

PRIMER ON PAYMENTS AND DIGITAL MONEY: PATHWAYS TO DEPLOYMENT AT SCALE

A Knowledge Guide to Forum Programming

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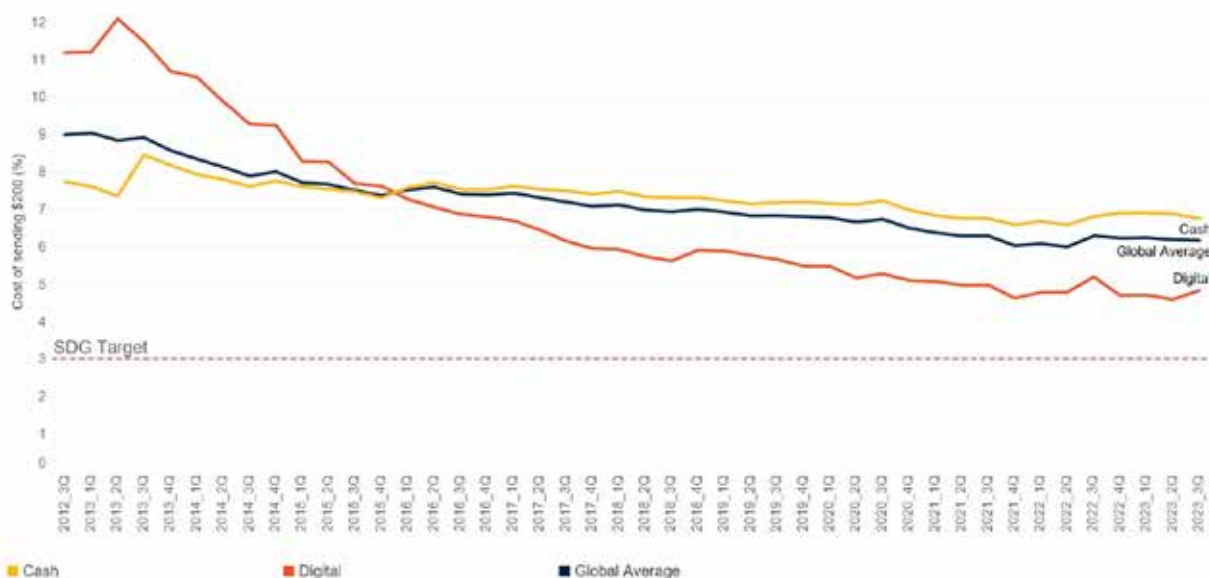
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Since time immemorial, money in one form or the other has enabled the storage and exchange of value, thus serving as the enabler of global trade. Through centuries of evolution, humanity has arrived at the forms that are prevalent today and are used extensively to make payments to purchase goods and services: we make more than 2 billion digital payments each day.¹ Behind every single one of these digital payments is an extensive Payment System/Financial Market Infrastructure (FMI) built on principles of centralised trust, efficiency, and integrity.

While friction has largely been reduced from some forms of payments (such as domestic payments), sending money across borders is still quite expensive and time-consuming mainly due to various intermediaries that help bridge each country's own payment FMI and regulatory framework.

For example, it still costs an average of USD 12.36 to send a remittance of USD 200² (see figure below on trend).

Figure 1: Trends in the global cost of sending \$200 in remittances

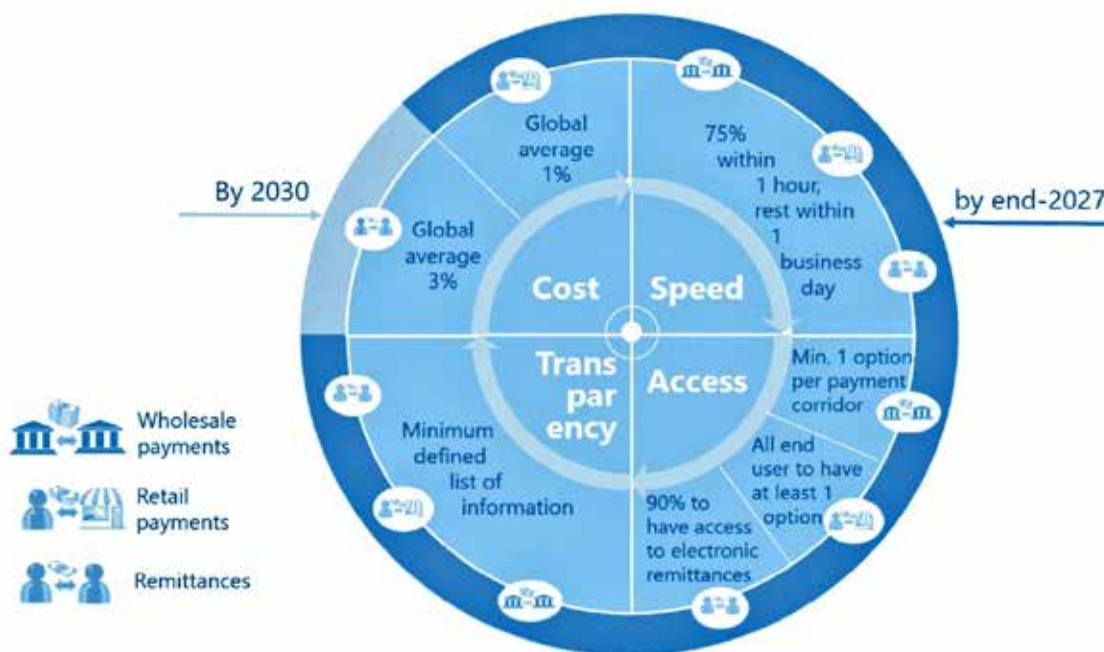


Source: Issue 47 of "Remittance Prices Worldwide", World Bank Group, September 2023

The World Bank Group further estimates that cutting remittance prices by 5 percentage points would save up to USD 16 billion a year.³ Looking at it from another lens, USD 45 billion is paid each year to remittance providers and there is an opportunity to give this back to those in need.⁴ This represents a subset of the opportunity that remains unrealised: the overall value of global cross-border payments is forecasted to reach USD 250 trillion by 2027.⁵

In 2020, this prompted the G20 to make cross-border payments faster, cheaper, more transparent, and more inclusive by 2027 a priority.⁶

Figure 2: G20 targets for cross-border payments



Source: Lammer, T, T Rice (2022): The G20 cross-border payments programme: A global effort. Journal of Payments Strategy & Systems Vol. 16, No. 3 2022, pp. 1–12

In parallel, the rise in blockchain technology in the years following the birth of Bitcoin in 2009, has led to the development of various digital forms of money that shift the whole payment paradigm and are revolutionising the role of various actors in the FMI.

CHAPTER 1: History of Money, Payments, and the Monetary System

The earliest payments system was the **barter system**. However, the barter system was inconvenient as it lacked a standard measure of value, and the commodities used were perishable, difficult to transport and indivisible. **Metal coins** became the first standard measure of value and solved the challenges of the barter system. The earliest discovered gold and silver minted coins appeared in Lydia (modern day Turkey) in the seventh century B.C.⁷ But as these precious metals were expensive and needed to be found, extracted, and processed, receipts issued by goldsmiths started to be used to make payments and laid the foundation for **paper money**.⁸

The first payment note we know about was introduced in China at the end of the tenth century under the Song Dynasty.⁹ However, as they were mass produced, the value of paper notes in

China eroded over time due to inflation and depreciation leading to decline in their popularity post the fifteenth century¹⁰. This challenge, along with the problem of determining and maintaining the value of paper money, was solved by linking the value of paper money to a certain amount of gold, thus giving rise to **Commodity Money** based on the **Gold Standard**: gold was officially made the standard of value in England in 1816 and in the United States in 1900.¹¹ **Governments started to control the issue of paper money and metal coins to remove counterfeits, determine their value and ensure the power to pay was secure, thus cementing the role of a central bank and its monetary system.**

The Great Depression of the 1930s prompted the US Federal Reserve to discontinue the gold standard domestically to protect their gold reserves, and this was firmly enacted in 1971 when the gold standard was completely abolished by the US and hence, foreign governments could no longer exchange dollar money for gold. More information on the post-World War II era global monetary system which was in place till 1971 and its dynamics can be found on the US Federal Reserve's history page.¹²

As notes and coins ceased to be directly convertible for gold, **Fiat Money** became the norm - money that is not convertible to gold or any other asset.¹³ Gradually, with technological advances, more abstract forms of money such as cheques, and credit cards gained popularity. With Internet, online commerce and banking gaining popularity from mid-1990s, electronic money and payments became prevalent. In early 2000s, PayPal made online payments and money transfers possible through its digital wallets without using banking information. The launch of the iPhone in 2007 and its App store made mobile payments more convenient and prevalent. And in 2009, the launch of Bitcoin added a new dimension to the existing monetary system based on centralised trust.

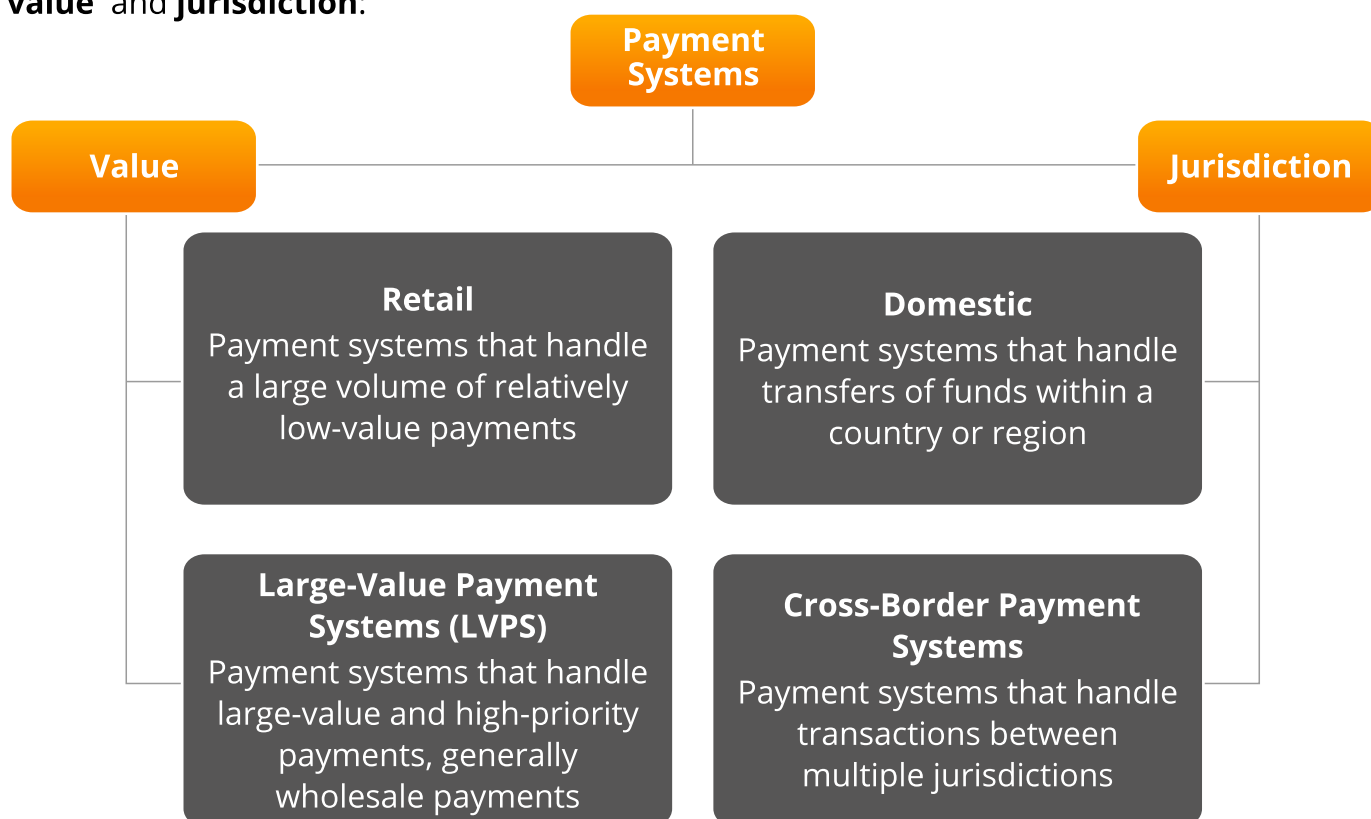
Figure 3: Evolution of money¹⁴



CHAPTER 2: Payment Systems as FMI

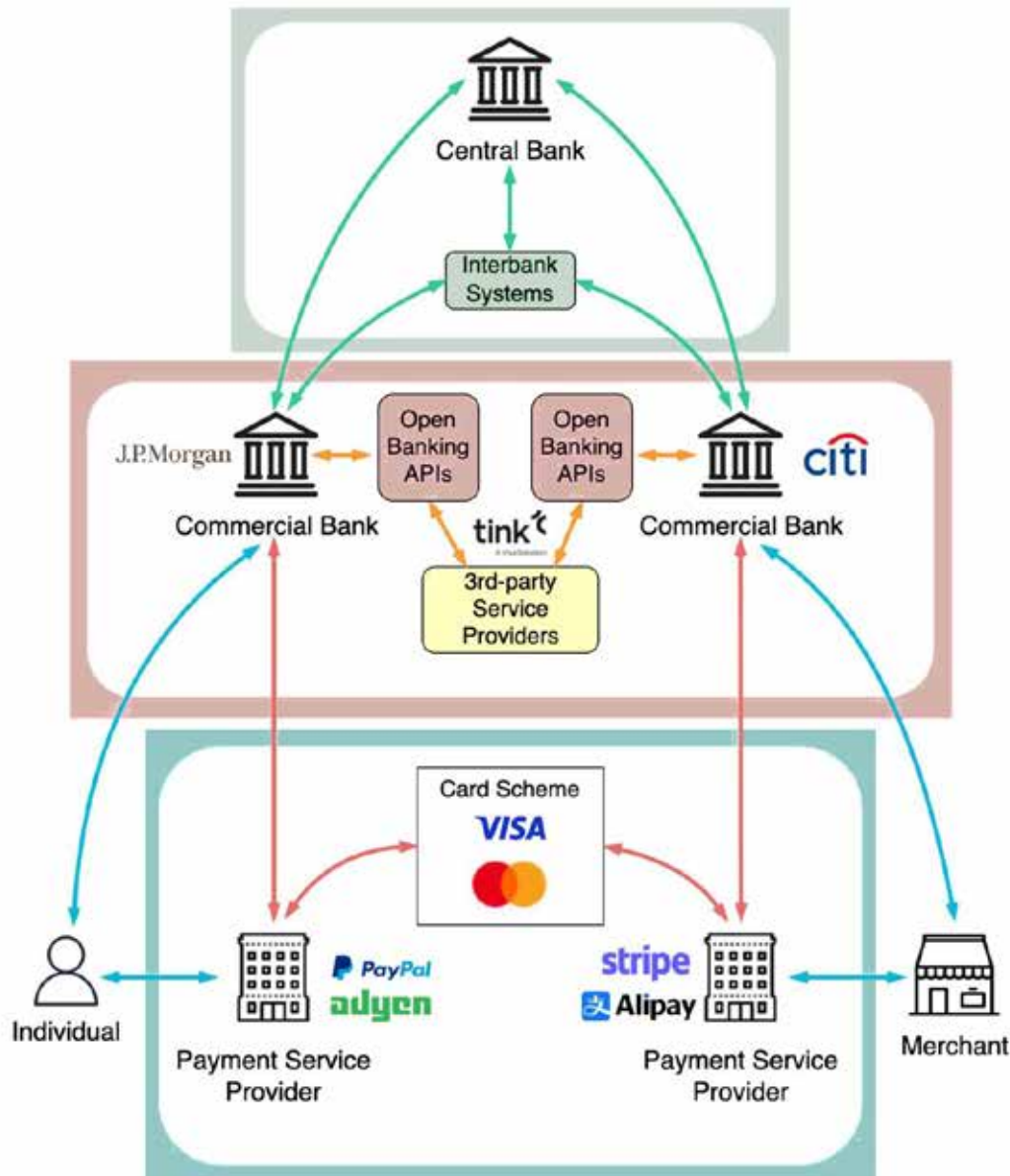
The Bank of International Settlements (BIS) defines an FMI as *a multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions*.¹⁵ Hence, a payment system is a type of FMI that looks at the subset of transfer of funds between or among participants. FMIs play the important role of setting common rules, procedures, and a risk-management framework for all participants. For more details on the 24 Principles for an FMI, please refer to the BIS website.¹⁶

At the core of a payment system is a central bank that issues money and maintains its essential functions. Alongside the central bank, commercial banks and payment service providers execute the vast majority of payments and offer customer-facing services.¹⁷ Payment systems can be classified based on a variety of factors, but the two key factors are **value** and **jurisdiction**:



The efficiency of each payment inherently depends on the underlying FMI supporting the payment system and hence, the time and money taken for funds to not only be transferred between the accounts of the payer and the payee, but also to be settled on the accounts of their financial institutions and the central bank. This process is known as the clearing and settlement process. For more information on the details of the process, please refer to your country's central banking website (an example is the [Federal Reserve's website](#)).

Figure 4: High-level payment system representation¹⁸



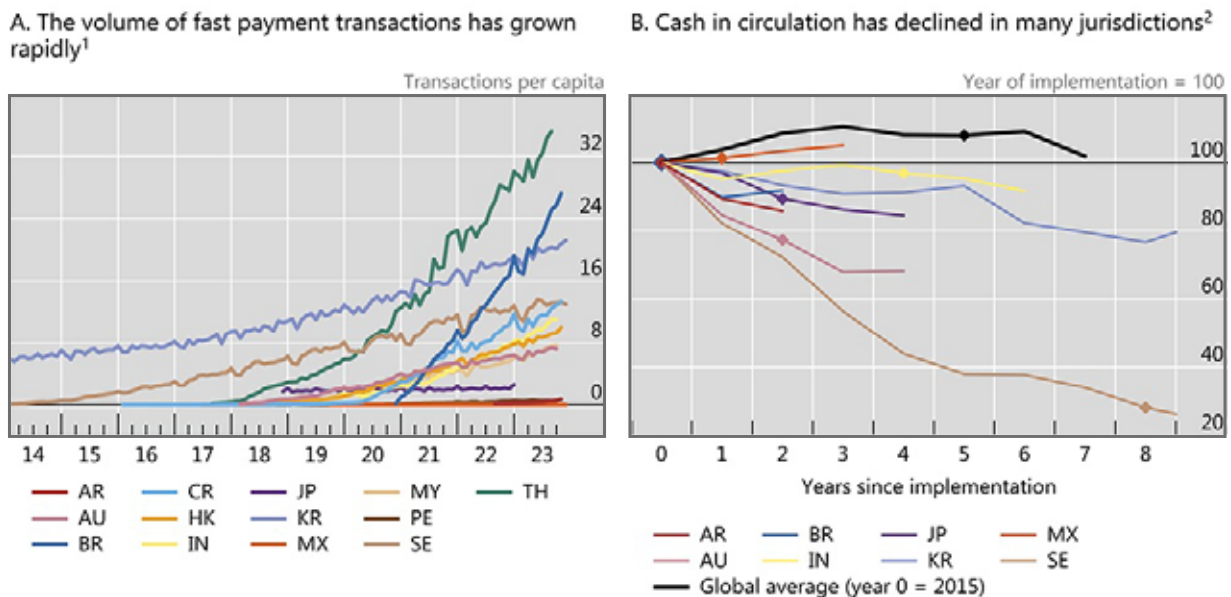
Source: World Bank Fast Payments Toolkit, World Bank, September 2021

Fast Payment Systems: A case study on successful evolution of payment systems

For more than two decades, the global financial system has seen a tremendous uplift in the number of jurisdictions that enable payments in real time (or near real time). **Such a system, where the transmission of the payment message and the availability of final funds to the payee occur in real time or near real time, and as near to 24 hours a day, seven days a week (24/7) as possible, is called a Fast Payment System (FPS).**¹⁹ As per BIS' latest quarterly review from March 2024, there are more than 100 jurisdictions that now have access to fast payments.²⁰

As seen in the chart below from the BIS review, the rise in fast payments across a sample of jurisdictions has coincided with a fall in cash:

Figure 5: Rise in fast payments and fall in cash circulation



The World Bank Group has assisted more than 120 countries in modernising their payment systems and is working with the Bill & Melinda Gates Foundation on Project FASTT²¹ (Frictionless, Affordable, Safe, Timely Transactions). The global fast payment market is further expected to grow at a compound annual growth rate of 35.5 percent from 2023 to 2030.²² For details on the key design features of a FPS and their impact on user adoption, please refer to the BIS' March 2024 quarterly review.

Apart from being timely, FPSs are cost effective for domestic payments as well:

Table 6: Reduction in transaction cost due to FPS²³

Country	Pre-FPS Cost per transaction	FPS Cost per transaction
Thailand (2018)	1.26 baht	0.46 baht
UK (2014)	Between USD 1.21 – 2.79	GBP 0.02

Use of FPS for cross-border payments has been limited, although recent attempts are being made to link domestic FPS bilaterally and multilaterally through BIS' Project Nexus.²⁴ Outside

CHALLENGES FOR CROSS BORDER PAYMENTS

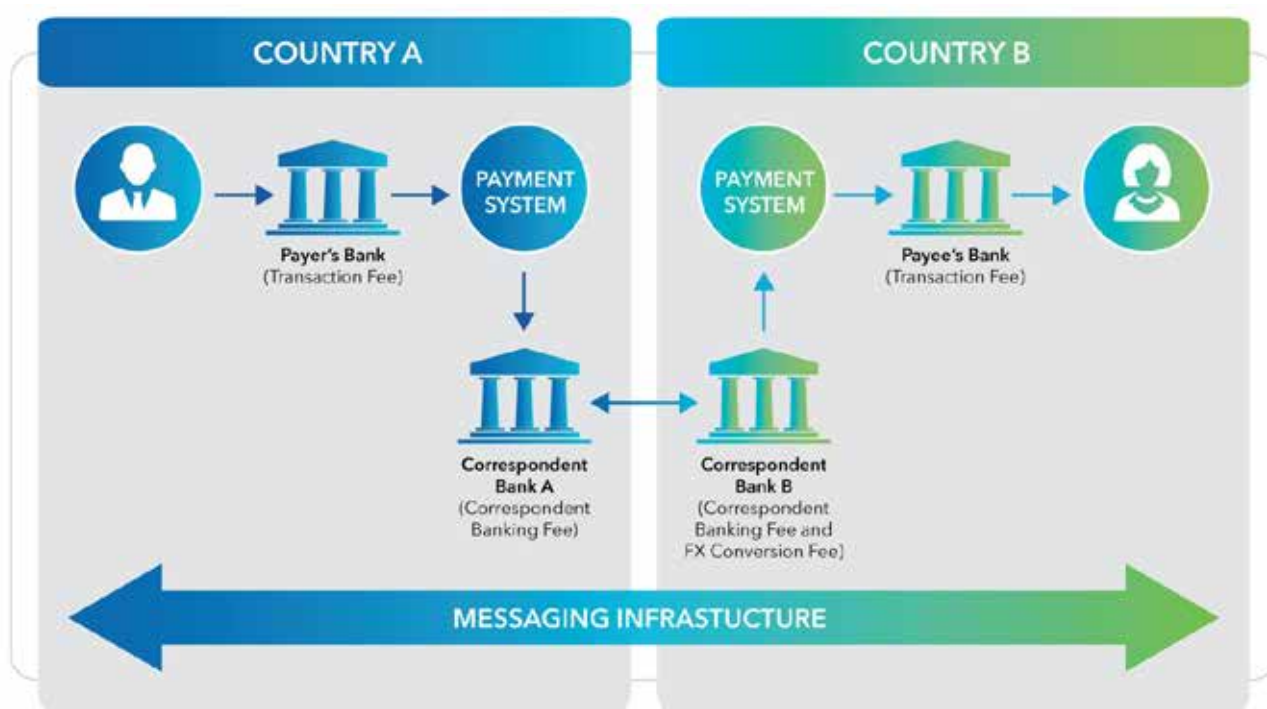
traditional public rails, private sector innovations, such as Onafriq in Africa, are also simplifying payments across the continent by seamlessly connecting 500 million mobile wallets across 40 countries.

While significant progress has been made in domestic retail payment systems, cross-border payment systems still lag behind.

CHAPTER 3: Challenges for Cross-Border Payments

Cross-border payments are challenging because they involve multiple currencies and intermediaries. Currencies are closed-loop systems and domestic payments systems of jurisdictions are not connected to each other. **Hence, when a cross-border payment is made, currency does not physically get transferred across borders; instead, accounts are credited in one jurisdiction and debited the corresponding amount in the other**²⁶. In simple scenarios, the two banks transacting have a direct relationship. But in complex cases, especially when emerging and developing economies are involved, the two banks do not have a direct relationship and depend on an intermediary **Correspondent Bank** to transact with trust.

Figure 7: Indicative representation of a cross-border payment²⁷



Source: Cross-Border Payments Overview, Federal Reserve Banks

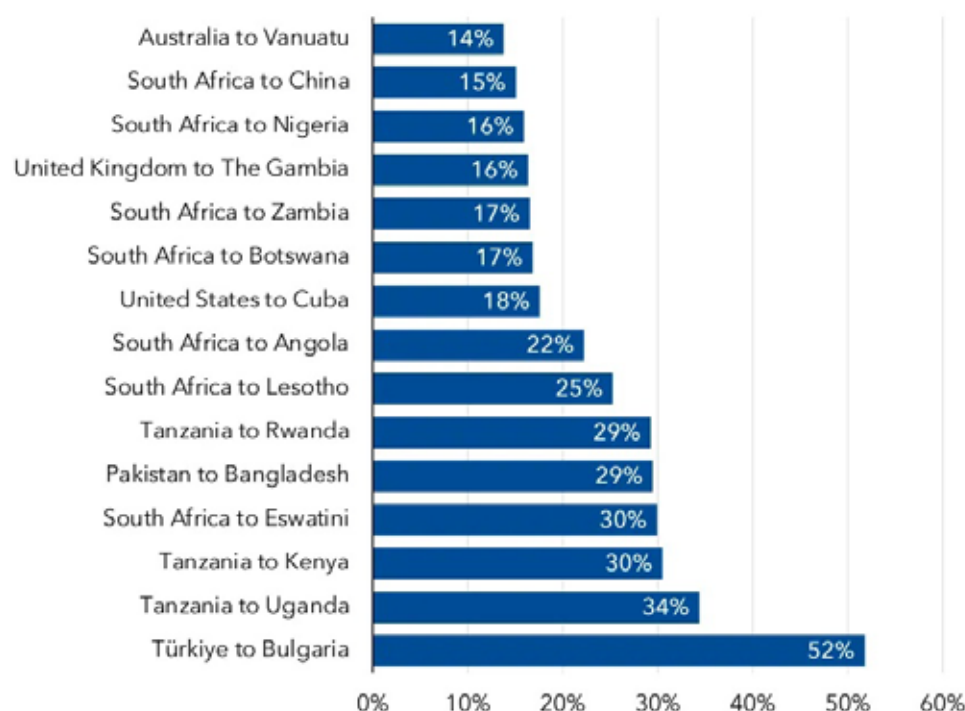
CHALLENGES FOR CROSS BORDER PAYMENTS

The less common the currencies being exchanged, the more correspondents are required, making it more time consuming and expensive as fees are deducted and KYC checks take place at each step of the chain. While the average costs for sending remittance globally is around 6%, it can reach as high as 52% in some corridors as shown in the figure below²⁸:

Figure 8: Higher than average remittance costs for some corridors

High costs

Low-value cross-border payments can incur steep fees.
(cost to send \$200 in percent)



Source: The World Bank, Remittance Prices Worldwide, and IMF staff.
Note: Data as of 2023 Q1.

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The multiple steps in each cross-border payment chain are further exacerbated by lack of payment messaging data standards, limited operating hours and legacy technology platforms. For a further deep-dive into challenges with cross-border payments, please refer to central banking resources such as the "[Bank of England's resource](#)".

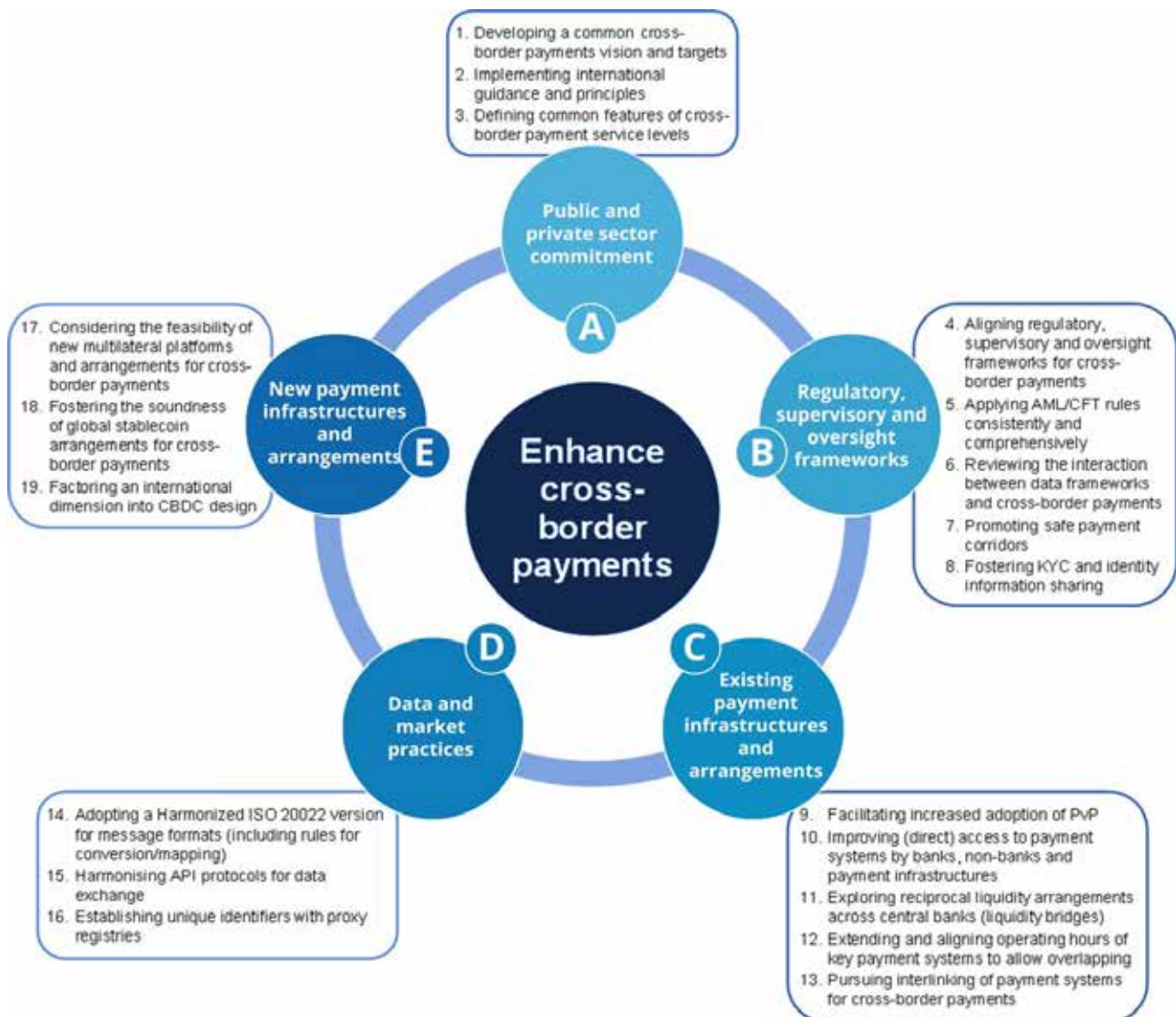
CHALLENGES FOR CROSS BORDER PAYMENTS

Solving cross-border payment challenges

The Financial Stability Board (FSB), in coordination with the BIS Committee on Payments and Market Infrastructures (CPMI) and other relevant international organisations and standard-setting bodies, developed a roadmap in 2020 at the request of G20 to enhance cross-border payments.²⁹

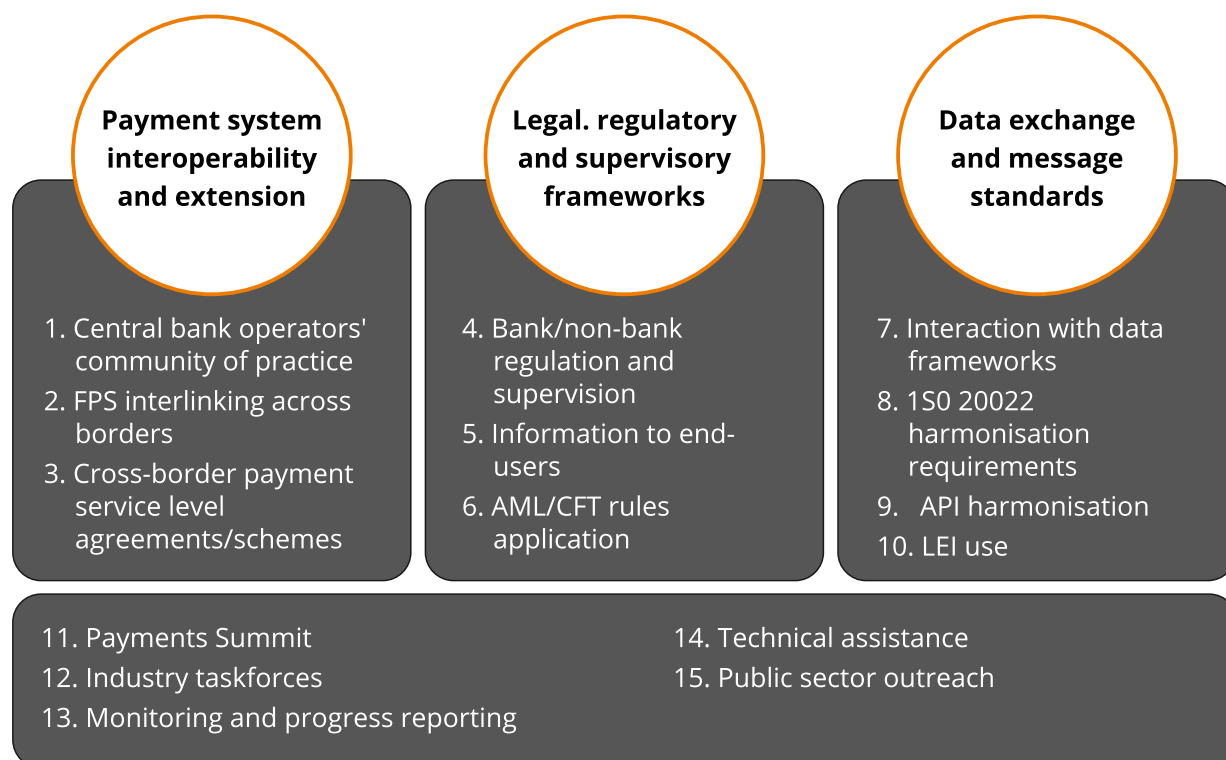
The roadmap identified 19 building blocks to address these various frictions:

Figure 9: Building blocks in G20 roadmap for cross-border payments



Post a two-year examination and assessment, the working group prioritised 3 key building blocks to take the roadmap forward:

Figure 10: Prioritised building blocks in G20 roadmap



This programme has now moved into action phase and FSB regularly monitors the progress of the KPIs shown in the introduction chapter of this paper (latest report [here](#)).

CHAPTER 4: Digital Money





Even though money has been digitised and made electronic in the last two decades, its reconciliation still requires centralised intervention. In this regard, blockchain has been one of the major technological stories of the recent decades. Fundamentally, it is based on Distributed Ledger Technology (DLT) which enables the network to update the distributed database (in an open / permissionless or closed / permissioned manner).

Blockchain, in principle, enables exchanging of value without a central trusted party as it allows other participants to record data and transactions permanently and transparently. **Inspired by software and technological advances through various DLTs, both central banks and private organisations have been exploring how to re-shape the current payment landscape and give money new capabilities³⁰, like:**

- 1. Programmability:** Adding a smart contract to money, which is a computer program that executes conditional "if/then" and "while" commands.
- 2. Composability:** This means that many smart contracts, covering multiple transactions and situations, can be bundled together, like "money Lego".
- 3. Tokenisation:** The use of software programmes to represent as a digital and unique token the ownership rights over any item of value.

Such functionalities in money potentially mean a sequence of transactions can be automated, resulting in reduction of manual intervention and dependence on intermediaries. For payments, this could mean simultaneous near-instant payments and settlement. With these new functionalities in mind, existing forms of money are being adapted with technology: **Central Bank Digital Currency (CBDC), Tokenised Deposits** and **Stablecoins**.

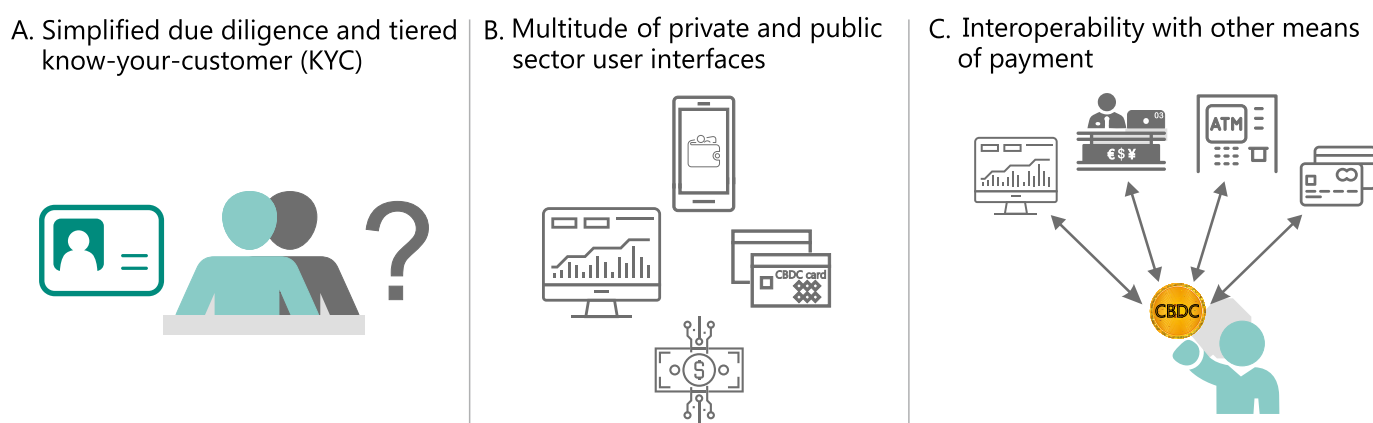
Figure 11: Different types of Digital Money³²

			
<p>CBDCs</p>	<p>Tokenised deposits</p>	<p>Fiat-backed stablecoins</p>	<p>Decentralised stablecoins</p>
<p>What it is</p>			
<ul style="list-style-type: none"> ◦ Digital form of central bank liability ◦ A kind of modern version of paper currency, coins and reserves 	<ul style="list-style-type: none"> ◦ Digital form of a bank deposit, issued by a regulated institution ◦ Recorded on a distributed ledger and intended to settle trades of digital assets 	<ul style="list-style-type: none"> ◦ Private sector-issued digital assets designed to maintain a stable value against a national currency, such as the US dollar, and backed by assets denominated in that currency 	<ul style="list-style-type: none"> ◦ Private sector-issued digital assets designed to maintain a stable value while backed by other digital assets, with decentralised governance
<p>Notable points</p>			
<ul style="list-style-type: none"> ◦ Being actively explored by 90+ countries ◦ Retail CBDCs expected to be live in major economies (EU, China, India) in next 5 years ◦ Wholesale CBDCs also being explored alongside new central bank platforms 	<ul style="list-style-type: none"> ◦ Early experiments by financial institutions and central banks ◦ Further scaling depends on clarifying legal status and regulation 	<ul style="list-style-type: none"> ◦ Proven scale in crypto markets (over \$7T transactions executed in 2022, market cap of ~\$130BN as of April 2023) ◦ Regulation in process of being clarified globally, but could be delayed in key markets (US) 	<ul style="list-style-type: none"> ◦ Space to watch for innovation and transparency ◦ Currently fraction of total stablecoin transactions ◦ Regulatory path not as clear as fiat-backed stablecoins, given challenges to regulating decentralised entities
<p>Interest on issuance</p>			
<ul style="list-style-type: none"> ◦ Central Bank/Public 	<ul style="list-style-type: none"> ◦ Banks 	<ul style="list-style-type: none"> ◦ Digital Disruptors 	<ul style="list-style-type: none"> ◦ Investors via decentralised autonomous organisations (DAOs)

CBDCs

CBDCs are mainly classified as retail or wholesale based on the intended user: **retail** CBDCs made available to individuals, while **wholesale CBDCs are intended to be used by financial institutions and other intermediaries to transact more efficiently with each other.** Retail CBDCs can augment FPS and further promote financial inclusion by removing specific barriers and lowering costs of payment services for unbanked:

Figure 12: Inclusive retail CBDC design features to improve financial inclusion



Source: Boakye-Adjei et al (2022).

For more details on the various design possibilities and current experiments, please refer to Section D of this [BIS paper](#).

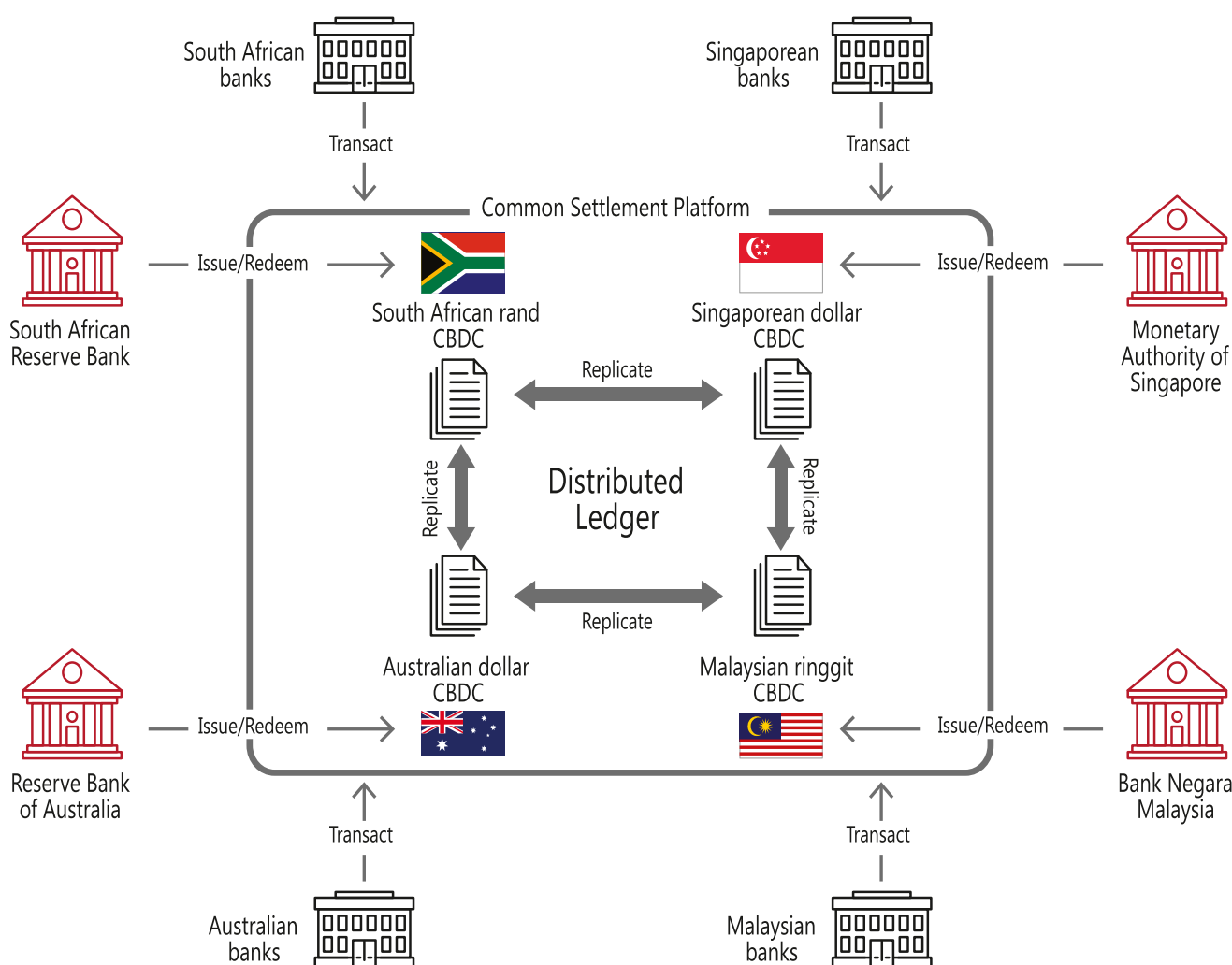
On the other hand, wholesale CBDCs offer the possibility for cross-border payments to overcome the lack of payment system interoperability that is today patched by the corresponding network in an expensive and time-consuming manner. By removing intermediaries and improving the speed and reliability of settlements, wholesale CBDCs will reduce the cost and complexity of cross-border payments.³³ A wholesale CBDC could also be programmed to settle transactions automatically based on predefined conditions.

In 2020, corporates moved nearly USD 23.5 trillion across countries, or an equivalent of 25% of Global GDP, while incurring transaction costs (excluding FX) of USD 120 billion and an average settlement time of 2-3 days.³⁴ By using a common digital platform linking national CBDCs, it was forecasted these costs could be reduced by 80%.

A BIS pilot project with the central banks of China, Hong Kong, Thailand, and the United Arab Emirates showed that DLT could execute trades between the four parties' digital currencies in seconds and reduce costs as much as 50% by cutting out correspondent banks and streamlining liquidity management.³⁵

In another BIS project, Project Dunbar³⁶, the Bank for International Settlements (BIS), Innovation Hub Singapore Centre, the Reserve Bank of Australia (RBA), the Bank Negara Malaysia (BNM), the Monetary Authority of Singapore (MAS) and the South African Reserve Bank (SARB) to explore how a common platform for multiple CBDCs could enable cheaper, faster and safer cross-border payments. The project explores multi-CBDC platforms where a central bank issues its own CBDC in its own domestic currency and commercial banks can hold these directly, enabling access to foreign currency without the need for accounts with correspondent banks (as shown below).

Figure 13: Multi-CBDC platform in Project Dunbar

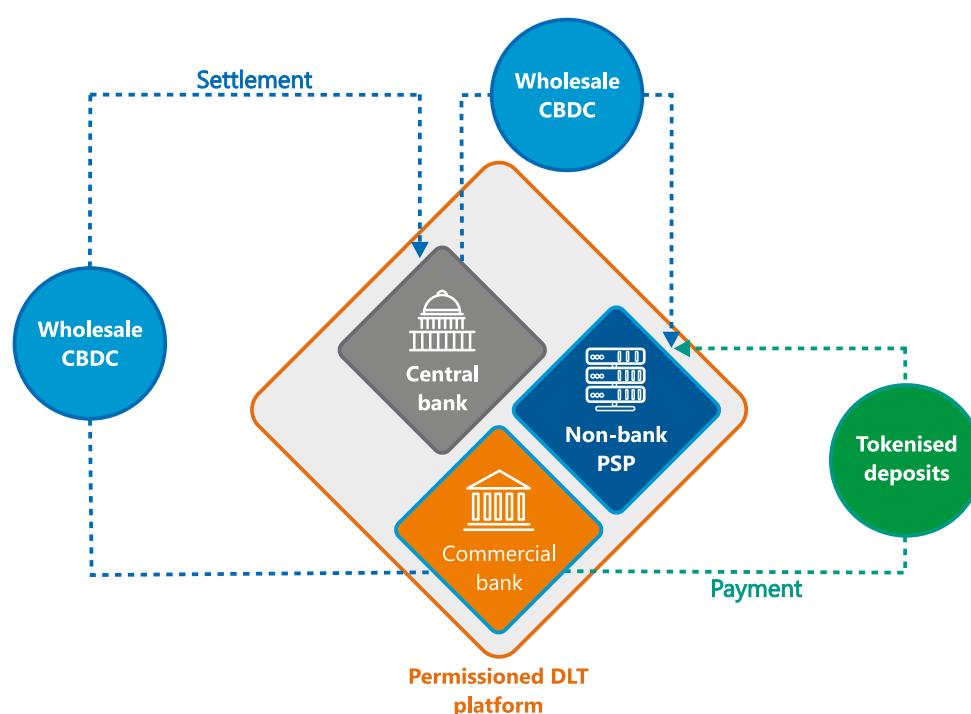


Source: Chapter III: The Future of the Monetary System, "BIS Annual Economic Report 2022", The Bank of International Settlements, 21 June 2022

Tokenised Deposits

Tokenised deposits are adaptations of current deposits, which could be programmed and made available 24/7. When combined with wholesale CBDCs, tokenised deposits could enable various steps of a complex transaction (such as paying for a house) to happen simultaneously when executed through a smart contract:

Figure 14: Payment made with tokenised deposits with Wholesale CBDCs³⁷



DLT = distributed ledger technology; PSP = payment service provider.

The green arrows indicate the movement of liabilities and the blue arrows indicate the movement of assets.

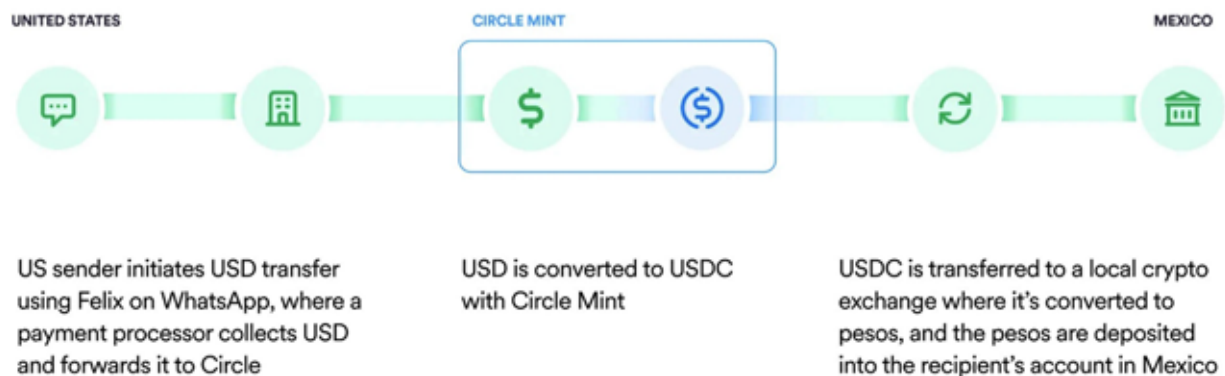
Source: BIS, adapted from McLaughlin (2021).

Fiat-backed Stablecoins

Fiat-backed stablecoins, such as USD Coin (USDC), are typically managed by a centralised intermediary that invests the underlying collateral and coordinates the coins' redemption and creation.³⁸ Such stablecoins can also be used to facilitate cross-border payments, such as remittances, in a faster and cheaper fashion. For example, the usage of USDC for sending money from the US to Mexico (as shown below) enabled a FinTech to offer a 40% better rate.³⁹

Figure 15: Cross-border payment using Stablecoins

Cross-border payments settle in seconds



Digital infrastructure and the need for interoperability

With various new adaptations and forms of money being explored, interoperability between the different networks that they run on is key to ensure their potential benefits can be realised. In this regard, various organisations such as BIS ([Unified Payments Ledger](#)) and the Monetary Authority of Singapore ([Global Layer-1](#)) have proposed open and interoperable digital networks that are compliant with regulatory requirements.

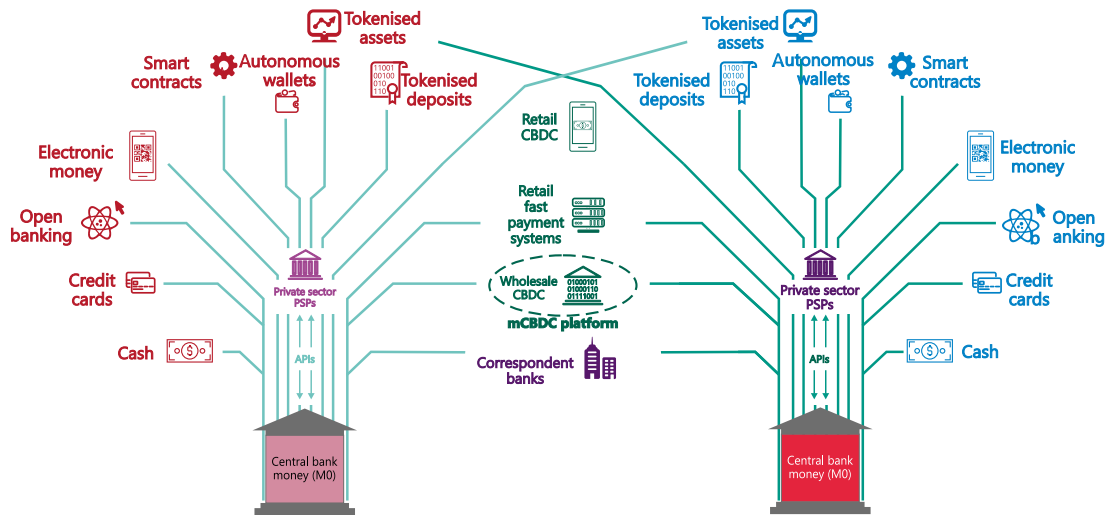
CHAPTER 5: The Future State

“ The future state of money and payments will be shaped by how the forces of policy, technology, business models, and user adoption evolve ”



The future state of money and payments will be shaped by how the forces of policy, technology, business models, and user adoption evolve. As per the BIS annual economic report of 2022⁴⁰, the future state could be an adaption of today's system with a forest canopy made up of various forms of money:

Figure 16: A possible future global monetary system

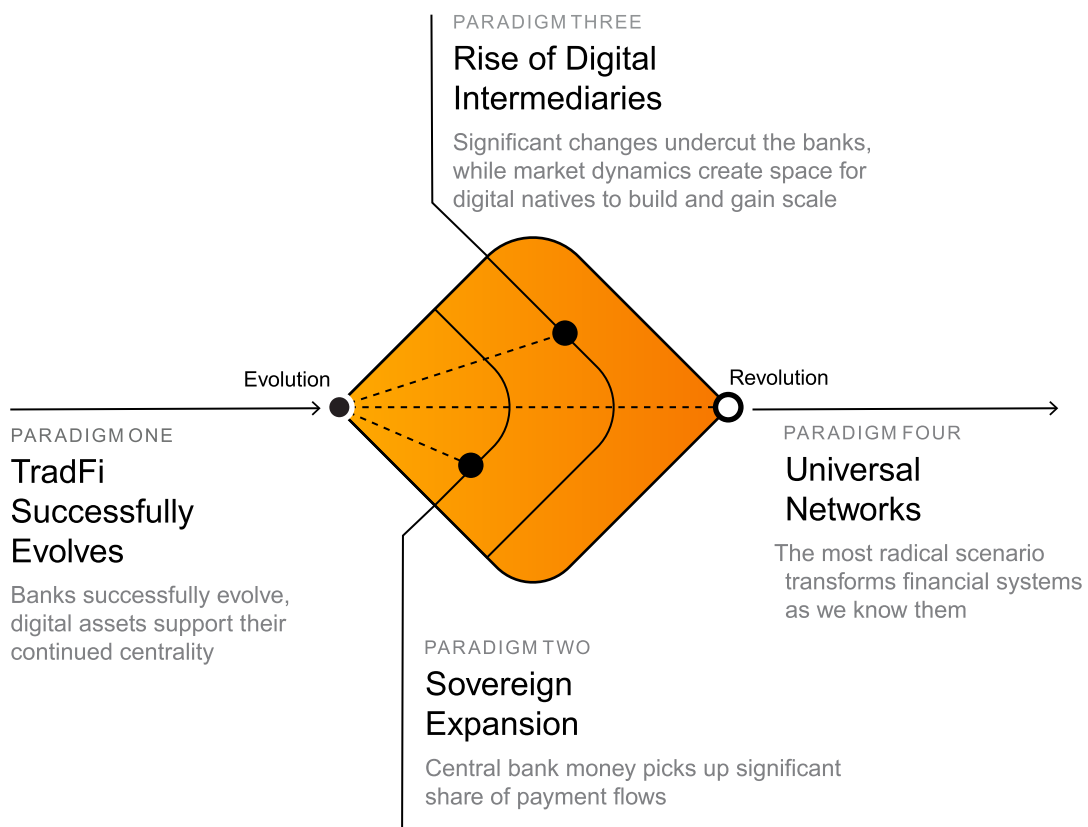


API = application programming interface; CBDC = central bank digital currency; PSP = payment service provider.

Source: BIS.

While this represents one potential future state, there are other options (as shown below) ranging from small evolutionary upgrades to revolutionary seismic shifts⁴¹:

Figure 17: Potential future monetary systems



Source: Four Visions For The Future Of Digital Money, Oliver Wyman Forum, May 2023

Conclusion

As we peer into the future, the landscape of digital money and cross-border payments is full of possibilities. **Interoperability and harmonised global regulations will pave the way for a seamless, interconnected network of financial transactions.** There is a serious potential to unlock financial inclusion, innovation, and economic growth, but only through careful navigation of regulatory guidance and technological advancements can we unlock the full promise of this digital frontier.

In conclusion, the evolution of money and payments is an unfolding saga, with digital money poised to script the next chapter. As stewards of this transition, regulators, financial institutions, and innovators alike must collaborate to sculpt a future where digital payments not only meet the demands of a dynamic economy but also serve as a catalyst for positive change.

CHAPTER 6: Coverage at Point Zero Forum 2024



Figure 18: Digital money and cross-border payments coverage at Point Zero Forum 2024

Global Update on State of Payments

- What are the key trends shaping the current global payments landscape in the digital age?
- How are these key trends impacting various stakeholders, including consumers, businesses, and financial institutions?



Global Update on Digital Money & Tokenisation

- How are emerging technologies and innovations driving the future evolution of digital money?
- How can stakeholders prepare to adapt to these changes to capitalise on new opportunities and mitigate potential challenges?



Pathways to Deployment at Scale (Digital Money & Tokenisation)

- What are the essential components of a blueprint for pervasive digital asset implementation at financial institutions?
- How can open and interoperable infrastructure facilitate seamless use of various digital money forms on the payment rails of tomorrow?

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The views expressed here are their own and do not necessarily reflect the views of Elevandi or its staff.

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