexus, seek to improve interoperability by linking domestic payment systems through common messaging, routing, and participation frameworks. Shared ledger models, including stablecoins and deposit tokens, seek to simplify value transfer by enabling settlement on a common digital infrastructure while providing greater flexibility in liquidity and foreign exchange management, allowing FX conversion at different points of value transfer. Both approaches are assessed in terms of their impact on cost, speed, access, liquidity efficiency, and consistency.

Access is expanding from traditional bank accounts to digital asset wallets and other non-bank endpoints—all subject to the same regulatory, AML, and consumer protection requirements. As it does, interoperability increasingly depends on effective coordination across compliance, identity, trust, data management, and operational frameworks—areas where the report identifies persistent gaps before concluding with a path forward.

Introduction

The cross-border paradox: innovation exists, the problem persists

Cross-border payments remain fragmented, slow, expensive, and often inaccessible — not for lack of innovation, but because structural gaps persist in the middle-layer interoperability and first- and last-mile access, all compounded by the complexity of coordinating liquidity across markets.

As a result, the end-to-end payment journey, from origination to final delivery, continues to break down, even though ISO 20022-based messaging and emerging approaches such as Faster Payment System (FPS) linkages (e.g., Project Nexus) and shared ledger systems (including stablecoins and deposit tokens) demonstrate meaningful progress toward improving interoperability.

What is this report about?

The report examines why the three segments of the cross-border payment journey: first mile (origination), transport-layer interoperability (middle mile), and last mile (delivery), continue to function as loosely connected components rather than as a single coordinated system. Its central argument is that interoperability — across messaging standards, operating rules, and settlement models — is the mechanism required to align these layers so that improvements in faster payment systems translate into better cross-border outcomes.

Interoperability challenges are most concentrated in the middle layer, where domestic payment systems must connect across networks with differing technical standards, rule frameworks, and settlement arrangements. Despite progress in ISO 20022 adoption, new faster payment system linkages, and emerging settlement approaches, fragmentation across these areas continues to limit seamless end-to-end movement of value.

These gaps become most visible at the edges of the system. The first mile shapes how easily senders can initiate cross-border payments through accessible accounts, wallets, and networks. The last mile determines how reliably funds reach the recipient in usable form. By examining interoperability across all three segments, the paper identifies where connectivity is improving, where structural disconnects persist, and what types of coordination are required to make cross-border payments function as a cohesive end-to-end system. Many of the interoperability challenges discussed in this paper align with priorities already identified in the G20 Roadmap for Enhancing Cross-Border Payments, including faster payment system interlinking, ISO 20022 adoption, broader access, and regulatory coordination.¹ This paper builds on these efforts by examining the remaining operational, liquidity, semantic, and governance gaps that continue to affect end-to-end interoperability.

Approach

- I. Defines the cross-border payments problem through the lens of interoperability across the middle layer, and first and last mile
- II. Examines the current state
 - a. Middle-layer interoperability, including scheme linkages, shared ledger models, messaging alignment, and settlement coordination
 - b. First and last mile access, including bank account and wallet reach, non-bank access points, domestic payment system connectivity, and end-user access to funds

- III. Evaluates emerging approaches based on their impact on cost, speed, access, security, and liquidity efficiency
 - a. Shared Connectivity Model: Project Nexus
 - b. Shared Ledger Model: Stablecoins and Deposit Tokens
- IV. Outlines the remaining gaps that must be addressed to improve interoperability across the end-to-end cross-border payment flow
- V. Discusses the path forward focusing on improving interoperability

I. End-to-End Flow of Interoperability

In the context of cross-border payments, interoperability is the answer to a fundamental question: how does a payment initiated in one domestic system reach a beneficiary in another, without losing data, incurring unnecessary cost, or requiring manual intervention along the way?

A payment initiated in one domestic system must move across multiple institutions, regulatory environments, messaging frameworks, and settlement arrangements before reaching a beneficiary in another market. The challenge is not simply transmitting payment instructions between systems, but enabling different payment infrastructures to operate together consistently, efficiently, and predictably across borders. This is facilitated by an end-to-end interoperability journey that has three parts as shown in Figure 1.



Figure 1: End-to-End Flow for Interoperability has three parts

Unlike domestic payment systems, where interoperability is often supported by shared operating rules, messaging standards, and settlement frameworks, cross-border payments operate across fragmented institutional environments and markets. The global payment ecosystem has evolved as a network of domestic payment systems, correspondent banking relationships, regional arrangements, and intermediary messaging layers developed independently over decades. As a result, cross-border transactions frequently move through fragmented operational chains where differences in data standards, compliance requirements, operating rules, and settlement coordination introduce friction into payment execution.

These frictions affect the core dimensions of cross-border payment performance: cost, speed, access, network security, liquidity efficiency, and consistency. Payments may pass through multiple intermediaries, require repeated compliance checks, depend on corridor-specific operational processes, or rely on liquidity positioned across markets. While most payments ultimately reach their destination, the process remains operationally complex, costly, opaque, and inconsistent compared to modern domestic instant payment experiences.

Middle Mile

The middle mile is addressed first because interoperability failures at this layer are the primary constraint on cross-border payment performance. First and last mile access gaps compound those failures but cannot be resolved without first establishing the connectivity and consistency that the middle mile requires.

Layers Defining the Middle Mile Interoperability

To understand why interoperability in the middle mile remains incomplete, it is useful to consider the three interconnected layers: technical interoperability, semantic interoperability, and governance interoperability.²

- **Technical** interoperability concerns the ability of payment systems to connect and exchange transactions through common interfaces, APIs, messaging protocols, routing mechanisms, and infrastructure connectivity. This layer enables systems to communicate with one another but does not by itself guarantee that payment information will be interpreted consistently or processed according to the same operational rules.

- **Semantic interoperability** concerns the consistent interpretation of payment data across institutions and markets. Shared standards such as ISO 20022 improve semantic interoperability by enabling richer, more structured, and machine-readable payment information. Without semantic consistency, technically connected systems may still require manual repair, exception handling, or data transformation due to differences in how payment information is interpreted.
- **Governance interoperability** concerns the institutional and operational frameworks that allow interoperable systems to function reliably at scale. This includes operating rules, participant obligations, dispute resolution processes, liability allocation, compliance coordination, and mechanisms for change management. Governance interoperability is ultimately what transforms technical connectivity into a sustainable and trusted payment network.

These three layers together determine whether payment systems are merely connected or truly interoperable. Technical interoperability enables communication. Semantic interoperability enables consistency and automation. Governance interoperability enables trust, scalability, and coordinated operation across markets.

Interconnectivity vs. Interoperability

In discussions on cross-border payments, the terms interconnectivity and interoperability are often used interchangeably. In practice, however, many initiatives described as interoperability efforts primarily improve interconnectivity. Interconnectivity refers to the technical ability of systems to exchange payment messages or transactions. Systems may be connected through APIs, messaging gateways, correspondent banking arrangements, or network interfaces while still operating independently with different rules, data structures, and settlement processes. Interoperability goes further. It describes the ability of payment systems to function together seamlessly across technical, semantic, and governance layers so that transactions can move across markets without requiring extensive manual coordination, translation, or corridor-specific operational handling.

This distinction has become increasingly important as domestic instant payment systems continue to expand globally. More than eighty countries now operate faster payment infrastructures capable of processing domestic transactions in seconds. While these developments improve technical interconnectivity between payment environments, they do not by themselves establish full interoperability across markets. Yet improvements in domestic payment speed have not translated into comparable improvements in cross-border payments. International transactions continue to depend heavily on fragmented intermediary arrangements that were not originally designed for real-time, data-rich, always-on payment environments.

First and Last Mile

From a first and last mile perspective, payment system interoperability is ultimately measured by whether funds can reach end users in a form that is accessible and useable to them. International policy work led by the G20, the Financial Stability Board, and the BIS consistently emphasizes that improving cross-border payments requires progress not only in the middle layer, but also at the first and last mile, where access constraints are more visible to end users. Even where financial institutions and domestic payment systems are technically interoperable, outcomes for consumers and small businesses may remain constrained if recipients lack suitable account access or face friction converting funds into useable value.

Liquidity

Although the primary focus of this paper is interoperability, liquidity remains a critical cross-cutting operational constraint in determining whether cross-border payments can move efficiently in practice. Interoperability determines how systems connect, but liquidity determines whether funds are available in the right currency and market at the right time to complete a transaction. Cross-border payments often require institutions to hold money in advance in accounts located in other countries or currencies, so payments can be processed when transactions occur.

Stablecoins and other digital assets are beginning to alter this requirement, allowing FX exchanges to be either optional or conducted before or after the funds transfer. However, today's cross-border system continues to rely significantly on correspondent banking relationships, where banks hold balances with each other across markets to facilitate international payments. While this model enables global reach, it also requires institutions to maintain significant amounts of capital in multiple currencies and markets. Funds held in these accounts cannot easily be deployed for lending, investment, or other revenue-generating activities. In addition, post-crisis regulatory reforms such as Basel III have increased the balance sheet and liquidity costs associated with maintaining these relationships. As a result, cross-border correspondent banking has become more expensive to operate.

Large global banks are generally better positioned to absorb these costs because their transaction volumes justify maintaining broad correspondent networks. Smaller banks, credit unions, and regional financial institutions often cannot efficiently maintain balances across many corridors and therefore rely on larger intermediaries for international payment access. This creates access gaps that can increase dependency on a smaller number of global institutions, reduce competition, and contribute to higher costs and lower transparency in cross-border payments. Over the past decade, the number of correspondent banking relationships globally has declined even as cross-border transaction volumes have continued to grow, reflecting the increasing cost and complexity of maintaining these networks.³

These rising costs ultimately affect end users. Institutions operating in higher-cost corridors may pass these costs to customers in the form of higher remittance fees, less favorable foreign exchange pricing, slower settlement times, or reduced service availability in lower-volume markets. In some corridors, particularly those with limited transaction scale, perceived higher risk or fragmented banking infrastructure, the cost of maintaining liquidity can become a major barrier to improving payment efficiency. This dynamic can become self-reinforcing: when providers withdraw from higher-risk or higher-cost corridors, transaction scale falls further, discouraging new entrants and leaving those corridors persistently underserved.

At the same time, improvements in interoperability can reduce some of these liquidity frictions. More standardized messaging, clearer settlement rules, and more direct system linkages can reduce the need to maintain separate pools of balances across multiple intermediaries and corridors. Improved interoperability can also enhance visibility into funding positions and enable liquidity to be utilized more efficiently across payment networks. In this way, liquidity shapes what interoperability can achieve, while stronger interoperability can also improve how efficiently liquidity is managed. The paper therefore treats liquidity not as a separate problem space, but as a foundational cross-cutting constraint that both influences and is influenced by progress in interoperability across the first mile, transport layer, and last mile.

II. Current State

Current State of the Middle Mile for Cross-Border

Against the three layers of interoperability: technical, semantic, and governance, the current state of cross-border payments reflects a system that is increasingly interconnected but not yet fully interoperable.

Expansion of Domestic Faster Payment Systems

The expansion of domestic faster payment systems has strengthened technical infrastructure within national boundaries but introduced new governance and semantic fragmentation at the global level. Each system operates under its own participation rules, liability frameworks, dispute processes, and data implementation choices. These differences make cross-border interoperability more complex, as alignment is required not only at the level of technical connectivity but also across rule frameworks and data interpretation.

Bilateral Agreements Dominate

The most common form of cross-border interoperability today is a point-to-point arrangement between two domestic systems or two financial institutions. These arrangements establish technical connectivity, allowing payment instructions to pass between systems, but they do not create shared rule frameworks that scale across markets. Each corridor requires separate negotiation of participation terms, compliance responsibilities, liability allocation, dispute resolution processes, and operational procedures. In this sense, bilateral arrangements primarily address technical interconnectivity while limiting governance interoperability. As the number of corridors increases, the complexity of maintaining these relationships grows, restricting participation to institutions with sufficient scale to establish and manage multiple bilateral agreements. The result is a network of connections that enables payments to move between systems but does not produce consistent operating conditions across corridors. Multilateral frameworks seek to introduce shared rule structures and more consistent coordination mechanisms across systems, but adoption remains uneven and evolving.

Swift Remains the Primary Global Messaging Backbone

Swift operates primarily on the technical layer and increasingly at the semantic layer by enabling institutions to exchange standardized payment messages across a global network. However, Swift does not move funds; it transmits payment instructions between financial institutions that maintain correspondent account relationships required to settle those instructions. Swift therefore provides interconnectivity through messaging, while the underlying settlement process continues to rely on bilateral correspondent relationships governed outside the messaging network. The adoption of ISO 20022 within Swift represents meaningful progress in semantic interoperability by enabling richer and more structured payment data to move across institutions. However, differences in implementation across markets, as well as continued reliance on correspondent settlement arrangements, mean that governance and settlement coordination remain fragmented. Improvements in messaging enhance connectivity and data consistency, but do not fully resolve the rule alignment and liquidity coordination required for end-to-end interoperability.

Role of Data Standards and Straight-Through Processing

Consistent interpretation of payment data remains a persistent challenge in cross-border payments. Payment instructions often pass through multiple institutions that use different message formats, field structures, and regulatory data requirements. As information is translated across systems, payment details may be truncated, reformatted, or manually interpreted, increasing the likelihood of errors, investigations, and processing delays.

The migration toward ISO 20022 represents progress toward improved semantic interoperability by enabling richer, more structured, and machine-readable payment data. Many domestic faster payment systems and international networks are adopting ISO 20022 to improve data consistency, compliance screening accuracy, and transparency across the payment lifecycle. More standardized data supports higher straight-through processing (STP) rates by reducing the need for manual repair and exception handling. This is becoming increasingly important as sanctions regimes grow more complex and any payment touching the US dollar effectively becomes subject to US screening expectations. Compliance and sanctions screening costs have become one of the largest operational cost drivers in correspondent banking.

However, implementation remains uneven across markets. Differences in practice guidelines, optional data fields, and legacy system constraints continue to affect how payment information is interpreted across institutions. ISO 20022 improves how payment data is communicated but does not by itself resolve differences in operating rules, settlement models, liquidity coordination, or network-specific message usage. As a result, semantic interoperability continues to evolve alongside broader efforts to improve connectivity and settlement coordination across cross-border payment systems. Initiatives such as Swift GPI have significantly improved payment tracking and transparency across correspondent banking networks. However, end-to-end visibility remains incomplete when payments move across fragmented domestic onboarding, payout, and settlement environments at the first and last mile. Operational fragmentation also persists through nested correspondent banking relationships, where smaller banks access global payment networks through larger intermediary institutions. In these structures, due diligence, sanctions screening, and compliance reviews are often repeated across multiple layers, increasing operational complexity and cost.⁴

Taken together, the current state of middle-layer interoperability reflects progress concentrated primarily at the level of technical interconnectivity, with incremental improvements in semantic alignment through standards such as ISO 20022. Governance interoperability, including shared rule frameworks, consistent participation models, and coordinated settlement approaches, remain fragmented across markets. The system therefore operates as a set of connected infrastructures rather than as a unified payment environment. Understanding this helps explain why improvements in domestic payment speed and messaging richness have not yet translated into consistent end-to-end cross-border outcomes.

Current State for the First and Last Mile for the Cross-Border

Bank Account-to-Bank Account Transfers Remain Central

Most international transactions still begin and end as bank account-to-bank account payments. Customers initiate payments from domestic bank accounts, businesses manage liquidity and treasury operations through banking relationships, and recipients ultimately expect funds to settle into locally accessible accounts. As a result, the effectiveness of cross-border interoperability depends not only on how efficiently value moves across markets, but also on how seamlessly interoperability models integrate with domestic banking systems at both the sending and receiving ends of the transaction.

The first mile refers to the process through which funds enter the cross-border payment flow from the originating bank account. This includes customer onboarding, account validation, sanctions and AML screening, fraud controls, foreign exchange initiation, and interaction with domestic payment systems. Identity and account verification remain major sources of failed payments and processing exceptions, driving increased adoption of pre-validation initiatives such as Swift Payment Pre-validation and the EU Verification of Payee requirements.⁵

The last mile refers to the delivery of funds into the recipient banking environment, including domestic clearing, account crediting, confirmation of settlement, and customer access to funds. Even where the middle layer becomes highly interoperable, the first and last mile remain governed primarily by domestic banking infrastructure, local regulatory requirements, and institution-specific operational frameworks.

Growth of Non-bank Account Access

The challenges of interoperability and access become even more pronounced in markets where recipients rely on digital asset wallets, mobile wallets, agent banking networks, or cash-out mechanisms rather than traditional bank accounts. In such environments, interoperability extends beyond traditional banking systems into broader questions of access, identity, distribution, and local trust infrastructure.

Global standards bodies generally frame non-bank endpoints not as a separate interoperability layer, but as a dimension of distribution and access that interacts with governance, regulatory alignment, and risk management. BIS and CPMI work highlights that interoperability is a means rather than an end, and that expanding access, whether through banks or non-bank digital asset wallets, must be aligned with AML requirements, consumer protection, liquidity availability, and

domestic legal frameworks.⁶ In this context, digital asset wallets, mobile wallets, agent banking, and cash-enabled payout models can complement bank-account based systems by extending reach at the edges, but also introduce additional coordination channels related to supervision, FX conversion, and trust infrastructure. As a result, policy frameworks such as the G20 Roadmap focus on improving end-user outcomes (i.e., speed, cost, transparency, and access) without prescribing a single account model, recognizing that different markets may require different first-mile initiation or last-mile delivery approaches to translate interoperability into real-world gains.

III. Emerging Architectural Paths

Emerging interoperability approaches are developing along two distinct architectural paths: shared connectivity models and shared ledger models.

- **Shared connectivity models**, such as Project Nexus, seek to improve how existing domestic payment systems interact across markets by introducing common routing frameworks, standardized messaging structures, and coordinated participation rules. These approaches preserve existing banking infrastructure while improving how systems connect, allowing cross-border payments to function more like domestic instant payments in terms of speed, predictability, and transparency.
- **Shared ledger models**, represented by stablecoins and deposit tokens, take a different approach by placing the settlement asset on a common digital infrastructure. Rather than coordinating between multiple payment systems, these models enable value to move directly within a unified environment where payment and settlement occur together. Stablecoins tend to support open, globally accessible financial networks that enable programmable and composable payment flows, while deposit tokens extend existing banking systems into digital rails, preserving regulatory alignment and institutional trust structures.

Figure 2 illustrates the traditional correspondent model alongside the two emerging models. Shared connectivity models focus on reducing fragmentation between domestic faster payment systems through standardized messaging, routing, and participation frameworks. Shared ledger models, in contrast, seek to simplify cross-border value transfer by enabling settlement to occur directly within a common digital environment.

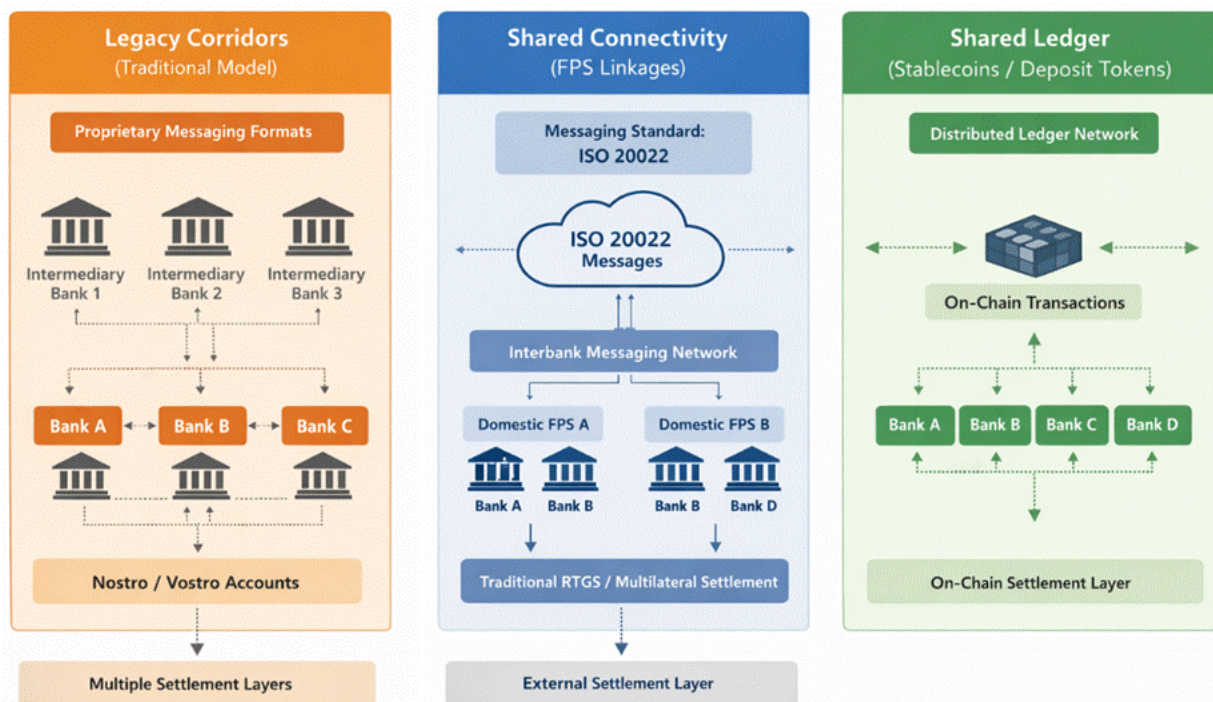


Figure 2: Traditional Correspondent, Shared Connectivity and Shared Ledger Models

The sections that follow examine representative approaches from each emerging model: Project Nexus as an example of shared connectivity across domestic instant payment systems, and stablecoins and deposit tokens as examples of shared ledger settlement models. Each approach is evaluated in terms of how effectively it addresses the structural frictions identified earlier, through a framework of cost, speed, access, security, and liquidity efficiency.

Shared Connectivity Models: Project Nexus

Project Nexus represents one of the most developed examples of the shared connectivity approach to cross-border interoperability. Coordinated by the Bank for International Settlements (BIS), the initiative seeks to enable instant cross-border payments by interlinking domestic instant payment systems through a common interoperability framework rather than through separate bilateral integrations between countries.

The initiative responds to a central limitation of the current cross-border payment system: fragmentation created by corridor-specific integrations. While more than eighty domestic instant payment systems are now operational globally, most cross-border transactions still depend on intermediary routing structures, correspondent banking relationships, and bespoke operational arrangements between markets. Each additional corridor typically requires separate technical integration, compliance alignment, operational coordination, and participation agreements. As more systems connect, this creates a complex and difficult-to-scale network structure.

Project Nexus addresses this problem through a multilateral interoperability model. Instead of requiring each domestic payment system to establish separate bilateral connections, systems connect once to a shared interoperability layer. This hub-and-spoke structure standardizes routing, messaging, participant identification, and operational coordination across markets, reducing dependence on corridor-specific integrations. The approach seeks to extend the efficiency and user experience of domestic instant payments into cross-border environments while preserving local regulatory and operational structures.

The initiative currently includes participation from central banks and domestic instant payment systems across Southeast Asia and India, including Malaysia, Singapore, Thailand, the Philippines, and India, with Indonesia participating as an observer. The participating systems include nationally significant payment infrastructures such as Singapore's FAST, Thailand's PromptPay, India's UPI, Malaysia's RPP, and the Philippines' InstaPay and PESONet. Together, these systems represent a large and rapidly growing cross-border payments environment spanning both retail and commercial payment flows. The collaboration also reflects broader G20 and ASEAN priorities focused on faster, cheaper, more transparent, and more inclusive cross-border payments.

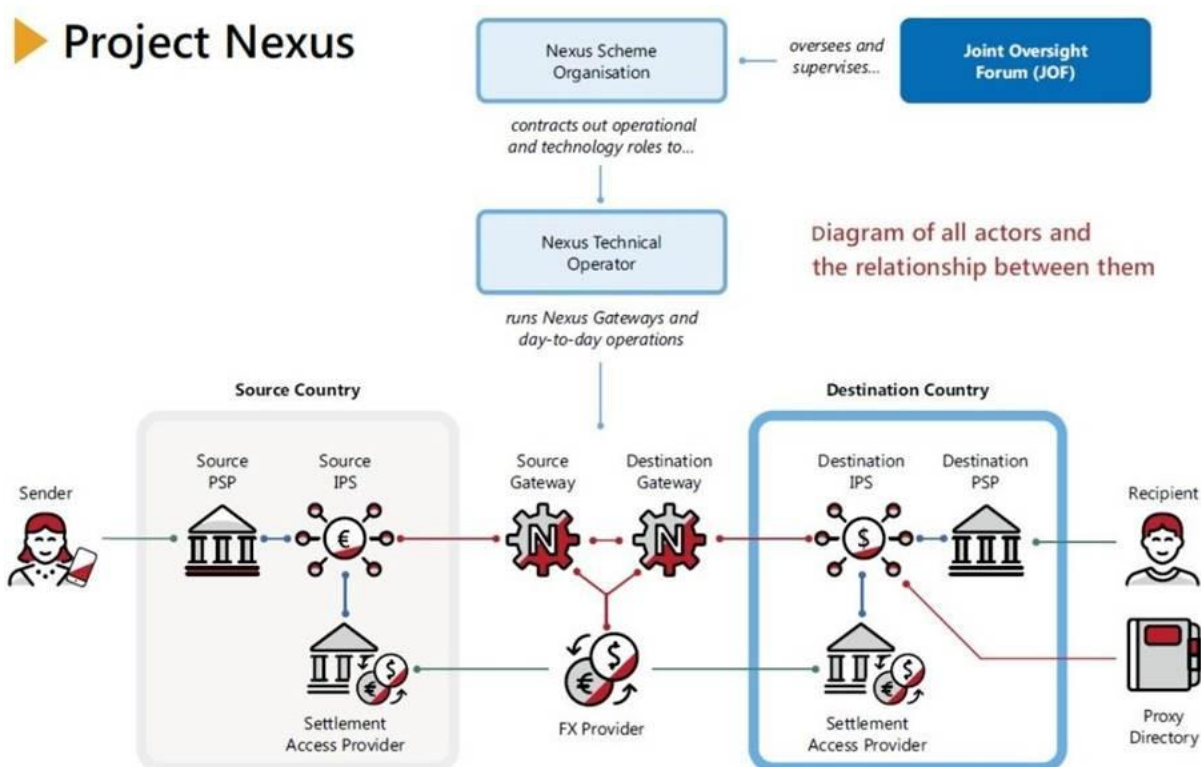
Importantly, Project Nexus does not introduce a new payment rail or settlement asset. Domestic instant payment systems continue to operate according to local regulatory frameworks and settlement arrangements, while foreign exchange conversion and liquidity provision remain external to the interoperability layer. The model therefore seeks to improve how existing systems coordinate rather than replacing underlying domestic infrastructures. This evolutionary approach is significant because it allows interoperability improvements to leverage already established domestic payment investments rather than requiring institutions or regulators to adopt entirely new settlement systems.

From an interoperability perspective, Project Nexus primarily strengthens technical and governance interoperability while also improving semantic interoperability through standardized ISO 20022 messaging. Common routing structures and participation frameworks improve consistency in how payment instructions move across markets, while richer and more structured payment data supports greater straight-through processing and reduced operational repair activity. At the same time, because settlement and liquidity management remain institution and market specific, interoperability improvements occur primarily through coordination rather than through unified settlement infrastructure.

Project Nexus also illustrates how interoperability is increasingly becoming a policy and economic coordination challenge rather than simply a technical one. The initiative requires alignment across central banks, domestic payment operators, regulatory frameworks, foreign exchange providers, and participating financial institutions. Its long-term success therefore depends not only on technical integration, but also on sustainable governance structures, commercial participation models, and coordinated regulatory oversight across markets.

Relationship to Liquidity and Settlement Coordination

Project Nexus does not change the underlying settlement assets used by participating institutions. Domestic instant payment systems continue to settle transactions according to local frameworks, while foreign exchange conversion is handled by participating institutions or designated providers. However, by reducing reliance on multiple bilateral arrangements and enabling more direct routing across systems, the model can improve how efficiently liquidity is positioned across markets. Interoperability improvements therefore influence liquidity efficiency indirectly, even though liquidity management itself remains outside the Nexus framework.



Source: Actors in Nexus – Conclusions from collaboration July 2024 (<https://www.bis.org/publ/othp86.pdf>)

Figure 3: Project Nexus

Evaluation: Project Nexus

- **Cost:** Reduced reliance on bilateral integrations lowers operational complexity associated with maintaining corridor-specific connections. More direct routing between domestic instant payment systems can reduce intermediary processing costs, while broader participation of FX providers may improve pricing efficiency.
- **Speed:** Payments can move more directly between domestic instant payment systems, reducing delays caused by intermediary routing and message translation. Processing timelines align more closely with domestic instant payment capabilities operating continuously, though completion times still depend on FX coordination and participation across markets. Prefunding helps with speed.
- **Access:** The shared interoperability framework reduces dependence on maintaining multiple correspondent banking relationships, lowering barriers to participation for institutions that lack global networks. Support for local account formats and proxy identifiers such as IBANs, domestic account numbers, phone numbers, or email aliases improves usability and reduces payment failures.
- **Liquidity Efficiency:** Liquidity provision remains external to the interoperability layer. As a result, prefunding requirements and associated trapped liquidity continue to exist across corridors. More coordinated routing and standardized connectivity may improve operational efficiency and reduce some duplication in liquidity positioning, but they do not fundamentally eliminate the need for prefunded liquidity across market.
- **Network Security:** The Nexus Scheme Rulebook establishes a common set of participant admission standards, account resolution requirements, and compliance obligations across all connected systems, replacing the corridor-by-corridor negotiation of bilateral arrangements with a single enforceable baseline. However, compliance responsibilities remain aligned with domestic regulatory frameworks, preserving institutional accountability for sanctions screening and fraud controls.
- **Consistency:** Project Nexus enforces data layer consistency by requiring payments to conform to a single messaging standard ISO 20022. Domestic systems that use different formats convert before entering the network carrying the same data structure and definitions, making reconciliation, compliance checks, and straight-through processing predictable end to end. More consistent data structures and structured information exchange reduce false positives and improve payment transparency, giving participants and end users more reliable visibility across corridors.

Manifestation in the First and Last Mile

In shared connectivity models such as Project Nexus, the first and last mile remain largely unchanged. Customers continue to send and receive funds through domestic bank accounts, while domestic instant payment systems continue to operate under local rules and regulatory frameworks. The interoperability layer improves coordination between systems by standardizing routing, messaging, and participation structures across markets, allowing payment instructions to move more efficiently between domestic payment environments. In this model, interoperability primarily improves the transport and coordination layer between banks rather than replacing the underlying banking relationships themselves.

As a result, many customer-facing frictions remain tied to domestic banking conditions. Payment outcomes may still depend on local account structures, onboarding requirements, fraud controls, operating rules, and foreign exchange arrangements at either end of the transaction. A payment may move efficiently through the interoperability layer yet still experience delays or costs associated with domestic account validation, compliance review, liquidity positioning, or payout processing within the receiving banking system. Shared connectivity therefore improves coordination across banking systems but does not fully harmonize the domestic environments in which those systems operate.

Shared Ledger Models: Stablecoins and Deposit Tokens

Shared ledger models approach interoperability from a fundamentally different architectural perspective. Rather than improving coordination between separate domestic payment systems, these models place payment and settlement within the same digital environment. Stablecoins and deposit tokens are the most prominent examples of this approach.

Stablecoins are digitally native instruments that are backed by reserve assets such as cash or short-term government securities. They operate on public or permissioned blockchain networks and allow tokenized value to move directly between participants on the network. Deposit tokens, by contrast, represent tokenized commercial bank liabilities issued within regulated banking frameworks. While the governance and regulatory treatment of these instruments differ significantly, both models rely on shared ledger infrastructure to coordinate payment, clearing, and settlement within a common technical environment.

This architecture addresses a different limitation of the current cross-border system. Traditional international payments require coordination across multiple institutions, messaging systems, correspondent relationships, and settlement processes. Shared ledger models reduce this coordination burden by enabling participants to transact directly within a common infrastructure where transaction records, settlement finality, and asset ownership are maintained on the same ledger. Rather than improving interoperability between separate systems, interoperability emerges from operating within the same settlement environment. This benefit is most pronounced when participants operate on the same ledger, as moving value across the hundreds of stablecoins and blockchains that exist today often requires additional coordination, which can add complexity, create fragmentation, and increase costs.

This structure can have important implications for cross-border payments. Transactions can settle continuously without sequential intermediary coordination, reconciliation processes can become more automated, and liquidity can potentially move more fluidly across participants and markets. Shared ledger models may also reduce dependence on correspondent banking networks in corridors where access to traditional banking infrastructure is limited or expensive.

At the same time, these models introduce new operational and governance considerations. Stablecoins and deposit tokens require custody infrastructure, digital identity controls, wallet management frameworks, and mechanisms for key management and transaction authorization. Regulatory treatment also varies significantly across markets, particularly for stablecoins operating outside traditional banking structures. In addition, shared ledger models improve settlement coordination, integration with existing financial systems, domestic payment infrastructures, and fiat conversion mechanisms remains a critical operational requirement.

From an interoperability perspective, shared ledger models collapse elements of technical, semantic, and settlement interoperability into a common infrastructure. Payment instructions, transaction records, and settlement outcomes exist within the same environment, reducing the need for translation across multiple systems. However, governance interoperability becomes increasingly important because trust shifts from bilateral institutional coordination toward governance of the shared network itself, including rules around issuance, custody, participation, and dispute resolution. Stablecoins tend to support open, globally accessible networks that enable programmable value transfer across wallets and platforms, while deposit tokens extend existing banking systems into digital rails, preserving regulatory alignment and institutional trust structures. Together, these models illustrate an alternative interoperability approach in which coordination occurs at the level of the settlement asset rather than primarily through alignment between domestic payment systems.

Relationship to Liquidity and Settlement Coordination

Stablecoins and deposit tokens change how liquidity is positioned and mobilized across markets by enabling tokenized value to move directly across networks without requiring multiple prefunded correspondent accounts. Shared ledger settlement allows participating institutions or users to transfer value continuously, potentially reducing delays associated with intermediary settlement coordination. Stablecoins can support more fluid movement of liquidity across networks, particularly in environments where access to correspondent banking infrastructure is limited. Deposit tokens maintain linkage to commercial bank balance sheets, allowing tokenized value to integrate with existing liquidity and treasury management frameworks. While foreign exchange requirements and funding considerations remain relevant, tokenized settlement models may reduce fragmentation in how liquidity is distributed across markets, improving flexibility in cross-border funding arrangements.

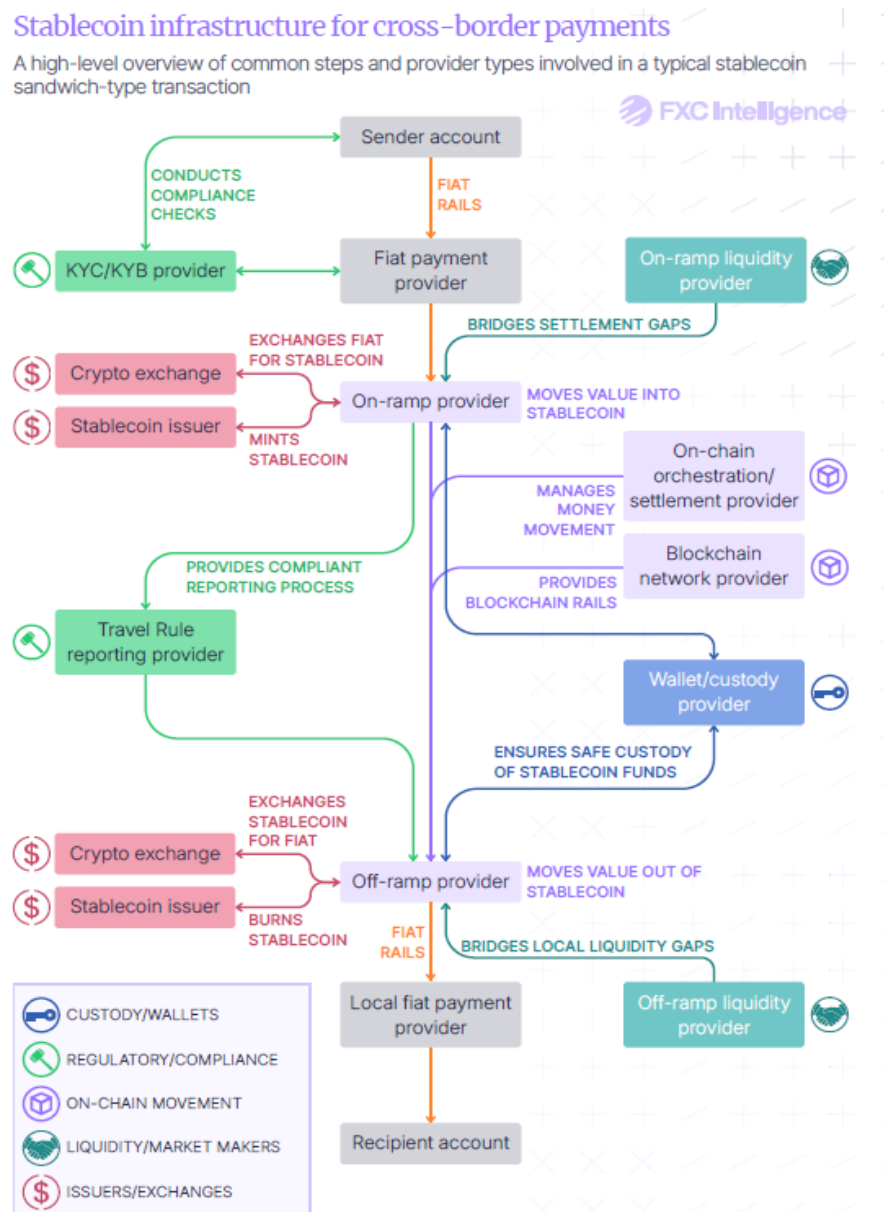


Figure 4: Stablecoins Infrastructure in Cross-Border Payments⁷

Evaluation: Shared Ledger Models like Stablecoins/Deposit Tokens

- **Cost:** Stablecoins and deposit tokens can reduce reliance on intermediary banks and multi-hop correspondent routing structures by enabling direct transfer of tokenized value across a common infrastructure. Settlement occurring within the same environment as payment can reduce reconciliation complexity and operational overhead associated with cross-border processing. At the same time, costs may shift toward custody infrastructure, compliance integration, wallet management, and fiat on/off-ramp services. The overall cost impact depends on adoption levels, market liquidity, and integration with existing financial systems.
- **Speed:** Stablecoins and deposit tokens enable near-instant transfer of value across markets, with transactions recorded directly on the network without requiring sequential coordination across multiple intermediaries. Continuous processing environments support 24×7 settlement availability, reducing delays associated with batch processing windows or intermediary handoffs. However, end-to-end transaction speed may still depend on conversion between fiat and tokenized assets, particularly where funds must enter or exit domestic banking systems that continue to operate within local banking hours or settlement windows.
- **Access:** Stablecoins and deposit tokens can expand access to cross-border payments by enabling participation through digital wallets, financial institutions, or fintech platforms connected to the network. In environments where correspondent banking access is limited, tokenized value transfer may provide alternative pathways for cross-border transactions. Participation structures vary depending on regulatory treatment, custody models, and integration with existing financial institutions.
- **Liquidity Efficiency:** Stablecoins and deposit tokens allow tokenized value to move directly across participants within the same environment, potentially reducing the need for multiple prefunded correspondent balances across markets. Liquidity can be positioned in digital form and reused across counterparties, improving flexibility in cross-border funding arrangements. Liquidity efficiency depends on market depth, convertibility with fiat systems, and interoperability between tokenized and traditional financial infrastructures.
- **Network Security:** Security in stablecoin and deposit token models depends on governance of the tokenized asset, custody arrangements, and integrity of the underlying infrastructure. Cryptographic validation can improve transaction traceability and auditability, while institutional implementations may incorporate regulatory oversight and established compliance controls. These models introduce operational considerations related to private key management, authorization controls, and recovery mechanisms.

- **Consistency:** On-chain transactions depend on issuer-level implementation for ISO 20022 compatibility. Blockchain's inherent traceability improves auditability, but end-to-end payment visibility for participants depends on platform-specific overlays rather than a common status reporting standard, causing potential inconsistencies in reconciliation and straight-through processing.

Manifestation in the First and Last Mile

Shared ledger models such as stablecoins and deposit tokens alter the middle layer more fundamentally by enabling tokenized value transfer within a common digital settlement environment. However, even in these models, bank account integration remains critical at both the first and last mile. Funds must typically move from a domestic bank account into a tokenized environment through fiat conversion or token issuance processes, and recipients often require conversion back into domestic bank deposits before funds become usable within the local economy.

This means that shared ledger models do not eliminate the role of banks in cross-border payments; rather, they reconfigure where settlement coordination occurs. Instead of coordinating payment movement between multiple banking systems through correspondent structures or interoperability frameworks, settlement occurs within a shared digital environment before reconnecting to domestic banking systems at the edges. The customer experience therefore still depends heavily on the efficiency of fiat on-ramps and off-ramps, banking integration, custody arrangements, compliance controls, and local payout infrastructure.

IV. Gaps Still Remaining across the two Shared Models

1. Cost of Liquidity Providers and Foreign Exchange Remains Persistent

Despite improvements in interoperability, the cost of liquidity management and foreign exchange coordination remains a significant constraint across both shared connectivity and shared ledger models. In shared connectivity approaches such as Project Nexus, liquidity provision and FX conversion remain external to the interoperability layer and continue to rely on participating financial institutions and market makers. While interoperability can improve routing efficiency and reduce operational friction, institutions may still incur substantial costs associated with prefunding, corridor liquidity management, and foreign exchange spreads, particularly in lower-volume or emerging-market corridors. In markets where there is a lack of local currency liquidity depth and/or a low frequency of trading, further delays – and market making costs - will also need to be factored in. The opportunity cost is particularly acute in a higher interest rate environment, where the yield foregone on idle prefunded capital is material and must be recovered through wider spreads or higher fees. As a result, interoperability improvements do not necessarily eliminate the underlying economic costs associated with cross-border liquidity coordination.

2. Liquidity Efficiency in Stablecoin Models is Still Evolving

Shared ledger models such as stablecoins and deposit tokens operate under a fundamentally different liquidity model than traditional correspondent banking systems. Correspondent banking relies heavily on bilateral balances positioned across markets and currencies to support payment execution. Stablecoin-based models instead depend on token convertibility, exchange connectivity, digital asset liquidity pools, and availability of fiat on/off-ramp infrastructure. This model has the potential to reduce fragmentation associated with maintaining multiple corridor-specific prefunded balances and may improve liquidity mobility across participants operating within shared settlement environments. However, liquidity efficiency in tokenized systems remains dependent on market depth, institutional participation, stable convertibility mechanisms, regulatory clarity, and interoperability between tokenized and traditional financial infrastructures. As a result, while stablecoin models may improve liquidity coordination in certain environments, their long-term liquidity efficiency characteristics are still evolving and remain less mature than traditional banking liquidity frameworks. Unlike interoperability models such as Project Nexus, which preserve domestic currencies and coordinate conversion across payment systems, most stablecoin activity today relies primarily on USD-denominated settlement assets. This may simplify certain aspects of cross-border settlement, but it also concentrates liquidity around a single currency environment rather than improving interoperability across multiple domestic currencies. In addition, tokenized systems may introduce new forms of monetary fragmentation, as different stablecoins and deposit tokens can vary in liquidity, convertibility, and market confidence despite representing the same underlying currency.

3. Compliance Data Portability and ISO 20022 Interoperability Remain Uneven

Cross-border interoperability increasingly depends not only on movement of value, but also on the portability of compliance and payment data across institutions. Existing banking systems rely on structured ISO 20022 messaging to support sanctions screening, reconciliation, remittance information, invoicing data, and end-to-end straight-through processing (STP). However, implementation remains uneven across institutions, payment systems, and markets, continuing to affect interoperability outcomes across corridors.

This challenge becomes more pronounced in shared ledger and stablecoin environments, where tokenized value transfer does not yet consistently support the same degree of structured financial messaging and semantic interoperability found in traditional banking rails. In many implementations, customer identity information, compliance data, remittance details, and invoicing context continue to move outside the settlement layer through middleware or off-chain operational processes. As a result, interoperability of value transfer may improve more rapidly than interoperability of financial and compliance data.

This creates an important transition challenge for financial institutions and corporate ecosystems that are currently investing heavily in ISO 20022 modernization. Enterprise resource planning (ERP) systems, reconciliation workflows, compliance platforms, and treasury infrastructures are increasingly being redesigned around richer structured messaging and end-to-end STP capabilities. If tokenized payment environments evolve without comparable semantic interoperability and data portability standards, there is a risk that parts of these investments may not translate effectively into emerging settlement models, potentially recreating fragmentation between value transfer and financial data coordination.

4. Quality and Consistency of Compliance Data Collection Remain Fragmented

Even where technical interoperability improves, inconsistencies in how institutions collect, validate, structure, and transmit customer identity information, sanctions screening attributes, and transaction purpose data continue to create operational friction across markets. Cross-border payments depend heavily on the quality of compliance information collected at both the sending and receiving ends of the transaction.

Differences in local regulatory expectations, onboarding standards, and compliance data requirements can reduce straight-through processing rates and increase manual review, repair activity, and exception handling. This challenge becomes more pronounced in multilateral interoperability environments where institutions operate under different supervisory and reporting frameworks.

5. Governance Coordination Continues to Lag Technical Interoperability

Technical interoperability frameworks can often be implemented more rapidly than legal, regulatory, and institutional coordination across markets. While shared connectivity and shared ledger models may improve routing efficiency, settlement coordination, and transaction processing, governance frameworks related to liability allocation, dispute handling, sanctions obligations, supervision, settlement finality, operational accountability, and data governance frequently remain fragmented across markets.

This challenge becomes particularly important in multilateral interoperability environments such as Project Nexus, where participating markets operate under different legal structures, regulatory expectations, and supervisory models. Shared ledger models similarly face evolving governance questions related to token issuance, custody, network oversight, operational resilience, and regulatory accountability. Differences in operating hours, settlement windows, legal finality frameworks, compliance obligations, and technology upgrade cycles continue to affect end-to-end coordination across markets. Payment visibility and exception management also remain fragmented across multiple institutions and operators, often without a single end-to-end accountable party.

As a result, interoperability may improve technical connectivity and settlement coordination while still leaving operational dependencies and runtime fragmentation unresolved.

6. Participation Asymmetry Across Corridors Remains a Structural Constraint

Interoperability improvements are unlikely to be adopted evenly across all institutions and markets. Larger financial institutions and high-volume payment corridors are better positioned to absorb integration costs, maintain liquidity access, and participate in emerging interoperability frameworks. Smaller institutions and lower-volume corridors may continue to face operational, regulatory, or economic barriers to participation.

This creates the risk that interoperability improvements disproportionately benefit already well-connected markets while fragmented, lower-volume, or underbanked corridors continue to experience higher costs, lower service quality, and reduced access to efficient cross-border payment infrastructure. Participation asymmetry therefore remains an important structural limitation in scaling global interoperability frameworks.

7. Continuous Settlement Does Not Fully Eliminate Domestic Operational Constraints

Traditional cross-border payment systems remain heavily influenced by domestic banking hours, settlement windows, and institution-specific operational availability. In shared connectivity models such as Project Nexus, end-to-end transaction timing may still depend on domestic payment system operating cycles, liquidity positioning, payout processing schedules, and local banking infrastructure at the receiving end.

Shared ledger environments such as stablecoins can reduce some of these timing constraints because tokenized settlement environments may operate continuously on a 24×7 basis without dependency on intermediary banking windows. However, many transactions reconnect to domestic banking systems through fiat conversion, customer account settlement, treasury movement, or payout processing. As a result, while stablecoins may reduce middle-layer timing constraints, end-user payment availability may remain dependent on domestic banking infrastructure and last-mile payout environments.

8. Endpoint Fragmentation Remains Unresolved

Even where middle-layer interoperability improves routing, messaging, and settlement coordination, customer experience continues to depend heavily on domestic onboarding frameworks, payout infrastructure, account access models, and local financial system conditions. Regulatory asymmetries, differing account structures, fragmented payout networks, and varying foreign exchange conditions continue to create friction at the points where interoperable payment systems reconnect to domestic banking environments.

These challenges become more pronounced in markets dependent on mobile wallets, agent banking, or cash-out networks where trust infrastructure, identity frameworks, and payout reliability remain uneven. As a result, interoperability between payment systems does not eliminate fragmentation at the customer access layer, and end-user outcomes continue to depend heavily on local financial infrastructure and domestic market conditions.

V. Path Forward

The current generation of interoperability initiatives demonstrate meaningful progress toward improving cross-border payment coordination across both shared connectivity and shared ledger models. Faster payment system linkages, ISO 20022 adoption, stablecoins, and deposit token initiatives each address different dimensions of fragmentation across the cross-border payment lifecycle. Recent market developments reflect this momentum. Bank of America announced cross-border real-time payments solution, connecting domestic instant payment systems in Mexico, the UK, and India through existing Swift infrastructure, illustrating how shared connectivity approaches are moving from blueprint to institutional deployment.⁸ Mastercard's expansion of stablecoin settlement optionality across its global card network—allowing issuers and acquirers to settle in regulated stablecoins alongside fiat, within existing security and dispute frameworks—demonstrates how shared ledger models are being integrated into established payment infrastructure rather than replacing it.⁹

However, the analysis in this paper also highlights that interoperability remains a multi-layer challenge extending beyond technical connectivity alone. Liquidity coordination, compliance data portability, governance alignment, and endpoint access continue to shape the effectiveness of cross-border payment outcomes across markets.

A key priority moving forward will be improving interoperability not only for the movement of value, but also for the movement of financial and compliance data. More prescriptive implementation approaches around structured messaging, identity attributes, sanctions information, electronic remittance data, and invoicing standards may help reduce data loss, manual repair activity, and semantic fragmentation across institutions. Recent updates to the FATF recommendations further reinforce the importance of consistent data capture and transmission across the payment chain.¹⁰ Exchange network approaches and richer interoperability frameworks may also support more portable payment context across payment environments, improving reconciliation, straight-through processing, and compliance coordination.

Liquidity coordination also remains a critical area for continued evolution. While interoperability initiatives improve routing efficiency and reduce operational fragmentation, liquidity management still largely remains external to the interoperability layer itself. Emerging models based on pooled liquidity, shared settlement coordination, and more centralized liquidity management could help reduce fragmentation caused by corridor-specific balance positioning. These approaches begin to resemble an RTGS-style model at a regional or even global level, where fewer balance accounts make liquidity pools easier to manage and coordinate. However, the economics of maintaining these pools—including funding costs and the opportunity cost of capital tied up in settlement liquidity—remain a critical consideration.

At the same time, governance interoperability will remain critical to scaling cross-border interoperability beyond technical connectivity. Differences in legal frameworks, supervision, liability allocation, sanctions obligations, operational accountability, and settlement finality continue to create friction across markets. The long-term success of both shared connectivity and shared ledger models will therefore depend not only on technical standardization, but also on the continued evolution of governance coordination across institutions, payment systems, and regulatory environments.

Ultimately, interoperability should be viewed not as a single technology architecture, but as a broader coordination problem across technical, semantic, operational, liquidity, and governance layers, even as substantial progress continues under G20-led modernization initiatives.¹¹ Progress is likely to remain incremental and multi-model, with different interoperability approaches coexisting across corridors and use cases. The path forward will depend on how effectively these models can reduce fragmentation across the full end-to-end payment lifecycle while maintaining trust, regulatory integrity, and broad accessibility across markets.

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About the Faster Payments Council and Cross-Border Payments Work Group

The Faster Payments Council (FPC) is an industry-led membership organization whose vision is a world-class payment system where Americans can safely and securely pay anyone, anywhere, at any time and with near-immediate funds availability. To further this vision, the Faster Payments Council established the Cross-Border Payments Work Group to cover global industry initiatives, gathering information on various models and use cases for real-time payments across borders with the long-term goal of cross-border interoperability.

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