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The Future of Payments and Cross-Border Finance: Navigating Transformation Amid Risk and Opportunity

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Executive Summary

The payments industry, once regarded as a stable utility within financial markets, is undergoing its most profound transformation in decades. At stake is not only the infrastructure that enables global commerce, but also the balance of power between central banks, financial institutions, technology firms, and regulators. What was once a background function of the economy has become a strategic arena where innovation, competition, and geopolitics converge.

Three forces drive this transformation. First, **technology and innovation** are reshaping payment systems at an unprecedented pace: real-time retail platforms such as India's UPI and Brazil's Pix, tokenized deposits, and stablecoins are redefining efficiency and reach. Second, **policy and regulation** are advancing with renewed urgency, led by the G20 roadmap on cross-border payments, the EU's MiCA framework and the US's Genius Act, and the proliferation of central bank digital currency (CBDC) pilots. Third, **market competition** is intensifying as global technology platforms scale payment services to hundreds of millions of users, challenging the traditional dominance of banks.

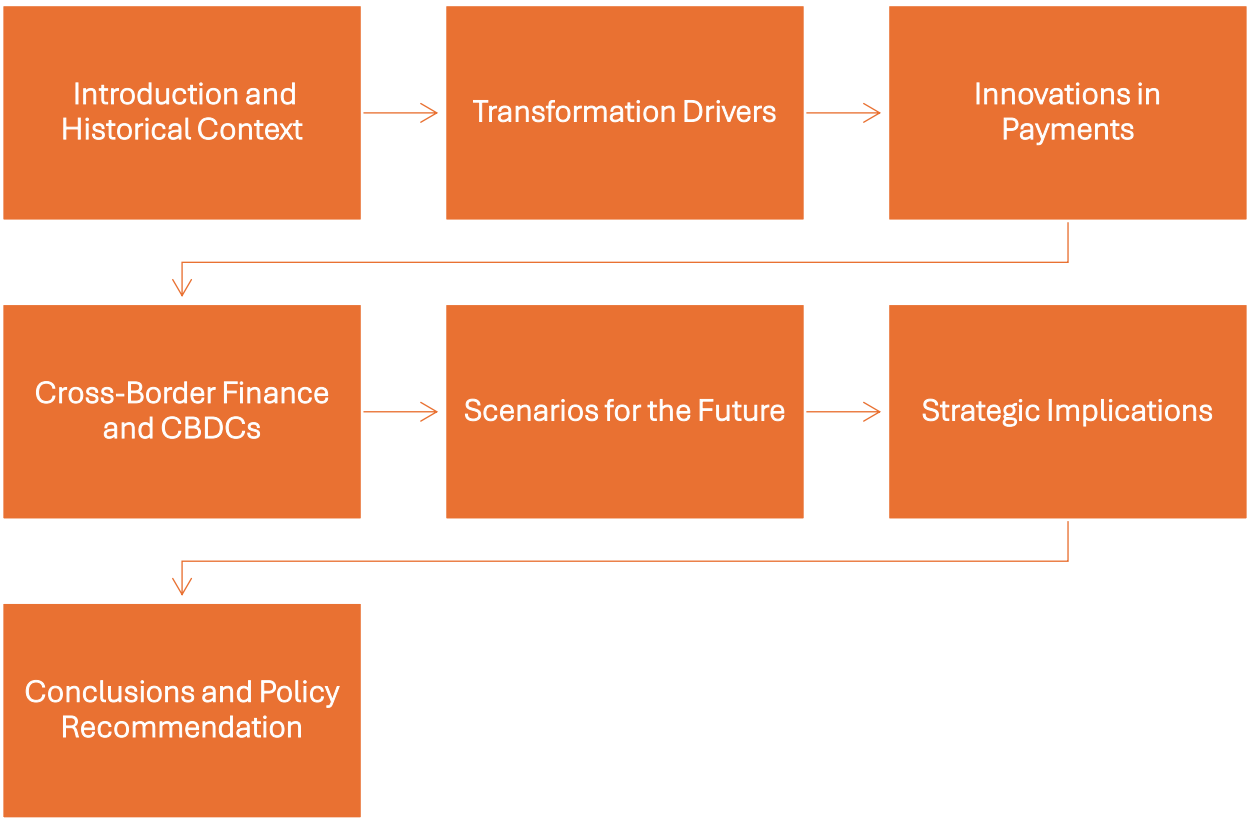
The implications extend well beyond technical efficiency. For **financial institutions**, payments—historically a source of stable revenues—are now exposed to disruption but also offer new opportunities in tokenized finance and value-added services. For **central banks and regulators**, the challenge lies in balancing innovation, efficiency, and financial stability, while ensuring resilience against geopolitical fragmentation. For **investors**, the modernization of payment infrastructures creates both new risks and avenues for capital deployment, from infrastructure rails to fintech ecosystems.

Looking ahead, three plausible scenarios emerge. A **fragmented world of competing systems** could raise costs and risks. A **Big Tech–dominated ecosystem** might offer convenience but challenge regulatory oversight and monetary sovereignty. Alternatively, a **coordinated architecture of interoperable CBDCs and regulated private solutions** could unlock efficiency gains, lower remittance costs, and advance financial inclusion in line with the UN's Sustainable Development Goals (SDGs).

This report examines the **evolution of payment systems**, analyzes the **strategic drivers of change**, maps the **landscape of innovations and regulatory responses**, and sets out **scenarios for the future of payments and cross-border finance**. It concludes with **implications for financial institutions, regulators, and investors**, highlighting both the risks of inaction and the opportunities for leadership in shaping the next era of global payments.

To guide readers through the complexity of the payments transformation, **Figure 1 presents the report's roadmap**. It highlights the logical progression from the historical evolution of payment systems, through the drivers of transformation, to the innovations and regulatory frameworks shaping the future. It then explores scenarios for global payments and concludes with strategic implications for stakeholders.

Figure 1 – Report Roadmap: Future of Payments and Cross Border Finance



1. Introduction

Payments are the **nervous system of modern economies**. They provide the infrastructure through which households consume, firms invest, and governments tax and spend. Every day, trillions of dollars' worth of transactions flow through networks of banks, clearing houses, card providers, fintech platforms, and increasingly, digital assets. Yet despite this centrality, the evolution of payments has often been **incremental rather than revolutionary**, with legacy infrastructures persisting for decades before significant upgrades take hold.

Historically, payment systems have **mirrored the broader structure of money and finance**. In the 19th century, the rise of national banking systems gave way to centralized clearing houses and the creation of central banks to stabilize settlements (Bordo and Roberds, 2005). In the postwar era, technological innovation drove the expansion of electronic payments and card networks, while global financial integration in the 1990s intensified the need for reliable cross-border settlements (Kahn and Roberds, 2009). More recently, the digital revolution has accelerated experimentation with new payment instruments—from PayPal to Alipay, from Bitcoin to real-time gross settlement systems—challenging the **long-standing dominance of traditional banking rails**.

Table 1 illustrates the historical evolution of payment systems, showing how each wave of institutional and technological change has reshaped the financial infrastructure. From the 19th-century rise of national banking systems and central clearing houses to the creation of central banks in the early 20th century, the postwar expansion of electronic payments, and the globalization of finance in the 1990s, the trajectory highlights an incremental path of innovation. In the 2010s, the digital revolution catalyzed a new phase, with private platforms and digital assets challenging incumbent payment providers. The 2020s mark a potential inflection point, as CBDCs, stablecoins, and tokenized deposits move from experimentation to deployment.

Table 1 – Historical Evolution of Payment Systems

Period	Key Developments
19th Century	Rise of national banking systems and central clearing houses
Early 20th Century	Creation of central banks to stabilize payment and settlement
Post-WWII Era	Expansion of electronic payments and card networks
1990s-2000s	Globalization of finance and need for cross-border settlement efficiency
2010s	Digital revolution: PayPal, Alipay, Bitcoin, RTGS modernization
2020s	CBDCs, stablecoins, tokenized deposits and private fintech/Big Tech rails

Source: Bordo and Roberds (2005), Kahn, and Roberds (2009), Bech and Garratt (2017), IMF (2022) and Atlantic Council (2024).

The evidence from Table 1 illustrates how payment systems evolve through long cycles of innovation and institutional change. This progression underscores the path-dependent nature of financial infrastructure: each stage builds on prior institutional foundations while responding to new technological and economic pressures. What makes the 2020s distinct is the potential for structural disruption, where new digital architectures may not merely enhance legacy systems but redefine the balance between public and private control of financial rails.

Theoretical perspectives underscore the significance of payments as both **economic infrastructure and a source of systemic risk**. New Keynesian models of monetary economics emphasize the role of **payment frictions in shaping liquidity demand and interest rate dynamics** (Kiyotaki and Moore, 2002). Meanwhile, financial stability literature highlights that disruptions in payments—whether from technological failure, liquidity crises, or cyberattacks—can propagate into broader economic shocks (Bech and Garratt, 2017). Payments are thus both a facilitator of growth and a channel of contagion.

Empirical evidence illustrates the stakes. Cross-border payments, estimated at **$150 trillion annually**, remain plagued by **high costs and slow settlement**. The World Bank reports that the average cost of sending $200 internationally is **6.2%**, well above the UN Sustainable Development Goal (SDG) target of **3%** (World Bank, 2023). This inefficiency in cross border-payments that translates into billions of dollars in lost value for households, firms and governments is summarized in **Table 2**. The IMF (2022) has warned that fragmentation of payment systems—driven by sanctions, technological competition, and regulatory divergence—risks undermining financial integration. At the same time, experiments with **Central Bank Digital Currencies (CBDCs)** are expanding rapidly: more than **130 countries are exploring CBDCs**, with pilots active in China, the Eurozone, and the Caribbean (Atlantic Council, 2024). Private innovation is also reshaping the landscape, as stablecoins have grown to a **market capitalization exceeding $150 billion** in 2024, with significant use in cross-border settlement (CoinMarketCap, 2024).

Table 2 – Cross-Border Payment Costs vs SDG Target

Indicator	Value (2023)
Global cross-border payment flows	$150 trillion
Average cost of sending $200 internationally	6.2%
SDG 10.c Target for remittance costs	3.0%
Gap relative to SDG target	+3.2 percentage points

***Source**: World Bank (2023), IMF (2022), United Nations (2015).*

The data highlights two lessons. First, while innovation has lowered costs in some markets, systemic inefficiencies remain entrenched, particularly in corridors serving emerging economies. Second, closing the gap with the SDG target is not merely a question of incremental efficiency: it requires new architectures that address interoperability, compliance, and settlement risks. The push toward CBDCs, stablecoins, and tokenized deposits can thus be seen not only as technological experimentation but as a strategic response to enduring cost and efficiency challenges in the global payments ecosystem.

These shifts suggest that we stand at a **turning point**. Unlike earlier waves of incremental modernization, today's convergence of technology, regulation, and geopolitics could lead to **structural change in the architecture of payments**. The rise of CBDCs, tokenized deposits, and private platforms raises fundamental questions: Who will control the rails of the future? How will efficiency gains balance against risks to financial stability, privacy, and sovereignty? And how will new payment infrastructures reshape trade, investment, and capital flows in a multipolar world?

This report situates these questions within a **global strategic framework**. We examine the current state of payment systems, the forces of transformation, and plausible scenarios for the future. We analyze the **strategic implications for central banks, regulators, financial institutions, and investors**, identifying risks and opportunities along the way. By combining **historical perspective, theoretical insight, and empirical evidence**, the report seeks to provide decision-makers with actionable intelligence to navigate the uncertain trajectory of payments and cross-border finance.

2. The State of Payments Today

Payments today are both **ubiquitous and uneven**. On the one hand, the world has witnessed a remarkable expansion of electronic and digital payment instruments. On the other hand, large segments of the global economy remain dependent on **slow, costly, and fragmented infrastructures**, especially in cross-border transactions. Understanding the state of payments requires examining the domestic and international dimensions, the actors that dominate the landscape, and the persistent inefficiencies that motivate current reforms.

At the **domestic level**, retail payments have undergone rapid digitization. In advanced economies, debit and credit cards dominate non-cash transactions, while mobile payments have surged in Asia. In China, Alipay and WeChat Pay process more than **90 percent of mobile payments**, illustrating how fintech platforms can leapfrog traditional banking rails (PBOC, 2023). In Africa, the M-Pesa system in Kenya demonstrates the role of mobile money in advancing financial inclusion, with more than **30 million users** transacting regularly outside the formal banking system (GSMA, 2022). In contrast, cash remains prevalent in parts of Latin America, South Asia, and sub-Saharan Africa, highlighting the persistence of **dual economies** where digital adoption coexists with traditional practices.

At the **wholesale level**, payment infrastructures are more centralized, with central banks operating real-time gross settlement (RTGS) systems that form the backbone of interbank liquidity. The Bank for International Settlements (BIS, 2023) reports that the daily value settled through RTGS systems globally exceeds **$20 trillion**, reflecting their critical role in financial stability. Yet even these systems vary in speed, coverage, and interoperability, often reflecting national priorities rather than global integration.

Cross-border payments remain the **weakest link** in the system. Despite decades of financial globalization, sending money across borders continues to be costly and slow. As Table 2 showed, the global average cost of sending $200 internationally is **6.2 percent**, more than double the UN Sustainable Development Goal target. Settlement can take days, passing through multiple intermediaries, with compliance checks introducing additional friction. For households, this erodes the value of remittances; for businesses, it raises the cost of trade and supply chain management; for financial institutions, it introduces liquidity and counterparty risk.

The structure of today's payments ecosystem is also shaped by the **actors who dominate it**. Traditional banks and card networks (Visa, Mastercard, American Express) remain central in advanced economies. At the same time, fintechs and Big Tech firms have become systemic players. Companies like PayPal, Stripe, and Square provide digital rails for commerce, while Alipay, Tencent, and Apple Pay integrate payments into broader platforms. The IMF (2022) notes that such firms increasingly blur the line between payments, lending, and asset management, raising questions about competition, regulation, and systemic risk.

What emerges is a **paradox**: never before have payments been so digital, fast, and integrated domestically; yet never before have cross-border inefficiencies and systemic vulnerabilities been so visible. This tension explains why central banks, regulators, and private innovators are pushing for a new era of payment modernization.

Table 3 compares payment systems in advanced and emerging economies, highlighting both the commonalities and the disparities. While advanced economies rely on sophisticated card networks and mobile wallets integrated with banking services, emerging markets depend more on mobile money and still see significant use of cash. Wholesale payment infrastructures are universal but vary in scale, with advanced economies processing vast volumes daily. Cross-border costs remain persistently high everywhere, but especially in developing economies where remittance corridors are most critical.

Table 3 – Global Payments Landscape (2023)

Dimension	Advanced Economies	Emerging and Developing Economies
Retail Payments	Card networks, mobile wallets (Apple Pay, Google)	Mobile money (M-Pesa, GCash), cash still dominant
Wholesale Payments	RTGS systems settle > $20 trillion/day (BIS)	RTGS systems expanding but coverage uneven
Cross-Border	Average cost 6.2% (World Bank)	Often higher than global average, slow settlements
Key Actors	Banks, Visa, Mastercard, PayPal, Big Tech wallets	Mobile operators, fintechs, regional banks

Source: BIS (2023), World Bank (2023), IMF (2022), GSMA (2022), PBOC (2023).

The table shows that payment innovation has not followed a uniform trajectory. In some cases,

emerging markets have leapfrogged advanced economies in retail payments (as with M-Pesa), while in others they lag behind in wholesale systems. The persistent inefficiencies in cross-border payments highlight why the future of payments is less about incremental improvement and more about structural redesign, with global implications for trade, investment, and financial stability.

3. Forces of Transformation

Forces of Transformation

The global payments landscape is entering a period of **accelerated transformation**, driven by a convergence of technological, regulatory, and geopolitical forces. Unlike previous waves of innovation, today's changes are not confined to incremental efficiency gains but instead challenge the very **architecture of monetary and financial systems**. Five drivers stand out as shaping the future of payments: **Central Bank Digital Currencies (CBDCs), stablecoins and tokenized deposits, modernization of Real-Time Gross Settlement (RTGS) systems, fintech and Big Tech platforms, and evolving regulatory and standard-setting frameworks.**

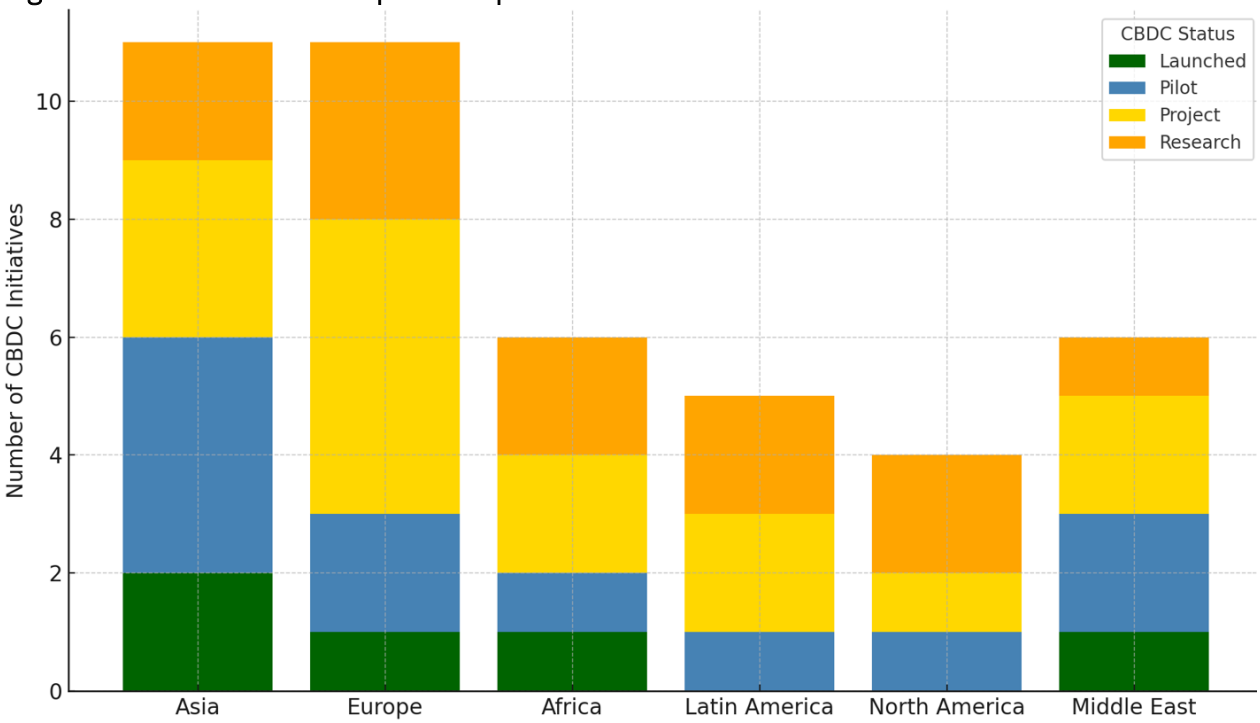
I. Central Bank Digital Currencies (CBDCs)

Central banks are at the forefront of experimentation. More than **130 jurisdictions are exploring CBDCs**, with pilots underway in China (e-CNY), the Eurozone (digital euro), and the Caribbean (DCash) (Atlantic Council, 2024). The rationale for CBDCs varies: some central banks emphasize monetary sovereignty and the need to counter private digital money; others highlight efficiency gains, inclusion, and resilience of payment infrastructures (BIS, 2023).

Empirical evidence shows that CBDCs can reduce costs and settlement times in cross-border payments by **up to 50 percent**, according to BIS experiments such as Project mBridge (BIS, 2022). Yet they also raise profound questions: How will CBDCs coexist with bank deposits? Will they crowd out private money creation, reshaping financial intermediation?

Figure 2 illustrates the breadth of CBDC experimentation worldwide. Asia leads in pilots and projects, with China, India, and Japan moving rapidly toward deployment. Europe shows strong activity at the project stage, reflecting the ECB's Digital Euro and several Nordic pilots. Africa and the Caribbean highlight early adoption cases, such as Nigeria's eNaira and the Bahamas' Sand Dollar. North America remains in the research phase, though Canada and the United States are actively studying potential models. The Middle East shows dynamic experimentation, particularly through joint initiatives such as Project mBridge.

Figure 2 – Global CBDC adoption map



Source: Atlantic Council (2024), BIS (2023), IMF (2022) and official central bank publications and regional pilot announcements. Details are available in Appendix B that presents a table of CBDC initiatives.

The figure highlights three important insights. First, **CBDC development is global**, with no region left untouched. Second, the distribution of activity reflects strategic priorities: emerging markets emphasize inclusion and efficiency, while advanced economies focus on monetary sovereignty and resilience. Third, the lack of a dominant model underscores the **uncertain trajectory of global payments**: some regions are already launching, others are testing, and others remain hesitant. This uneven pace raises the possibility of **fragmentation**—a key risk for cross-border finance.

II. Stablecoins and Tokenized Deposits

Parallel to sovereign efforts, private actors are experimenting with **stablecoins** and **tokenized deposits**. Stablecoins—digital tokens pegged to fiat currencies—have grown into a **$150 billion market** in 2024, dominated by USD-pegged coins such as Tether and USD Coin (CoinMarketCap, 2024). These instruments are increasingly used for cross-border settlements and as collateral in decentralized finance (DeFi).

Tokenized deposits, by contrast, are issued by regulated banks and represent liabilities recorded on distributed ledgers. They promise the efficiency of blockchain while preserving the stability of traditional deposits (Adrian and Mancini-Griffoli, 2021). Both instruments are potential building blocks of a new **"tokenized money hierarchy"**, where multiple forms of digital value compete for transactional dominance.

Table 4 compares the three leading families of digital money instruments—CBDCs, stablecoins, and tokenized deposits—along four dimensions: issuer, legal status, risks, and adoption stage. The distinctions matter for policy and strategy. CBDCs are direct central bank liabilities; stablecoins are private liabilities whose safety depends on reserve quality and governance; tokenized deposits remain conventional bank liabilities issued on new ledgers. Each carries a different risk profile and regulatory perimeter, which in turn shapes suitability for retail versus wholesale use, cross-border settlement, and integration with existing market infrastructure (Adrian and Mancini-Griffoli, 2021; BIS, 2023; FSB, 2023).

Table 4 – Comparison of CBDCs, Stablecoins, and Tokenized Deposits – issuer, legal status, risks, adoption stage

Instrument	Issuer	Legal status / nature of claim	Principal risks (illustrative, not exhaustive)	Adoption stage (global snapshot)
Retail CBDC	Central bank	Direct **central bank liability**; typically legal tender where issued	Disintermediation risk for banks; privacy and data-governance trade-offs; cyber/operational resilience; programmable-money design risks; cross-border fragmentation (BIS, 2023; IMF, 2022)	**Launched in a few jurisdictions**; **multiple pilots** ongoing; broader design work in progress (Atlantic Council, 2024)
Wholesale CBDC	Central bank (wholesale access set by law/policy)	Central bank liability for **regulated wholesale participants** (banks, FMIs)	Interoperability across RTGS and DLT platforms; settlement finality across borders; operational, cyber and governance risks in shared platforms (BIS, 2022; CPMI, 2023)	**Active pilots / PoCs** (e.g., cross-border corridors, securities settlement); **limited early production uses** in confined settings
Stablecoins (fiat-referenced; includes fiat-backed and other designs)	Private issuers (often SPVs / trusts under regulation varying by jurisdiction)	Private **issuer liability** backed by reserve assets; not legal tender; regulatory treatment varies (FSB, 2023)	Reserve quality / segregation and run risk; liquidity and market risk on reserves; governance and disclosure; settlement, AML / CFT and consumer protection; algorithmic designs add **de-pegging** risk (FSB, 2023; IMF, 2021)	**Large at-scale circulation** for some USD-pegged coins; **tightening regulation**; experimentation for payments and settlement use-cases
Tokenized Deposits	**Licensed banks**	**Bank deposit liability** recorded on tokenized ledgers; typically covered by existing deposit law / insurance in jurisdiction	Smart-contract/operational risk; interoperability across banks/ledgers; prudential alignment (capital, liquidity); legal finality across chains (Adrian and Mancini-Griffoli, 2021; BIS, 2023)	**Early pilots/consortia**, growing proofs of concept; policy work on standards and interbank interoperability underway

Source: Adrian and Mancini-Griffoli (2021), Atlantic Council (2024), BIS (2022), BIS (2023), CPMI (2023), FSB (2023), IMF (2021, 2022).

Three insights follow. First, **legal nature of the claim** is the anchor of safety: central bank liabilities (CBDCs) minimize credit risk by design; bank liabilities (tokenized deposits) rely on prudential regulation and deposit insurance; stablecoins depend on reserve quality and governance, with heterogeneous risk across designs (FSB, 2023). Second, **infrastructure choices shape interoperability**: wholesale CBDCs and tokenized deposits may integrate more readily with RTGS and securities systems, while stablecoins often require new bridges and controls (CPMI, 2023; BIS, 2022). Third, **policy direction is converging on safeguards rather than a single model**: jurisdictions are tightening standards for stablecoins, testing wholesale CBDC corridors, and piloting retail CBDCs with strong privacy and resilience constraints (IMF, 2022; BIS, 2023).

III. RTGS Modernization

While digital currencies attract attention, the **quiet revolution of RTGS modernization** may prove equally consequential. Many central banks are upgrading settlement systems to enable **instant, 24/7 domestic payments** and improve cross-border interoperability (CPMI, 2023). Systems such as FedNow in the United States and TIPS in the Eurozone aim to provide faster, cheaper rails that rival private-sector alternatives.

The challenge lies in interoperability. Without global coordination, fragmented RTGS systems risk reinforcing the very inefficiencies they aim to solve (IMF, 2022).

Figure 3 illustrates the modernization path of payment infrastructures, moving from batch settlements with significant delays to real-time gross settlement systems that became the backbone of domestic interbank liquidity. The current wave of innovation is extending RTGS systems to operate 24/7, enabling instant settlement for both retail and wholesale use. The next frontier is cross-border interoperability, where linking RTGS platforms could dramatically reduce costs, settlement delays, and counterparty risks in international payments.

Figure 3 – Diagram of RTGS Modernization

Source: BIS (2023), CPMI (2023), IMF (2022), Federal Reserve (2023), ECB (2023).

The figure highlights the progressive **compression of settlement times** as the central theme of RTGS modernization. Each stage reduces liquidity and counterparty risks, while broadening access to payment infrastructures. Yet, the final stage—cross-border linkage—remains largely experimental, requiring strong coordination on technical standards, legal frameworks, and supervisory oversight. This underscores the tension between domestic modernization and global integration, a theme that runs throughout the debate on the future of payments.

While Figure 3 outlines the conceptual evolution of RTGS modernization, real-world experiences illustrate both the opportunities and challenges of implementation. Two prominent cases—the Federal Reserve's FedNow in the United States and the ECB's TARGET Instant Payment Settlement (TIPS) in Europe—demonstrate how central banks are reshaping their domestic infrastructures to support instant payments. These initiatives provide valuable insights into the dynamics of adoption, interoperability, and policy design. **Box 1** summarizes these cases.

Box 1 – Case Study: RTGS Modernization in Practice

United States: FedNow Service

The Federal Reserve launched **FedNow** in July 2023 as a **24/7 instant payment service** for U.S. financial institutions. Unlike the batch-based ACH system, FedNow provides **immediate settlement finality**, allowing banks to offer real-time payments to households and businesses. Adoption has been gradual, with over **100 financial institutions connected by the end of 2023** (Federal Reserve, 2023). The key challenge remains **network effects**: widespread uptake requires participation by thousands of banks and payment service providers.

Europe: TARGET Instant Payment Settlement (TIPS)

In the Eurozone, the European Central Bank introduced **TIPS** in 2018 as part of the Eurosystem's RTGS modernization. TIPS enables **instant settlement of retail payments in central bank money** across participating countries. By 2023, TIPS was integrated with multiple European banks and was increasingly promoted as a **pan-European alternative** to private-sector solutions such as Visa and Mastercard (ECB, 2023). The main challenge is achieving **interoperability** with non-European systems, especially for cross-border payments.

Key Insights

These cases show that RTGS modernization is not only about technology, but also about **policy design and adoption dynamics**. In the U.S., uptake depends on voluntary participation in a fragmented banking system, while in Europe, the ECB has sought to create a **harmonized pan-regional solution**. Both highlight the tension between **domestic priorities** and the aspiration for **cross-border integration**.

***Source**: Federal Reserve (2023), ECB (2023), BIS (2023).*

The experiences of FedNow and TIPS highlight both the promise and the limits of RTGS modernization. Domestically, instant settlement enhances efficiency, reduces liquidity risk, and strengthens resilience. However, as long as these systems remain nationally or regionally bounded, the **cross-border payment problem remains unsolved**. The next phase will require not only technical interoperability but also alignment on regulatory frameworks, supervisory standards, and legal underpinnings across jurisdictions. Without this coordination, the risk is that RTGS modernization will deliver faster domestic rails but leave global payment frictions largely intact.

IV. Fintech and Big Tech Platforms

Perhaps the most visible transformation driver is the entry of **fintech and Big Tech firms** into payments. Companies such as PayPal, Stripe, Square, and Adyen dominate e-commerce payment rails, while platforms like Alipay and WeChat Pay integrate payments into broader ecosystems of commerce, messaging, and social media. In 2022, mobile wallets processed over **$13 trillion in transactions in China alone** (PBOC, 2023).

These platforms introduce efficiency and scale but raise concerns about **competition, market concentration, and systemic risk**. As they expand across borders, they may evolve into **parallel payment infrastructures** that challenge central banks and regulators.

Table 5 profiles the leading platform-based payment ecosystems, contrasting their core propositions, geographic footprints, and scale. U.S.- and EU-centric wallets (Apple Pay, Google Wallet/Pay, PayPal) leverage card tokenization and online checkout, while China and India are dominated by super-apps and real-time account-to-account rails (Alipay, WeChat Pay, PhonePe/UPI). Latin America's Mercado Pago illustrates how regional platforms can achieve global-scale throughput within multi-vertical ecosystems (MercadoLibre).

Table 5 – Global Big Tech Platforms in Payments

Platform (Owner)	Core Payments Products	Primary Markets / Reach	Scale (latest available)	Indicative Market Position / Notes
Alipay (Ant Group)	Wallet, QR/NFC, super-app checkout, Alipay+ cross-border	China; Alipay+ connects 60+ markets	1.6B user accounts (Alipay+); 90M+ merchants; Tap! NFC 100M users	Dominant Chinese wallet; expanding via Alipay+ merchant network
WeChat Pay (Tencent)	Wallet embedded in Weixin/WeChat, QR, mini-program checkout	China; some cross-border acceptance	1.385B MAU (Weixin/WeChat, Dec 2024)	Near-universal in China; tightly integrated into super-app ecosystem
Apple Pay (Apple)	Tokenized card wallet (NFC), in-	Dozens of countries/regions worldwide;	~100 markets with Apple Pay;	Penetration in high-income markets; strong

	app/web pay, Tap to Pay on iPhone	thousands of participating banks	thousands of banks integrated	issuer and merchant integration
Google Pay / Google Wallet (Alphabet)	Tokenized wallet; UPI interface in India; online/in-app	Wallet contactless in many countries; UPI in India; P2P in US/IN/SG	Wallet support across many countries; UPI volumes at nation scale	Strong position in India; Google Pay + PhonePe duopoly with >80% UPI volume
PayPal (PayPal Holdings)	Wallet, branded checkout, Braintree acquiring, P2P	Global online merchants; 200+ markets	TPV $1.68T (FY2024); 26.3B transactions (FY2024)	Leading global online checkout; expanding via Braintree acquiring
Mercado Pago (MercadoLibre)	Wallet, QR, merchant acquiring, installments	Latin America (Brazil, Mexico, Argentina, etc.)	TPV $197B (2024); strong off-platform growth	Regional super-app ecosystem; dense acceptance in LatAm
PhonePe (Walmart/Flipkart)	UPI wallet, merchant QR, P2P, bill-pay	India	46.5% UPI share (Jun 2025); 590M users; 40M merchants	#1 UPI app by volume/value; anchors India's retail payments market
Amazon Pay (Amazon)	Online checkout, merchant services, multi-currency	US, EU, Japan, India; cross-border for merchants	Global presence; multi-currency and SEPA support (scale not routinely disclosed)	Embedded in Amazon ecosystem; leverages Prime; selective availability

Source: Company and regulator data: *PayPal FY2024 TPV (SEC filing); Mercado Pago TPV (IR release); Tencent Weixin MAU (Annual Report 2024); NPCI UPI statistics.* ***Coverage/availability:*** *Apple Pay country and bank lists; Google Pay/Wallet support pages.* ***Market structure examples:*** *PhonePe share and user base (NPCI-cited press, Reuters); Alipay+ global scale disclosures; Alipay Tap! NFC adoption.*

Three implications emerge. First, **scale economics** are strongest where payments are embedded in daily-use platforms (super-apps and marketplaces). Second, **rail diversity** matters: tokenized card wallets dominate in advanced economies, while **account-to-account** rails (UPI) and **QR ecosystems** lead in Asia and LatAm. Third, **market power and standards** will shape cross-border efficiency: platform interoperability—and regulators' stance on wallet competition—will influence costs, data portability, and merchant choice across regions (BIS/CPMI).

V. Regulation and Standard-Setting

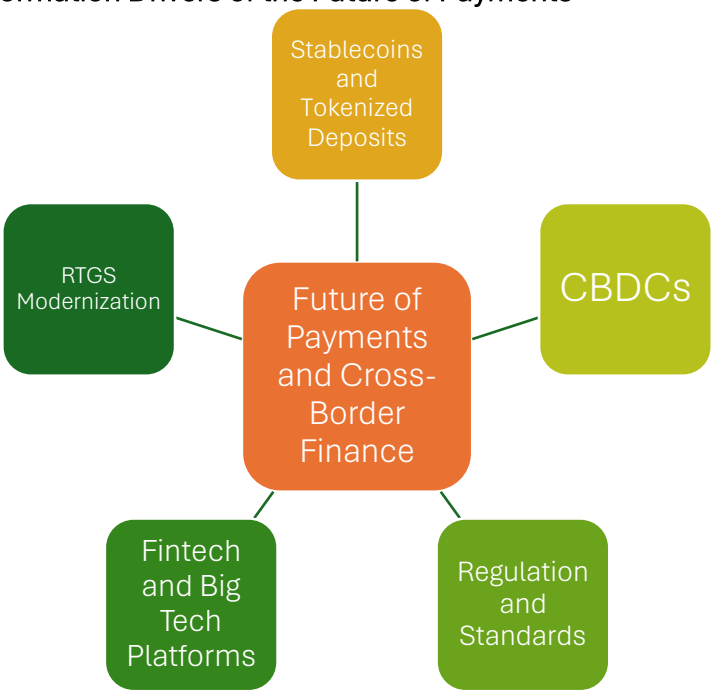
Finally, the future of payments will depend on the **regulatory and governance frameworks** that emerge. The Financial Stability Board (FSB), the Bank for International Settlements (BIS), and the G20 have all emphasized the need for harmonized standards on **interoperability, AML/CFT**

compliance, and consumer protection (FSB, 2022). Yet geopolitics complicates convergence: the rise of parallel standards in China, the EU, and the U.S. risks **fragmentation of global payment infrastructures** (IMF, 2022).

A central challenge is balancing **innovation with stability**. Regulators face the dilemma of enabling efficiency gains while containing systemic risks—from cyber vulnerabilities to currency substitution.

Figure 4 summarizes the five major forces transforming payments and cross-border finance. Each driver—sovereign digital currencies, private digital money, infrastructure upgrades, platform ecosystems, and regulatory standards—interacts with the others, shaping the trajectory of payment systems. Together, they will determine whether the future of payments converges on interoperability and inclusion or fragments into competing silos.

Figure 4 – Transformation Drivers of the Future of Payments



***Source**: Compiled by Bank and Finance as a conceptual synthesis of the five principal transformation drivers identified in the literature and ongoing policy debates based on BIS (2023), IMF (2022), FSB (2022), CPMI (2023) and Adrian and Mancini-Griffoli (2021).*

The figure underscores that no single factor will define the future of payments. Instead, it is the interaction of public and private initiatives, infrastructure modernization, and regulatory governance that will set the direction. This interconnectedness highlights the stakes for policymakers and market participants: coordination across these drivers could unlock a more efficient and inclusive payments ecosystem, while misalignment risks reinforcing fragmentation and systemic vulnerabilities.

Key Insights from This Section

The five transformation drivers illustrate that the **future of payments will not be determined by a single technology or actor**. Instead, it will emerge from the interaction of **sovereign initiatives, private innovation, infrastructure modernization, platform dynamics, and regulatory coordination**. The direction is clear: payments will become faster, cheaper, and more digital. The destination, however, remains uncertain, hinging on whether public and private systems converge on **interoperable standards** or fragment into competing silos.

4. Scenarios for the Future of Payments

The trajectory of payments innovation is highly uncertain. Multiple initiatives are unfolding simultaneously, driven by public authorities, private platforms, and cross-border collaborations. While the direction of travel is toward **faster, cheaper, and more digital systems**, the **end-state architecture remains contested**. In this section, we outline three plausible scenarios for the future of payments:

1. **CBDC-led architecture**
2. **Private innovation dominance**
3. **Hybrid multi-rail coexistence**

These scenarios are not mutually exclusive. Elements of each are already visible, and the eventual outcome will likely blend across them. However, structuring the debate in scenarios helps clarify the **strategic choices facing central banks, regulators, investors, and financial institutions**.

Scenario 1: CBDC-led Architecture

In this scenario, central bank digital currencies (CBDCs) become the dominant infrastructure for both domestic and cross-border payments. Retail CBDCs displace private stablecoins as households and firms gravitate toward the safety of **direct central bank liabilities**. Wholesale CBDCs form the backbone of cross-border settlement through linked RTGS systems, enabling near-instant global transfers (BIS, 2022).

Empirical support for this pathway comes from China, where the **e-CNY pilot has surpassed hundreds of millions of users** in select cities (PBOC, 2023), and from wholesale CBDC projects like **mBridge**, linking Hong Kong, Thailand, China, and the UAE (BIS, 2022). Proponents argue

that CBDCs enhance monetary sovereignty, financial stability, and payment resilience (BIS, 2023).

The risks are significant. A dominant CBDC system could **disintermediate commercial banks**, concentrating credit creation at the central bank. Privacy concerns could deter adoption if surveillance fears outweigh efficiency gains. Geopolitical fragmentation is another risk: multiple CBDC systems could evolve in parallel, creating **new "digital currency blocs"** instead of a globally integrated infrastructure (IMF, 2022).

Scenario 2: Private Innovation Dominance

Here, **stablecoins, tokenized deposits, and platform-based solutions** dominate the global payment architecture. Private-sector actors—Big Tech companies, fintechs, and global banks—deliver fast, interoperable, and user-friendly payment solutions at scale. Platforms such as Alipay, WeChat Pay, Google Pay, and PayPal demonstrate the **power of embedding payments in everyday digital ecosystems**, while stablecoins serve as global settlement assets, particularly in cross-border trade and decentralized finance (CoinMarketCap, 2024).

This trajectory draws on historical precedent: the 20th century saw **Visa and Mastercard emerge as private global networks** that shaped payments more than public-sector initiatives. Similarly, in the 2020s, stablecoins and tokenized deposits are scaling faster than many CBDC projects (FSB, 2023).

The advantages are clear: rapid innovation, customer-centric design, and seamless integration with digital commerce. However, risks include **financial instability from runs on stablecoins**, excessive concentration of market power in platforms, and cross-border fragmentation if regulators impose divergent standards (FSB, 2022; IMF, 2021). In this scenario, central banks play a limited role, focusing mainly on oversight and regulation.

Scenario 3: Hybrid Multi-Rail Coexistence

The most plausible outcome is a **hybrid model**, where public and private rails coexist and interoperate. CBDCs are introduced in select jurisdictions but coexist with tokenized deposits and regulated stablecoins. Central banks provide the **settlement backbone**, while private platforms offer **front-end innovation and user interfaces**. Cross-border systems are linked through **multi-rail hubs**, where different forms of digital money can be exchanged in real time (CPMI, 2023).

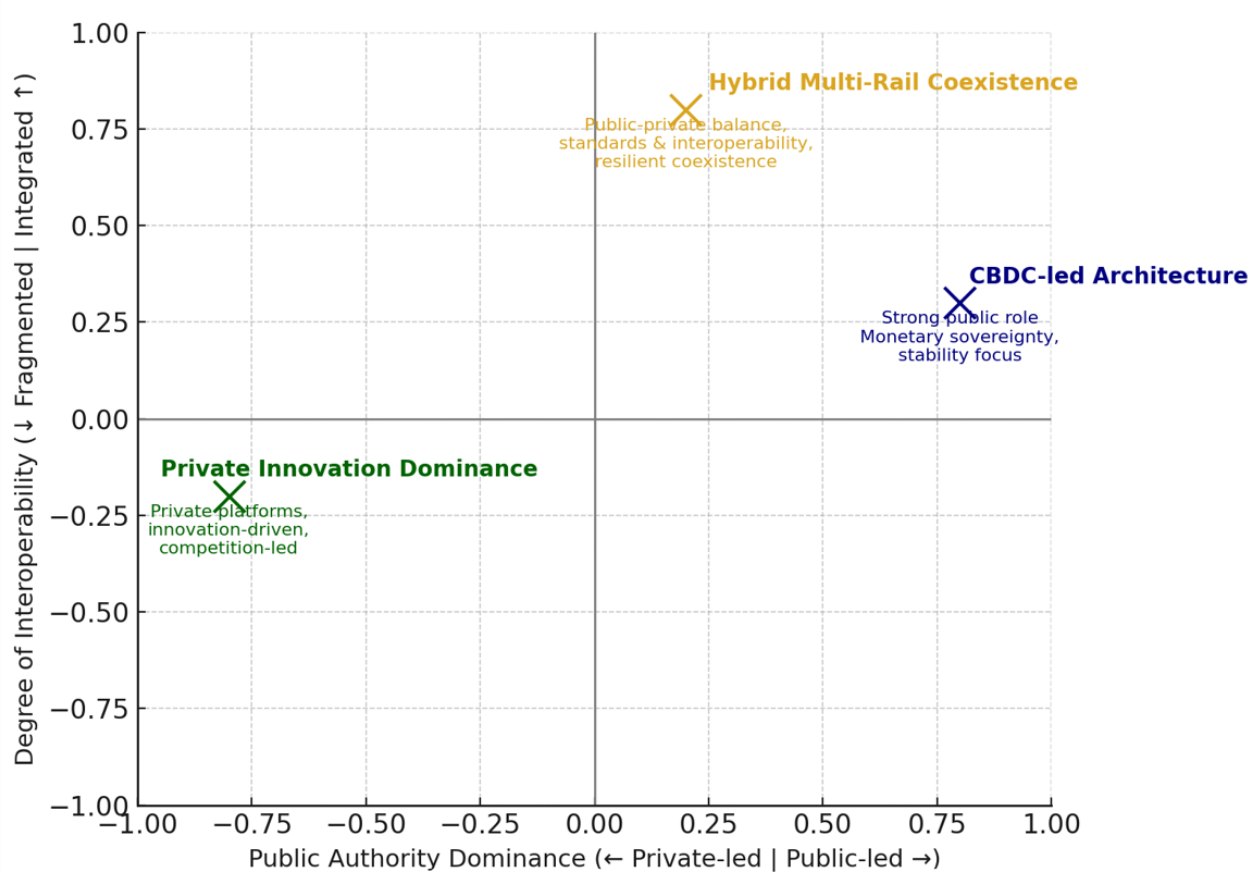
This scenario reflects the trajectory of projects such as the **Digital Euro**, which envisions coexistence with commercial bank money (ECB, 2023), and India's **UPI system**, where banks

and fintechs collaborate on a state-supported rail (NPCI, 2023). The hybrid model minimizes risks of disintermediation while harnessing private innovation.

The key challenge lies in **governance and interoperability**. Achieving a seamless multi-rail model requires coordinated standards on settlement finality, AML/CFT compliance, and cross-border regulation. If successful, however, this scenario could combine the **safety of public money** with the **innovation of private actors**, making it the most balanced path.

Figure 5 maps the three scenarios for the future of payments. A CBDC-led architecture lies toward the public-led side of the spectrum, emphasizing sovereignty and stability. A private innovation–dominated future lies on the opposite end, driven by competition and platform ecosystems but risking fragmentation. The hybrid multi-rail model occupies the upper-right quadrant, balancing public authority with private innovation and relying on interoperability to achieve resilient coexistence.

Figure 5 – Scenario Map: Future of Payments



Source: Compiled by Bank and Finance to illustrate scenario pathways based on central bank reports, market data, and academic literature. Main sources include BIS (2023), IMF (2022), FSB (2022), ECB (2023), PBOC (2023), NPCI (2023).

The map underscores that the scenarios are not mutually exclusive but represent possible equilibria in a contested landscape. Policymakers may push toward public-led solutions, while market forces continue to scale private platforms. The hybrid model—though complex to govern—emerges as the most integrated vision, but its success hinges on unprecedented regulatory coordination and the adoption of common technical standards.

Key Insights

The scenarios highlight that the future of payments is not predetermined. Policy choices, regulatory frameworks, and market dynamics will shape the balance between public authority and private innovation. The **CBDC-led model** prioritizes sovereignty and safety but risks concentration and fragmentation. The **private-led model** maximizes innovation but risks instability and dominance by a few platforms. The **hybrid model** offers a pragmatic compromise but demands unprecedented coordination across borders.

For central banks, regulators, and investors, **scenario planning is essential**. Rather than betting on a single future, stakeholders should prepare for coexistence, with strategies that are resilient across scenarios.

5. Strategic Implications for Stakeholders

The transformation of payments is not only a technological or regulatory development—it carries profound **strategic implications for all actors in the financial system**. Central banks, regulators, financial institutions, institutional investors, finance ministries, and development banks each face distinct opportunities and risks. Understanding these implications is critical for shaping resilient strategies across the three scenarios outlined above.

Central Banks and Regulators

For central banks, the payments revolution is fundamentally about **monetary sovereignty and financial stability**. CBDCs, stablecoins, and tokenized deposits raise questions about the nature of money itself. If private actors dominate, central banks may find their role in ensuring the unit of account diminished (Adrian and Mancini-Griffoli, 2021). Conversely, if CBDCs dominate, central banks risk overextension into credit intermediation, potentially destabilizing the banking system (BIS, 2023).

Regulators face the challenge of balancing **innovation and stability**. Divergent national approaches to stablecoin oversight—ranging from strict regulation in the EU's Markets in Crypto Assets (MiCA) framework to more permissive regimes elsewhere—highlight the risk of

fragmentation (FSB, 2023). Coordination through the BIS, IMF, and G20 will be critical to avoid regulatory arbitrage and preserve interoperability.

Institutional Investors

For institutional investors, payments innovation creates both **new asset classes** and **new risks**. Tokenized deposits and wholesale CBDCs may offer novel avenues for liquidity management, cross-border settlement, and collateral efficiency (BIS, 2022). Stablecoins, if regulated, could emerge as **short-term digital money market instruments**.

Yet risks abound. Unregulated stablecoins pose credit and liquidity risks, while fragmented CBDC systems could complicate FX hedging and cross-border flows. Investors must therefore prepare for a world of **multiple coexisting digital settlement assets**, requiring new strategies for treasury operations, risk management, and portfolio diversification (IMF, 2022).

Financial Institutions

Banks and payment service providers stand at the frontline of disruption. In a CBDC-led future, banks face **disintermediation risks** if households and firms shift deposits to central bank wallets. In a private-led scenario, Big Tech platforms could capture customer relationships, relegating banks to back-end infrastructure providers.

The hybrid model offers more sustainable roles, with banks issuing tokenized deposits and partnering with fintechs on new rails. To thrive, financial institutions must invest in **infrastructure modernization, cybersecurity, and interoperability standards**, while rethinking business models around data-driven services and customer experience.

Finance Ministries and Development Banks

For finance ministries, the stakes extend beyond payments to **economic competitiveness and fiscal capacity**. Cross-border payment inefficiencies currently add billions in costs to trade and remittances (World Bank, 2023). Faster, cheaper systems can enhance competitiveness, expand financial inclusion, and strengthen revenue collection.

Development banks, meanwhile, are uniquely positioned to catalyze investment in **interoperability projects and regional payment hubs**. Initiatives such as the Pan-African Payment and Settlement System (PAPSS) show how development finance can bridge infrastructure gaps and foster regional integration (Afreximbank, 2022).

Table 6 summarizes the strategic implications of each scenario across stakeholders. The CBDC-led pathway emphasizes sovereignty but risks overcentralization. The private-led model fosters innovation but erodes public oversight. The hybrid scenario balances roles but requires

unprecedented levels of global coordination. Each stakeholder must adapt strategies not only to the most likely scenario, but also to the uncertainty of coexistence.

Table 6 – Strategic Implications of Payment Scenarios by Stakeholder

Stakeholder	CBDC-led scenario	Private-led scenario	Hybrid multi-rail scenario
Central Banks and Regulators	Strong sovereignty; risk of bank disintermediation; heavy governance burden	Oversight role only; risk of reduced monetary control	Balanced role; need for global coordination and standard-setting
Institutional Investors	Safer settlement assets; potential liquidity disruption in banking	Innovation in settlement assets; exposure to platform risks	Multiple asset types; new portfolio strategies; interoperability critical
Financial Institutions	Disintermediation risk; new service models needed	Market share loss to Big Tech; role as back-end providers	Tokenized deposits; partnerships with fintechs; resilience and cybersecurity essential
Finance Ministries and Development Banks	Improved sovereignty but costly infrastructure investment	Efficiency gains, but possible loss of fiscal visibility	Inclusion, trade facilitation, regional hubs; development finance can catalyze

***Source**: Compiled by Bank and Finance as a structured synthesis of stakeholder-specific implications across the three scenarios. BIS (2023), IMF (2022), FSB (2023), World Bank (2023), Afreximbank (2022), Adrian and Mancini-Griffoli (2021).*

The table highlights the asymmetry of risks and opportunities. Central banks and regulators are most affected by the loss of sovereignty in private-led models. Financial institutions face disintermediation in a CBDC-led world, but also marginalization in a private-led system. Investors may benefit from efficiency gains but must navigate portfolio risks. Development banks emerge as key enablers, able to mobilize resources for interoperability projects that determine whether the future of payments converges or fragments.

6. Pathways to Implementation

The realization of a more efficient, inclusive, and interoperable payments system is not predetermined. Instead, it will depend on the **pathways taken by policymakers, regulators, financial institutions, and technology providers**. These pathways are shaped by three dimensions: **(i) technological infrastructure, (ii) regulatory frameworks, and (iii) international coordination**.

Technological Infrastructure

The modernization of payments hinges on upgrading infrastructure to support **real-time, tokenized, and cross-border transactions**. Real-Time Gross Settlement (RTGS) systems, as discussed in Figure 5, are being modernized into **24/7 instant payment platforms with cross-border linkages**. Projects such as **India's UPI**, **Brazil's Pix**, and **Singapore's PayNow** demonstrate that **retail instant payments can achieve mass adoption** when supported by open APIs and strong public-private cooperation (BIS, 2023).

Central banks face decisions on whether to build new CBDC infrastructures or **adapt existing rails for tokenization and interoperability**. The risk is a proliferation of isolated systems that replicate current inefficiencies rather than solving them. The success of projects like **mBridge**—linking CBDCs across Hong Kong, China, Thailand, and the UAE—shows that **cross-border pilots can address FX settlement frictions** (BIS, 2022).

Table 7 provides a comparative overview of selected instant payment systems across key jurisdictions. These systems—ranging from India's UPI and Brazil's Pix to the Eurozone's TIPS and the Pan-African PAPSS—highlight how different regions are advancing toward faster, more inclusive, and increasingly interoperable payment infrastructures. The table emphasizes differences in scale, adoption, and cross-border reach, shedding light on the diversity of approaches and outcomes observed to date.

The table reveals several important insights. First, **domestic adoption can reach critical mass rapidly when supported by central banks and enabled by strong regulatory backing**. UPI and Pix stand out as global benchmarks: UPI processes more than 10 billion transactions monthly, while Pix has already reached over 140 million users, covering roughly two-thirds of Brazil's adult population. These systems demonstrate the potential for **instant payments to drive financial inclusion**, lower transaction costs, and substitute cash in daily retail use.

Second, **cross-border interoperability remains nascent**. While some systems have achieved bilateral linkages—such as UPI with Singapore's PayNow, or PayNow with Thailand's PromptPay—most remain domestically focused. Regional projects like PAPSS in Africa seek to address this gap by reducing reliance on correspondent banking and U.S. dollar settlement for intra-African trade. However, PAPSS is still in its early stages, highlighting the long path toward **regional integration of instant payments**.

Third, the **role of advanced economies is more gradual**. The Eurozone's TIPS offers pan-European settlement in central bank money, but adoption by commercial banks has lagged compared to emerging markets. The United States, meanwhile, only launched FedNow in 2023, and adoption remains limited. These cases show that **institutional inertia, fragmented market structures, and legacy infrastructure can slow modernization**, even when technological capability exists.

Table 7 – Comparative Overview of Selected Instant Payment Systems

System	Country / Region	Launch Year	Key Features	Scale / Adoption	Cross-Border Linkages	Notes
UPI (Unified Payments Interface)	India	2016	24/7 real-time retail payments; interoperable QR and apps	10+ billion transactions/month (2023)	Linked with Singapore (PayNow), UAE	Strong regulatory and industry push; rapid adoption
Pix	Brazil	2020	Instant retail payments; QR code interoperability	140 million users (â‰ˆ65% of adult population)	Under discussion with other LatAm systems	Driven by Central Bank of Brazil; financial inclusion driver
PayNow	Singapore	2017	Mobile number/NRIC-based transfers, QR interoperability	Covers >80% of banks and e-wallets	Linked with India (UPI), Thailand (PromptPay)	Model for regional interoperability in ASEAN
FedNow	United States	2023	Instant clearing and settlement for interbank retail payments	Initial rollout; gradual adoption	Domestic only	Complements private networks (Zelle); still limited reach
TIPS (TARGET Instant Payment Settlement)	Eurozone	2018	Pan-European instant settlement in central bank money	Coverage in Eurozone banks; growing adoption	Domestic within EU	Aims to reduce reliance on private schemes (Visa, Mastercard)
PAPSS (Pan-African Payment and Settlement System)	Africa (AfCFTA)	2021	Regional payment infrastructure enabling cross-border instant settlement in local currencies	Early stage; multi-country rollout	Regional (AfCFTA countries)	Backed by Afreximbank; reduces reliance on USD in intra-African trade

***Source**: Compiled by Bank and Finance, based on central bank reports, BIS analyses, and market data. NPCI (2023), Banco Central do Brasil (2023), MAS (2022), Federal Reserve (2023), ECB (2022), Afreximbank (2022).*

Overall, Table 7 illustrates that **emerging markets have been at the forefront of instant payment innovation**, leveraging digital infrastructure to leapfrog legacy systems. Yet, without greater international coordination, the proliferation of domestic schemes risks replicating the fragmentation that currently burdens cross-border payments.

Regulatory Frameworks

The effectiveness of new payment models will depend on **regulatory clarity and harmonization**. Current divergence across jurisdictions creates uncertainty:

- The **EU's MiCA framework** offers a comprehensive regime for stablecoins.

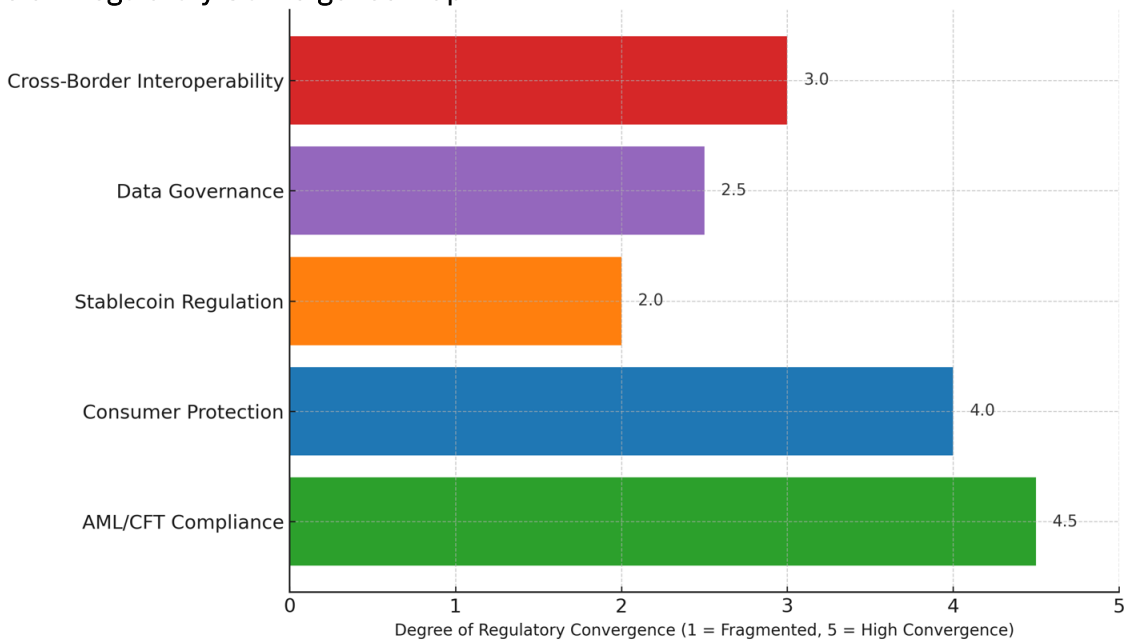
- The **US GENIUS Act**, enacted last month, is a comprehensive guide to US Stablecoin regulation. This federal law defines who may issue a stablecoin, how it must be backed and which federal or state regulator must oversee it. This will be important to overcome an environment of fragmented state frameworks.

- **Emerging markets** vary widely, with some promoting CBDCs aggressively while others experiment with private e-money regulation.

Without **common taxonomies, disclosure requirements, and settlement standards**, cross-border payments risk becoming **a patchwork of incompatible regimes** (IMF, 2022). Harmonization through the **G20 Roadmap** and **standard-setting bodies (CPMI, IOSCO, FSB)** is therefore essential.

Figure 6 provides a comparative overview of regulatory convergence across key dimensions of the payment landscape. It reveals that while progress has been achieved in areas such as anti-money laundering (AML/CFT) and consumer protection—where international bodies like the FATF and CPMI/IOSCO provide common guidance—other domains remain fragmented. The regulation of stablecoins is highly uneven: the EU has adopted MiCA, providing a comprehensive framework, while the United States maintains a patchwork of state-level licenses, and many emerging markets are still experimenting with pilot regimes. Similarly, approaches to data governance and cross-border interoperability diverge widely, reflecting competing models of digital sovereignty (e.g., EU's GDPR vs. China's data localization rules).

Figure 6 – Regulatory Convergence Map



***Source**: Compiled by Bank and Finance based on central bank and regulatory frameworks. BIS (2023), FSB (2023), IMF (2022), FATF (2022), CPMI-IOSCO (2021).*

Figure 6 highlights the uneven pace of regulatory convergence across different dimensions of the payments ecosystem. The analysis shows that **AML/CFT compliance and consumer protection are the most harmonized globally**, largely due to the guidance and peer review mechanisms established by international bodies such as the Financial Action Task Force (FATF) and the CPMI/IOSCO. Most jurisdictions have implemented some form of risk-based AML/CFT framework and baseline consumer safeguards, though enforcement varies in depth and consistency.

By contrast, **stablecoin regulation remains highly fragmented**. The European Union has introduced MiCA as a comprehensive legal framework, while the United States still relies on a fragmented state-by-state approach but it is starting to implement the Genius Act. Many emerging markets are experimenting with sandbox regimes or interim guidance, leaving significant uncertainty for market participants. This divergence creates legal risks and compliance costs, hampering cross-border use cases.

Similarly, **data governance and cross-border interoperability are only partially aligned**. Competing models—such as the EU's GDPR, China's data localization mandates, and ASEAN's regional frameworks—reflect broader issues of digital sovereignty. While some regional payment linkages (e.g., Singapore–India UPI/PayNow, EU TIPS) show promising progress, global standards remain elusive. Without coordination, the risk of a "splinternet" in payments grows.

Taken together, Figure 6 underscores that **technological innovation must be matched by legal and regulatory convergence**. Otherwise, fragmentation will persist, undermining efficiency, scalability, and trust in the future of payments. The policy challenge is to translate common objectives—safety, inclusion, competition, and innovation—into interoperable frameworks that can sustain global finance.

International Coordination

Perhaps the most decisive factor is **international coordination**. Payment systems are inherently cross-border, yet governance remains national. Current efforts—such as the **FSB Roadmap for Enhancing Cross-Border Payments**, the **G20 Data Gaps Initiative**, and BIS's multi-CBDC projects—show the need for **collective action**.

The challenge is that geopolitical competition often undermines technical cooperation. For example, while Europe and the US debate the regulation of stablecoins, China is rapidly internationalizing the **e-CNY pilots**, which could embed alternative standards into global trade networks (Carstens, 2021).

The uneven regulatory landscape illustrated in Figure 6 raises the question of how new collaborative frameworks might emerge to bridge these gaps. One of the most important experiments in this space is the **mBridge project**, a multi-CBDC platform led by the BIS Innovation Hub and a group of central banks across Asia and the Middle East. By testing shared

digital infrastructure for wholesale cross-border payments, mBridge provides valuable insights into both the opportunities and the obstacles of multi-jurisdictional innovation. Box 2 examines the lessons learned from this initiative.

Box 2 – The Case of mBridge – Lessons on Multi-CBDC Collaboration

The **mBridge project**, launched in 2021, represents one of the most ambitious multi-central bank digital currency (multi-CBDC) experiments to date. Coordinated by the **BIS Innovation Hub Hong Kong Centre** in partnership with the central banks of Hong Kong SAR, Thailand, the United Arab Emirates, and China (People's Bank of China), the initiative seeks to develop a shared digital ledger platform to enable **real-time, cross-border wholesale CBDC payments and settlements** (BIS, 2022).

Key Lessons from mBridge

First, **technology can reduce settlement frictions**. The pilot has shown that distributed ledger technology (DLT) can significantly reduce transaction times and costs compared to the correspondent banking model. Initial trials demonstrated that cross-border transfers could be completed within seconds, rather than days, while lowering operational risks associated with long settlement chains.

Second, **legal and governance frameworks remain a critical bottleneck**. While the technology is functional, the project has highlighted the difficulty of aligning legal regimes across jurisdictions. Questions over **jurisdictional authority, data-sharing, and dispute resolution** remain unresolved, underscoring that governance is as important as technical innovation in multi-CBDC arrangements.

Third, **interoperability and scalability are central challenges**. The mBridge prototype has demonstrated that multiple CBDCs can coexist on a shared platform, but extending participation to additional countries would require common standards and robust interoperability frameworks. Otherwise, the risk of creating "CBDC islands" persists, limiting global efficiency gains.

Finally, **political economy factors cannot be ignored**. The participation of major economies such as China and the UAE highlights the strategic dimension of CBDCs. Multi-CBDC platforms could reshape global liquidity flows and reduce reliance on existing reserve currencies, with potentially significant geopolitical implications (IMF, 2023).

Strategic Implications

The mBridge case demonstrates both the **promise and complexity of multi-CBDC collaboration**. It illustrates that while technological feasibility is no longer in doubt, the path to large-scale implementation requires unprecedented levels of regulatory coordination, political will, and international trust. For policymakers, mBridge provides a **laboratory of learning**, while for market participants it signals that the future of cross-border payments may evolve in radically different directions depending on the outcome of these experiments.

Source: *Compiled by Bank and Finance based on BIS (2022), BIS (2023), IMF (2023), Auer, Frost and Scholten (2022).*

Strategic Sequencing

A successful pathway will require **sequencing reforms and investments**:

Phase 1 – Domestic modernization: Expand instant payments, upgrade RTGS, and introduce clear regulation for e-money and stablecoins.

Phase 2 – Cross-border linkages: Establish bilateral and regional bridges, harmonize AML/CFT requirements, and pilot multi-CBDC systems.

Phase 3 – Global interoperability: Converge standards on data, messaging, and legal frameworks; ensure interoperability between CBDCs, stablecoins, and tokenized deposits.

This sequencing is not linear—countries may advance differently—but **coordination at each stage is crucial to avoid fragmentation and exclusion**.

7. Policy Recommendations and Roadmap

The future of payments is not solely shaped by technology or market adoption, but equally by the **policy frameworks and collective action** of regulators, central banks, and private-sector stakeholders. To ensure that innovation supports efficiency, resilience, and inclusion, coordinated strategies are required. This section outlines key policy recommendations and provides a phased roadmap for action.

1. Strengthening Global Standards and Governance

Policymakers must prioritize the convergence of **regulatory frameworks** across CBDCs, stablecoins, and tokenized deposits. International bodies such as the BIS, IMF, and FSB should extend their role from issuing high-level recommendations to facilitating binding agreements. Lessons from mBridge and other pilots highlight that without legal interoperability, technical interoperability cannot achieve full impact (BIS, 2023).

2. Accelerating Cross-Border Interoperability

While domestic instant payment systems have achieved remarkable progress (Table 7), their **cross-border integration remains limited**. Regional initiatives (e.g., ASEAN PayNow–PromptPay link, AfCFTA's PAPSS) should be scaled up into broader **inter-regional corridors**. Bilateral projects must be aligned with global standards to avoid fragmentation.

3. Ensuring Financial Inclusion and Consumer Protection

Instant payments and digital money carry significant potential to **narrow financial inclusion gaps**, particularly in emerging markets. However, policymakers must ensure **accessibility, affordability, and protection against fraud and misuse**. Regulatory frameworks should require transparent disclosure, redress mechanisms, and safeguards against exclusionary practices.

Box 3 analyses the collapse of Terra-Luna and the bankruptcy of FTX in 2022 to illustrate how design flaws, governance failures, and regulatory gaps can turn theoretical vulnerabilities into real-world systemic shocks. These episodes provide valuable lessons for the future architecture of payments and cross-border finance.

Box 3 – The Terra-Luna and FTX Collapses: Lessons on Fragility in Digital Finance

The collapse of the Terra-Luna stablecoin ecosystem in May 2022 and the bankruptcy of FTX in November 2022 exposed the vulnerabilities of digital financial structures that lacked credible backing, governance, and oversight. TerraUSD (UST), an algorithmic stablecoin pegged to the U.S. dollar through its sister token Luna, unraveled within days as confidence evaporated and redemption pressures mounted. At its peak, **UST had a market capitalization of over USD 18 billion**, making its implosion one of the most significant events in the short history of digital assets (CoinMarketCap, 2024).

The FTX crisis, meanwhile, underscored the systemic risks posed by **opaque governance, conflicts of interest, and insufficient safeguards in centralized exchanges**. At its height, FTX had over one million users and was among the largest global crypto trading venues. Its sudden collapse, triggered by revelations of misuse of customer funds and inadequate liquidity management, resulted in **losses exceeding USD 8 billion**, with ripple effects across global markets.

Lessons for payments and cross-border finance:

- **Illusion of stability**: Algorithmic stablecoins without hard collateral are highly susceptible to death spirals, undermining confidence in digital money more broadly.
- **Governance failures**: Weak internal controls and regulatory arbitrage can magnify systemic risks in global payment infrastructure.
- **Contagion potential**: Failures in one part of the crypto ecosystem can spread rapidly through interconnected markets, highlighting the importance of robust regulation, supervision, and resolution regimes (FSB, 2023; IMF, 2023).

These events reinforce why central banks and regulators emphasize resilient design, credible backing, transparency, and safeguards in both public (CBDCs) and private (stablecoins, tokenized deposits) forms of digital money.

***Source**: BIS (2022), BIS (2023), FSB (2022), FSB (2023), IMF (2022), IMF (2023), Rosengren (2022), SEC (2023) and Zetzche Arner and Buckley (2022).*

The Terra-Luna and FTX collapses serve as cautionary tales of how rapid growth in unregulated or poorly designed digital assets can destabilize markets and undermine trust. For policymakers and market participants, the key takeaway is not merely the need for tighter oversight, but also the imperative of designing resilient architectures that minimize contagion risks, ensure transparency, and align incentives. These lessons are directly relevant to the ongoing evolution of cross-border finance, where the pursuit of innovation must be balanced with safeguards to preserve stability and trust.

4. Balancing Competition and Innovation

Regulators should ensure that innovation does not lead to excessive **market concentration by Big Tech** or dominant payment platforms. As Table 5 showed, global Big Tech players already command significant scale. Antitrust oversight, interoperability mandates, and data-sharing requirements will be essential to maintain a level playing field for fintech entrants and incumbents.

5. Building Cyber and Operational Resilience

As payment infrastructures evolve into **always-on, real-time, and borderless systems**, the risk of cyberattacks and systemic outages rises. Regulatory frameworks must embed **resilience by design**, requiring redundant infrastructure, real-time monitoring, and clear crisis management protocols.

Roadmap for Policy Action

- Short-term (1–2 years):
  - Establish international working groups on CBDC legal harmonization.
  - Expand bilateral instant payment linkages and pilot regulatory sandboxes.
  - Issue baseline consumer protection standards for digital payments.

- Medium-term (3–5 years):
  - Scale up regional interoperability platforms (e.g., PAPSS, ASEAN initiatives).
  - Adopt shared standards for digital identity, KYC/AML, and data portability.
  - Develop prudential frameworks for stablecoins and tokenized deposits.

- Long-term (5–10 years):
  - Converge toward **globally interoperable CBDC networks**.
  - Embed digital money into cross-border trade settlement frameworks.
  - Establish permanent institutions for **global coordination of payments policy** under BIS/IMF/FSB oversight.

The regulatory treatment of digital money varies widely across jurisdictions, reflecting differences in institutional priorities, market structures, and policy philosophies. While some countries have introduced comprehensive frameworks to govern CBDCs, stablecoins, and

tokenized deposits, others remain in the early stages of experimentation. **Table 8** provides a comparative overview of selected jurisdictions, highlighting the diversity of approaches across three key categories of digital money. This comparison underscores the opportunities for innovation, but also the risks of fragmentation if regulatory convergence is not achieved.

Table 8 – Regulatory Frameworks for Digital Money (CBDCs, Stablecoins, Tokenized Deposits)

Jurisdiction	CBDC Status	Stablecoin Regulation	Tokenized Deposits	Key Risks Addressed	Adoption Stage
European Union	Digital euro in advanced research phase; ECB pilots ongoing	MiCA provides comprehensive licensing and reserve requirements	Under consideration via European Banking Authority guidance	Consumer protection, systemic risk, AML	Early adoption of stablecoin framework; CBDC in pilot
United States	Fed exploring CBDC (research only, no pilot)	Genius Act is the US's first federal legislation on digital assets.	Tokenized deposits emerging under OCC oversight	Financial stability, investor protection, legal uncertainty	Fragmented adoption
China	e-CNY in large-scale pilot with retail use cases	Stablecoins effectively prohibited; crypto ban in place	Tokenized deposits not permitted	Capital controls, monetary sovereignty	Advanced CBDC pilot
Singapore	MAS exploring wholesale CBDC; retail CBDC low priority	Stablecoin regulatory framework finalized in 2023	Tokenized deposits tested under Project Guardian	Innovation, AML, financial stability	Pilot/adoption stage
Brazil	Digital Real in pilot with financial institutions	Developing legal framework for stablecoins under central bank guidance	Tokenized deposits part of pilot ecosystem	Inclusion, systemic resilience, innovation	Active pilot phase
Nigeria	eNaira launched in 2021 but limited uptake	No dedicated framework; ad hoc oversight	Tokenized deposits not covered	Financial inclusion, adoption risk	CBDC operational but underutilized

Source: *Compiled by Bank and Finance from ECB (2023), European Commission (2023), Federal Reserve (2022), MAS (2023), Banco Central do Brasil (2023), Central Bank of Nigeria (2022), BIS (2023).*

The comparison in Table 8 reveals that while progress has been made, global regulatory approaches to digital money remain **fragmented and uneven**. The EU has taken the lead in creating a unified stablecoin framework under MiCA, while China and Nigeria have prioritized

CBDC deployment. By contrast, the U.S. was in a regulatory limbo, with tokenized deposits emerging in a fragmented supervisory environment, something that is expected to change with the recently approved Genius Act. The absence of clear, consistent rules poses risks for cross-border interoperability and market confidence. The lesson is clear: **regulatory clarity and convergence will be as important as technological innovation in shaping the future of digital money.**

8. Conclusions

The global payments landscape is entering a period of unprecedented transformation. The convergence of **digital innovation, regulatory change, and geopolitical realignment** is reshaping how value moves across borders, how institutions interact, and how individuals experience finance in their daily lives. This report has examined the historical trajectory of payments, the rise of CBDCs, stablecoins, and tokenized deposits, as well as the modernization of infrastructures and the emergence of global Big Tech competitors.

Three overarching conclusions emerge:

1. Technology alone will not determine the future of payments.

While new infrastructures such as **instant payments, CBDCs, and tokenized deposits** are advancing rapidly, their ultimate success depends on the regulatory and governance frameworks that shape their interoperability. As Tables 7 and 8 demonstrated, without coherent rules, innovation risks fragmenting rather than integrating the global system.

2. Cross-border payments remain the defining challenge.

Domestic systems are achieving remarkable efficiency and scale, from UPI in India to Pix in Brazil. Yet **cross-border corridors remain costly, slow, and fragmented**. Initiatives such as mBridge (Box 2) and regional linkages in Asia, Africa, and Europe demonstrate the potential for progress, but also highlight the institutional and legal complexities ahead. The G20's roadmap for enhancing cross-border payments remains a critical guiding framework — but success will require sustained multilateral cooperation.

3. Stakeholders face both risks and opportunities.

- **Regulators and central banks** must strike a balance between innovation, stability, and inclusion.
- **Financial institutions** have the opportunity to harness tokenized infrastructures, but face competitive threats from both fintechs and Big Tech platforms (Table 5).

- **Institutional investors** should monitor the regulatory convergence map (Figure 6) as both a **risk matrix** and a guide to emerging opportunities in infrastructure, technology, and new forms of digital assets.

The broader lesson is that **payments are no longer a "back-office" function but a strategic frontier** for financial systems and global economic integration. Just as earlier reforms in real-time gross settlement and securities clearing reshaped markets in the 20th century, the new wave of digital money and infrastructures will define the financial architecture of the 21st century.

Looking ahead, we anticipate a three-stage trajectory:

- **Short-term:** expansion of domestic instant payment systems and stablecoin frameworks.
- **Medium-term:** regional linkages and tokenized deposit experiments.
- **Long-term:** emergence of a **globally interoperable payments ecosystem**, potentially anchored by multi-CBDC platforms and supported by harmonized regulation.

For policymakers, institutions, and investors, the strategic imperative is clear: **engage early, shape the rules, and build capabilities** that will thrive in a digital, interconnected financial world. Those who wait for convergence to be achieved risk being left behind; those who act now can help shape the system that will define global finance for decades to come.

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10. Appendices

Appendix A. Methodology and Data Sources

The analysis presented in this report draws on a combination of **primary sources** (central bank publications, BIS and IMF working papers, regulatory frameworks, and official project documentation) and **secondary sources** (academic studies, industry white papers, and consultancy insights).

- Quantitative data on **remittance costs** and payment efficiency were sourced from the *World Bank Remittance Prices Worldwide* database (World Bank, 2021).
- Information on **CBDC projects and pilots** was obtained from the *BIS CBDC Tracker*, BIS Innovation Hub publications, and central bank communications.
- Regulatory frameworks were reviewed using official EU, MAS, Brazilian, and U.S. documentation (ECB, 2023; European Commission, 2023; MAS, 2023; Banco Central do Brasil, 2023).
- Market analysis on **Big Tech in payments** relied on BIS (2023), IMF (2023), and company disclosures.

This blended approach ensures both **academic rigor** and **practical relevance**, providing a solid foundation for strategic insights.

Appendix B. Table of CBDC Initiatives

Appendix **Table A1** provides a reference overview of selected Central Bank Digital Currency (CBDC) initiatives across jurisdictions. It lists the name of the initiative, its current status, and notes from official sources. The table highlights the diversity of approaches: some countries, such as the Bahamas and Nigeria, have already launched retail CBDCs; others, including China, India, Brazil, and Sweden, are conducting advanced pilots; while major economies such as the Euro Area, Singapore, and South Africa remain in the project phase. Meanwhile, countries like the United States, Canada, Mexico, and Kenya continue in research and consultation stages. By consolidating these initiatives, the appendix offers a transparent foundation for Figure 2 and underscores the uneven yet global nature of CBDC experimentation.

Taken together, the initiatives in Appendix Table A1 reveal three important patterns. First, **emerging markets have led in CBDC launches**, with the Bahamas and Nigeria moving earliest to deployment as part of broader financial inclusion agendas. Second, **advanced economies dominate the pilot and project stages**, with China's e-CNY, Sweden's e-Krona, and the Euro Area's digital euro as leading cases—indicating a cautious but strategic approach to digital money. Third, **North America and parts of Africa remain in research or consultation phases**, reflecting both policy hesitations and institutional priorities. These differences highlight the

uneven geography of CBDC adoption, raising questions about interoperability, cross-border coordination, and the risk of fragmentation in global payments.

Table A1 – Selected CBDC Initiatives by Country

Country / Region	Initiative	Status	Notes and Sources
Australia	eAUD	Pilot	Pilot program in 2023 testing multiple use cases (RBA, 2023)
Bahamas	Sand Dollar	Launched	First fully launched retail CBDC (Central Bank of the Bahamas, 2020)
Brazil	Drex	Pilot	Testing wholesale CBDC use cases (Banco Central do Brasil, 2023)
Canada	Project Jasper	Research	Wholesale CBDC experiments, no retail issuance planned (Bank of Canada, 2022)
China	e-CNY (Digital Yuan)	Pilot	Ongoing pilots in >20 cities, linked to Belt and Road trade (PBOC, 2023)
Euro Area	Digital Euro	Project	ECB launched investigation phase, progressing to design (ECB, 2023)
India	Digital Rupee	Pilot	Wholesale and retail pilots launched 2022 (Reserve Bank of India, 2022)
Japan	Digital Yen	Pilot	Moved into pilot stage in 2023 (Bank of Japan, 2023)
Kenya	e-KES	Research	Consultation ongoing on CBDC feasibility (Central Bank of Kenya, 2022)
Mexico	Digital Peso	Research	Announced plans, still in early research stage (Banxico, 2022)
Nigeria	eNaira	Launched	Africaâ€™s first CBDC, launched 2021 (Central Bank of Nigeria, 2021)
Russia	Digital Ruble	Pilot	Began pilot in 2023 (Central Bank of Russia, 2023)
Singapore	Project Orchid	Project	Exploring tokenized deposits and retail CBDC options (MAS, 2022)
South Africa	Project Khokha	Project	Wholesale CBDC experiments, interbank settlement (SARB, 2022)
Sweden	e-Krona	Pilot	Longest-running CBDC pilot in advanced economy (Sveriges Riksbank, 2023)
UAE and Saudi Arabia	Project Aber	Project	Joint cross-border wholesale CBDC pilot (BIS, 2020)
United States	Digital Dollar	Research	Fed studies wholesale CBDC, no launch (Federal Reserve, 2022)

Appendix C: Glossary of Acronyms

AML – Anti-Money Laundering

CBDC – Central Bank Digital Currency

CPMI – Committee on Payments and Market Infrastructures

FSB – Financial Stability Board

G20 – Group of Twenty

IMF – International Monetary Fund

MAS – Monetary Authority of Singapore

MiCA – Markets in Crypto-Assets Regulation (European Union)

RTGS – Real-Time Gross Settlement

SDG – Sustainable Development Goals

UPI – Unified Payments Interface (India)