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INNOVATION

The Way Value Moves

The Evolution of Domestic, Regional and Global Payment Systems

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The history of payments is the history of reducing friction while increasing trust. The next generation will make settlement programmable.

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Executive Summary

Payment infrastructure is one of the least visible yet most critical components of the modern economy. Every purchase, salary payment, tax collection, investment, and international trade transaction depends upon trusted systems capable of moving value securely and efficiently between individuals, businesses, financial institutions, and governments. Like electricity or telecommunications, payment systems form part of a nation's critical infrastructure. When they function well, they are largely invisible. When they fail, economic activity slows immediately.

For decades, the global payments ecosystem has been remarkably successful. Domestic payment systems have become faster, safer, and more reliable, while international networks such as SWIFT have enabled financial institutions around the world to exchange payment instructions securely. Within Europe, the Single Euro Payments Area (SEPA) has created an integrated market for euro payments, significantly reducing friction for consumers and businesses operating across borders.

Yet the environment in which payments operate is changing rapidly. Global commerce has become increasingly digital, real-time, and international. Businesses expect instant settlement, continuous availability, lower costs, greater transparency, and seamless cross-border transactions. New technologies—including cloud computing, open banking, artificial intelligence, distributed ledger technology, tokenisation, stablecoins, and central bank digital currencies—are fundamentally reshaping how value can be transferred and managed. At the same time, geopolitical uncertainty, cyber threats, and increasing regulatory expectations are placing greater emphasis on resilience, security, and strategic autonomy.

These developments are transforming payment infrastructure from an operational utility into a strategic capability.

Understanding payment architecture is therefore no longer the exclusive domain of banks and payment specialists. Business leaders, policymakers, investors, regulators, entrepreneurs, and place managers increasingly need to understand how payment systems work, where their limitations lie, and how emerging technologies are changing the economics of moving money. Decisions about payment infrastructure now influence competitiveness, financial inclusion, innovation, international trade, national resilience, and economic sovereignty.

This Whitepaper provides an overview of today's payment architecture, explains the strengths and limitations of existing systems, and explores how the next generation of payment infrastructure is likely to evolve. Understanding these changes is essential not only for financial institutions, but for anyone seeking to navigate—and help shape—the digital economy of the coming decade.

This paper argues that every major innovation in payments has followed the same direction: reducing friction while increasing trust. The next stage in that evolution is programmable settlement, where payments become integrated directly into digital business processes rather than existing as isolated financial transactions.

I. Why Payments Matter

At its core, every economy depends on one fundamental capability: the ability to move value from one party to another. Whether buying a cup of coffee, paying salaries, financing international trade, investing in new businesses, or settling government obligations, payments are the mechanism through which economic activity becomes reality. Money is more than cash or numbers in a bank account. Money is information.

Every payment communicates a transfer of value between two parties. It identifies who is paying, who is receiving, how much is being transferred, in which currency, under what conditions, and when ownership changes. Modern payment systems therefore serve not only as financial infrastructure but also as information infrastructure, enabling billions of trusted transactions every day. Trade, in turn, depends upon trust.

A seller must trust that payment will arrive. A buyer must trust that goods or services will be delivered. Financial institutions must trust one another to settle obligations accurately and securely. Governments must trust the integrity of financial markets. Without trusted payment mechanisms, markets become slower, more expensive, and significantly less efficient.

Throughout history, improvements in payment infrastructure have consistently enabled economic growth. The development of banking systems, central banks, clearing houses, payment cards, electronic transfers, and digital banking has reduced transaction costs, increased liquidity, expanded international trade, and accelerated innovation.

Today, payment infrastructure has become one of the world's most critical strategic assets. It underpins financial stability, supports international commerce, facilitates investment, enables public services, and increasingly forms part of national resilience. As economies become more digital and interconnected, the ability to move value quickly, securely, and intelligently becomes a source of competitive advantage.

Understanding payment architecture therefore requires recognising that payments operate at several interconnected levels.

Throughout history, every significant advance in payment infrastructure has pursued the same objective: to reduce the friction involved in moving value while increasing the trust between participants. Coins reduced the limitations of barter. Banks reduced the risks of transporting cash. SWIFT reduced the uncertainty of international communication. SEPA reduced friction within Europe. Blockchain introduces a new possibility—not simply moving money faster, but making settlement programmable.

Domestic Payments

Most payments begin within a single country. Salaries, consumer purchases, utility bills, taxes, government payments, and business transactions are typically processed through national payment systems operated by central banks, commercial banks, and domestic clearing infrastructures. These systems are optimised for speed, efficiency, and high transaction volumes.

Regional Payments

As economic integration expands, domestic systems evolve into regional payment infrastructures. Europe's Single Euro Payments Area (SEPA) demonstrates how multiple countries can create a common framework that enables cross-border euro payments to be processed almost as easily as domestic transfers. Regional integration reduces friction, lowers costs, and supports a more competitive internal market.

Global Payments

International trade requires payment systems capable of connecting thousands of financial institutions across different jurisdictions, currencies, legal systems, and time zones. Networks such as SWIFT provide the secure exchange of payment instructions, while correspondent banking relationships enable funds to move between institutions worldwide. These systems have supported global commerce for decades but also reflect the complexity of international finance.

Digital Payments

A new generation of payment infrastructure is now emerging. Cloud-native platforms, real-time settlement, open banking, distributed ledger technology, tokenised assets, stablecoins, and programmable money are reshaping how value can be exchanged. These technologies do not simply make existing payments faster; they introduce entirely new possibilities for automation, interoperability, and financial innovation.

Together, these four layers—**domestic, regional, global, and digital**—form the architecture of modern payments. They are not competing systems but complementary components of an increasingly interconnected financial ecosystem. Understanding how they interact is essential for policymakers, financial institutions, businesses, and technology providers seeking to build the next generation of payment infrastructure.

The chapters that follow explore each of these layers in turn, explaining how today's systems operate, why they have been remarkably successful, where their limitations lie, and how payment architecture is evolving to meet the demands of a rapidly changing digital economy.

Why Payments Matter

Payments move value. Value drives trust. Trust enables economies.

Every economy depends on the ability to move value securely and efficiently. Payments turn economic activity into reality—connecting people, businesses, institutions and governments across four interconnected layers of infrastructure.

Money is information

Every payment communicates who, how much, in which currency, under what conditions, and when ownership changes.

Trade depends on trust

Sellers, buyers, institutions and governments must trust that value will move as expected.

Infrastructure drives growth

Better payments reduce costs, increase liquidity, expand trade, attract investment and accelerate innovation.

Strategic and resilient

Payments infrastructure underpins financial stability, public services, national resilience and global competitiveness.

Throughout history, every advance in payment infrastructure has pursued the same objective:

to reduce friction while increasing trust.

Coins reduced the limitations of barter › Banks reduced the risks of transporting cash › SWIFT reduced the uncertainty of international communication › SEPA reduced friction within Europe › Blockchain introduces a new possibility: programmable settlement

	1 Domestic Payments	2 Regional Payments	3 Global Payments	4 Digital Payments
Purpose	Enable everyday payments within a single country.	Enable cross-border payments within an integrated region.	Enable payments across the world between financial institutions.	Enable new forms of digital value exchange and automation.
Examples	Salaries, Purchases, Bills, Taxes	Euro Transfers, Business Payments, Direct Debits, Instant Payments	Trade Payments, FX Transfers, Cross-border Investments, Remittances	Mobile Payments, Blockchain Transfers, Smart Contracts, Stablecoin Payments
Key Infrastructure	Central bank payment systems, commercial banks, domestic clearing and settlement.	Regional schemes and standards (e.g., SEPA), common rules, interoperable systems.	SWIFT messaging, correspondent banking, international clearing, settlement in multiple currencies.	Cloud platforms, real-time settlement, APIs, DLT, tokenised assets, programmable money.
Focus	Speed, efficiency, reliability, high volumes.	Lower cost, standardisation, interoperability.	Security, reach, compliance, risk management.	Innovation, automation, interoperability, programmability.
Scope	**Within a country.**	**Across countries within a region.**	**Across the world.**	**Global, digital and borderless.**

An Interconnected Ecosystem

These four layers are not competing systems. They work together to support an increasingly interconnected global economy.

→ Individuals · Businesses · Financial Institutions · Governments · Global Economy →

The ability to move value quickly, securely and intelligently is a source of trust, resilience and competitive advantage.

> “Payments are more than infrastructure. They are the foundation of commerce, growth and prosperity.

II. The History of Moving Value

The history of civilisation is, in many respects, the history of moving value.

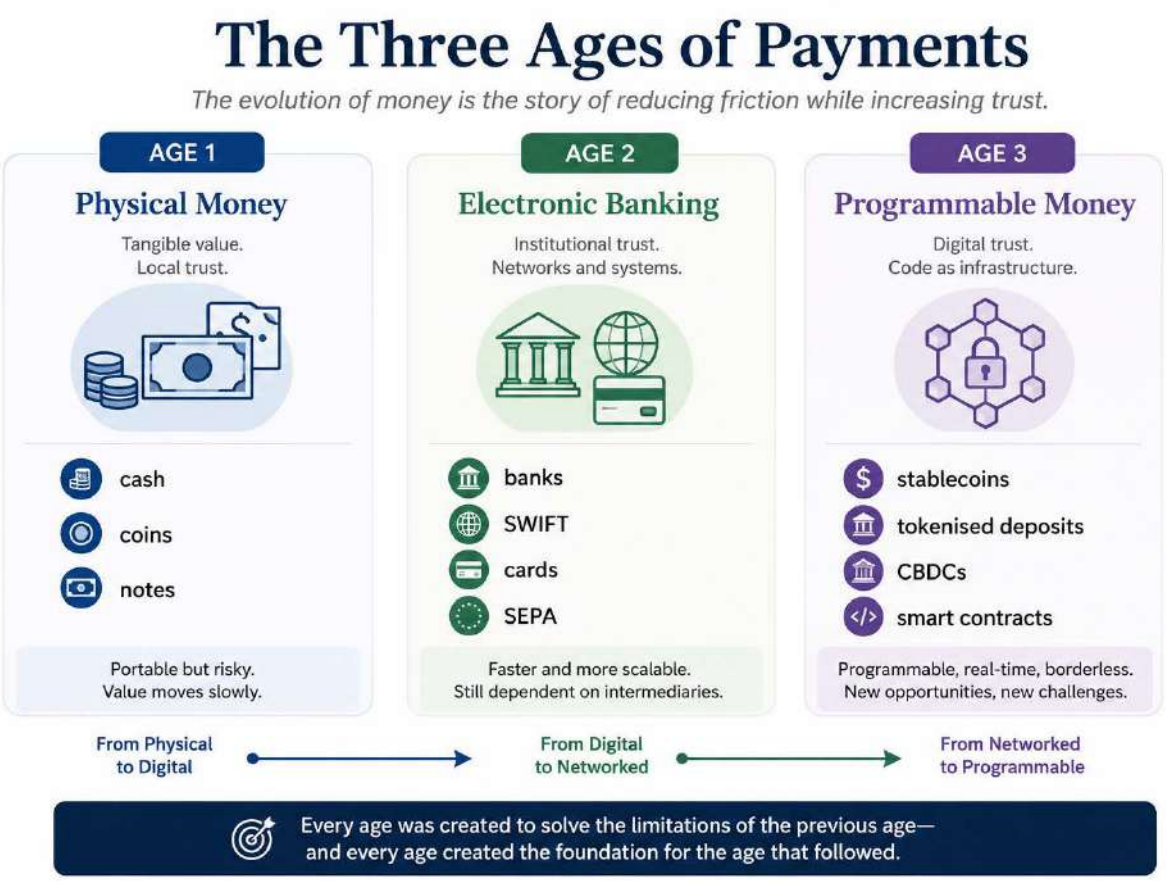
Long before banks, payment cards, or digital currencies existed, people exchanged goods directly through barter. Farmers traded grain for livestock. Craftsmen exchanged tools for food. Communities relied on trust, reputation, and reciprocal obligations to facilitate commerce.

Barter, however, had clear limitations. Every transaction required a "double coincidence of wants"—both parties needed to possess exactly what the other desired. As societies grew larger and trade expanded, barter became increasingly inefficient. Money solved this problem.

Whether represented by shells, precious metals, coins, or later paper notes, money provided a common medium of exchange, a store of value, and a unit of account. For the first time, economic activity could scale beyond local communities. Trade became faster, markets became larger, and prosperity expanded.

Yet the movement of physical money remained slow. For centuries, moving value meant physically transporting coins or banknotes between people and places. The risks were considerable. Theft, loss, distance, and time all limited commerce, particularly across borders.

The modern history of payment infrastructure is therefore the story of separating the movement of value from the movement of physical money. Every major innovation since the nineteenth century has made payments faster, safer, more scalable, and more trusted.



A Timeline of Payment Innovation

Before the nineteenth century – Barter and Cash

Economic exchange depended upon physical goods, coins, and later paper money. Payments could only occur where people and money met physically.

Mid-1800s – Cheques

Cheques enabled value to be transferred without moving cash. Banks became trusted intermediaries capable of settling obligations between customers.

1850s–1870s – Telegraph Transfers

The invention of the electric telegraph transformed finance. Payment instructions could suddenly travel across countries in minutes rather than weeks, laying the foundations of modern international banking.

Late 1800s – Correspondent Banking

As international trade expanded, banks established correspondent relationships around the world. Instead of maintaining branches everywhere, banks could hold accounts with one another, allowing payments to move across borders through trusted banking networks.

1950s – Payment Cards

Credit cards and later debit cards revolutionised retail payments by replacing cash with electronic authorisation. Consumers gained convenience, while merchants gained faster and more secure payment acceptance.

1973 – SWIFT

The Society for Worldwide Interbank Financial Telecommunication (SWIFT) introduced a standardised and secure messaging network connecting financial institutions globally. Rather than moving money itself, SWIFT enables banks to exchange trusted payment instructions, forming the backbone of modern international banking.

1980s–1990s – Electronic Banking

Electronic funds transfer, ATMs, and computerised banking increasingly replaced manual processes. Banking became faster, more automated, and more accessible.

Late 1990s–2000s – Internet Banking

The internet fundamentally changed customer interaction with financial institutions. Payments that once required visiting a branch could now be initiated from a personal computer and later from a smartphone.

2008 – SEPA

The Single Euro Payments Area created a harmonised market for euro payments across Europe. Standardised rules and common technical standards made cross-border euro transfers almost as simple and inexpensive as domestic payments.

2008 onwards – Faster Payments

Real-time payment systems began emerging around the world. Customers increasingly expected payments to settle within seconds rather than days, twenty-four hours a day, every day of the year.

2020s – Stablecoins and Tokenised Money

Blockchain technology introduced a new model for transferring value. Stablecoins combine the speed and programmability of digital assets with the relative stability of traditional currencies, enabling continuous settlement across borders without relying entirely on conventional banking infrastructure.

Generation	Solved	Created
Barter	Direct exchange	No scale
Cash	Universal money	Transport risk
Banking	Safe custody	Slow communication
Telegraph	Faster communication	Manual processing
SWIFT	Standard messaging	Settlement friction
SEPA	European integration	Regional limitation
Stablecoins	Programmable settlement	Regulatory questions

From Physical Money to Digital Value

Viewed over two centuries, the evolution of payments reveals a consistent pattern.

- Each generation of payment infrastructure has sought to reduce friction.
- Payments have become faster.
- Less expensive.
- More secure.
- More automated.
- More global.
- More transparent.

At the same time, expectations have risen. Consumers now expect instant payments. Businesses expect global reach. Regulators demand greater transparency. Financial institutions require stronger resilience. Technology companies seek programmable infrastructure capable of supporting entirely new business models. The result is that payment architecture is entering another period of profound transformation.

Domestic payment systems continue to evolve. Regional infrastructures such as SEPA are expanding their capabilities. Global networks such as SWIFT are modernising. At the same time, distributed ledger technology, tokenisation, stablecoins, and programmable money are introducing entirely new approaches to moving value. The fundamental objective, however, has remained remarkably consistent for thousands of years.

To enable people to exchange value with greater confidence, greater efficiency, and greater trust than ever before. Every generation has solved the challenges of its own time. Barter became money. Money became banking. Banking became digital. Digital payments became instantaneous. The next generation will make settlement programmable.

History suggests that no payment architecture is ever final. Every generation solves the limitations of the previous one while revealing new opportunities for innovation. The objective, however, remains remarkably constant: **to reduce friction while increasing trust.** Programmable settlement is simply the next chapter in that continuing story.

Every generation of payment infrastructure has reduced friction while increasing trust. The next generation will make settlement programmable. That is not simply the future of payments. It is the future of commerce itself.

III. Domestic Payment Systems

Every payment begins somewhere.

Although international payments often attract the greatest attention, the overwhelming majority of transactions occur within national borders. Salaries are paid, taxes collected, utility bills settled, retail purchases completed, and businesses pay suppliers through domestic payment systems.

These infrastructures process millions of transactions every day and form one of the most critical components of a country's financial system. Their success is often invisible. Consumers simply expect money to move quickly, securely, and reliably.

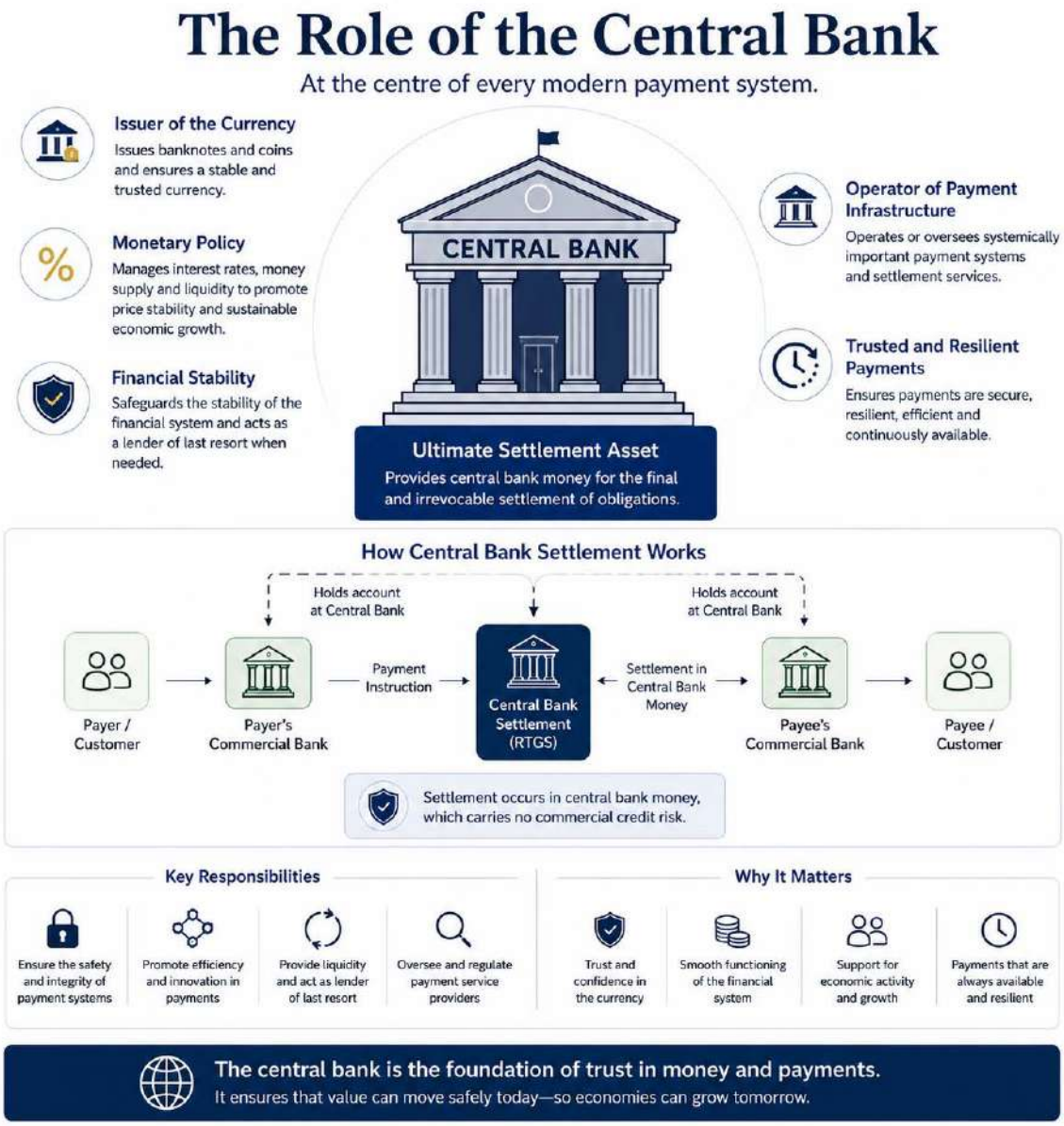
Behind every transaction, however, lies a sophisticated infrastructure operated jointly by central banks, commercial banks, payment service providers, and clearing organisations. Understanding how domestic payment systems operate provides the foundation for understanding the wider payment ecosystem.

The Role of the Central Bank

The concept of a central bank has evolved over more than three centuries. Early central banks were established to finance governments, manage public debt and provide monetary stability. Sweden's **Sveriges Riksbank**, founded in 1668, is the world's oldest central bank still in operation, while the **Bank of England**, established in 1694, became a model for many modern central banks. As banking systems expanded during the nineteenth and twentieth centuries, central banks assumed additional responsibilities, including issuing currency, acting as banker to commercial banks, maintaining financial stability and conducting monetary policy.

Today, the central bank sits at the heart of every modern payment system. Commercial banks maintain accounts at the central bank, allowing obligations between banks to be settled using **central bank money**—the safest form of money in the financial system because it carries no commercial credit risk. Most central banks also operate or oversee the country's systemically important payment infrastructure, particularly **Real-Time Gross Settlement (RTGS)** systems, which provide immediate and irrevocable settlement of high-value payments.

As payment technologies continue to evolve, central banks are modernising their infrastructures through initiatives such as **ISO 20022**, supporting instant payment systems and exploring **Central Bank Digital Currencies (CBDCs)**. While the technologies are changing, their fundamental mission remains unchanged: to preserve confidence in money and ensure that the financial system remains secure, resilient, efficient and continuously available.


The Role of the Central Bank
At the centre of every modern payment system.
Issuer of the Currency
Issues banknotes and coins and ensures a stable and trusted currency.
Monetary Policy
Manages interest rates, money supply and liquidity to promote price stability and sustainable economic growth.
Financial Stability
Safeguards the stability of the financial system and acts as a lender of last resort when needed.
CENTRAL BANK
Ultimate Settlement Asset
Provides central bank money for the final and irrevocable settlement of obligations.
Operator of Payment Infrastructure
Operates or oversees systemically important payment systems and settlement services.
Trusted and Resilient Payments
Ensures payments are secure, resilient, efficient and continuously available.
How Central Bank Settlement Works
Holds account at Central Bank
Holds account at Central Bank
Payer / Customer
Payer's Commercial Bank
Payment Instruction
Central Bank Settlement (RTGS)
Settlement in Central Bank Money
Payee's Commercial Bank
Payee / Customer
Settlement occurs in central bank money, which carries no commercial credit risk.
Key Responsibilities
Ensure the safety and integrity of payment systems
Promote efficiency and innovation in payments
Provide liquidity and act as lender of last resort
Oversee and regulate payment service providers
Why It Matters
Trust and confidence in the currency
Smooth functioning of the financial system
Support for economic activity and growth
Payments that are always available and resilient
The central bank is the foundation of trust in money and payments.
It ensures that value can move safely today—so economies can grow tomorrow.

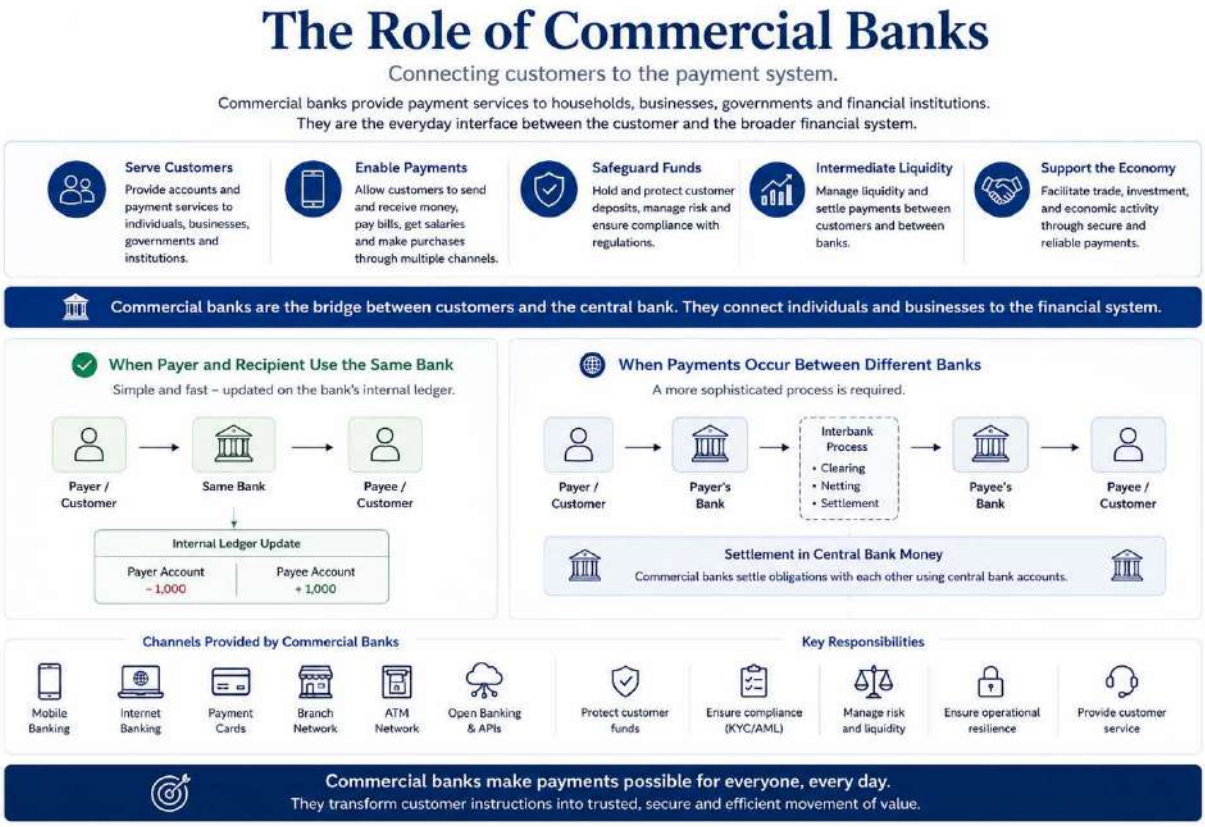
The Role of Commercial Banks

Commercial banks provide payment services to households, businesses, governments and financial institutions. Customers hold deposit accounts with their bank, initiate transfers, receive salaries, make purchases, and access payment services through mobile applications, internet banking, payment cards and other digital channels.

Commercial banks also play a central role in the creation of money. Contrary to a common misconception, most of the money in modern economies is not created by central banks but by commercial banks when they extend loans. When a bank grants a mortgage or business loan, it typically credits the borrower's deposit account with a matching amount, thereby creating a new bank deposit. This deposit becomes part of the money supply and can be used for payments throughout the economy. Central banks influence this process through monetary policy, liquidity provision and prudential regulation, but the day-to-day creation of bank deposits is primarily undertaken by commercial banks.

When both payer and recipient use the same bank, transferring money is relatively straightforward. The bank simply updates its own internal ledger, debiting one customer's account and crediting another's.

When payments occur between different banks, however, a more sophisticated process is required. Because each bank maintains its own ledger, the transfer must ultimately be settled between the banks themselves using central bank money. This interbank settlement process forms the foundation of modern payment systems and ensures that obligations between financial institutions are discharged with finality.



Clearing

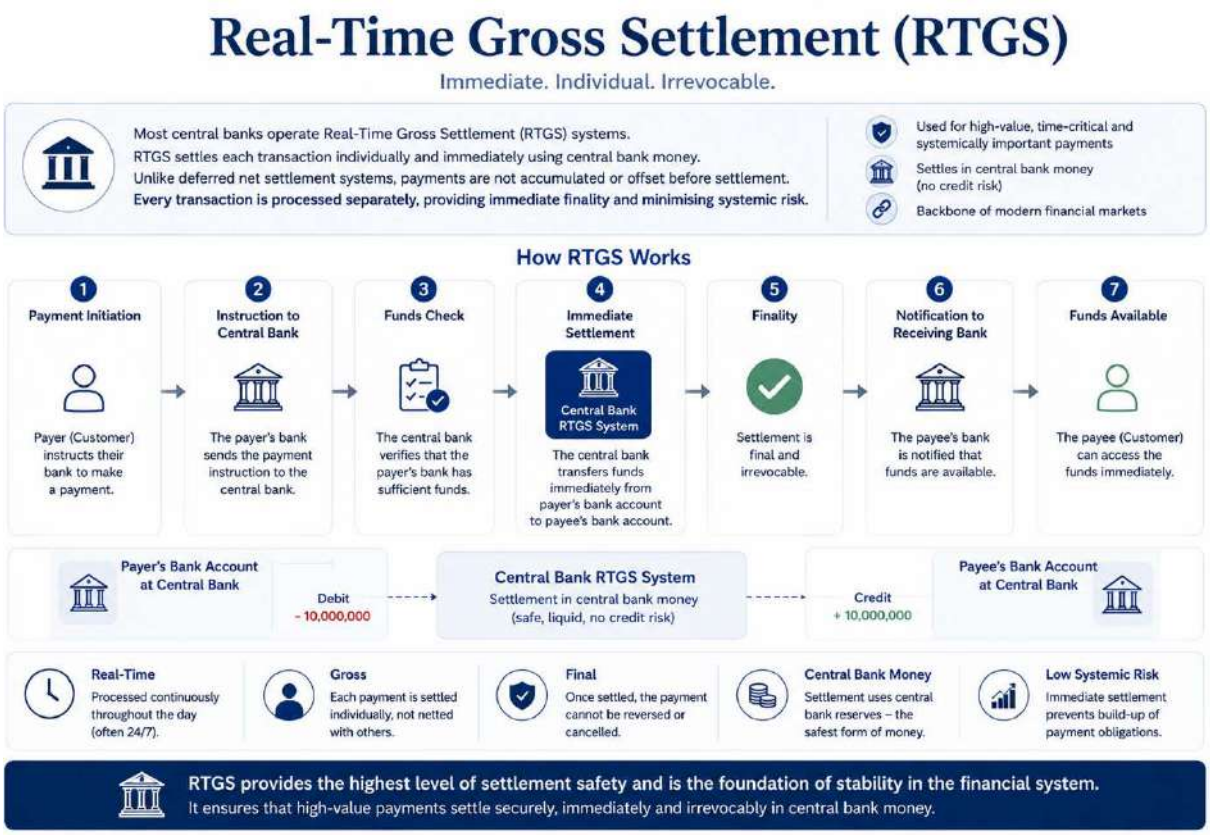
Clearing determines what each participating bank owes every other participating bank. Throughout the day, banks exchange payment instructions representing thousands or millions of individual customer transactions. Rather than settling every payment separately, clearing systems calculate the net obligations between participating institutions. This significantly reduces the amount of liquidity required within the banking system while improving operational efficiency. In simple terms, clearing answers the question: Who owes whom, and how much?

Settlement

Settlement is the final transfer of funds between financial institutions. Once clearing has determined each bank's obligations, settlement transfers central bank money between the banks' accounts held at the central bank. Once settlement has occurred, the payment becomes final and irrevocable. Settlement therefore provides legal and financial certainty. While customers experience a payment as a single transaction, financial institutions distinguish carefully between clearing—the calculation of obligations—and settlement—the discharge of those obligations.

Real-Time Gross Settlement (RTGS)

Most central banks operate Real-Time Gross Settlement (RTGS) systems. RTGS settles each transaction individually and immediately using central bank money. Unlike deferred net settlement systems, payments are not accumulated or offset before settlement. Every transaction is processed separately, providing immediate finality and minimising systemic risk. RTGS systems are primarily used for high-value, time-critical, and systemically important payments between financial institutions. They form the backbone of modern financial markets.



Instant Payments

Consumer expectations have changed dramatically. Historically, many domestic transfers required one or more business days to complete. Today, customers increasingly expect payments to settle within seconds, twenty-four hours a day, seven days a week. Instant payment systems meet this expectation by enabling immediate funds availability, continuous operation, and rapid confirmation that payments have been completed successfully. For individuals and businesses alike, instant payments improve cash flow, reduce uncertainty, and enable entirely new digital services.

Examples of Modern Domestic Payment Systems

Countries have adopted different approaches to domestic payment infrastructure, reflecting their regulatory environments, market structures, and technological priorities.

Swish (Sweden)

Swish enables real-time mobile payments between individuals, businesses, organisations, and public authorities. Built on Sweden's domestic payment infrastructure, it has become one of the world's most widely adopted instant payment services and demonstrates how collaboration between banks can deliver simple, secure, and highly trusted consumer payment experiences.

Faster Payments Service (United Kingdom)

Launched in 2008, Faster Payments was one of the first national real-time payment systems. It allows immediate electronic transfers between participating banks and has become a cornerstone of the UK's digital payments ecosystem.

FedNow (United States)

Introduced by the Federal Reserve in 2023, FedNow provides banks and credit unions with nationwide real-time payment capabilities operating continuously throughout the year. It complements, rather than replaces, existing US payment systems.

TIPS (TARGET Instant Payment Settlement)

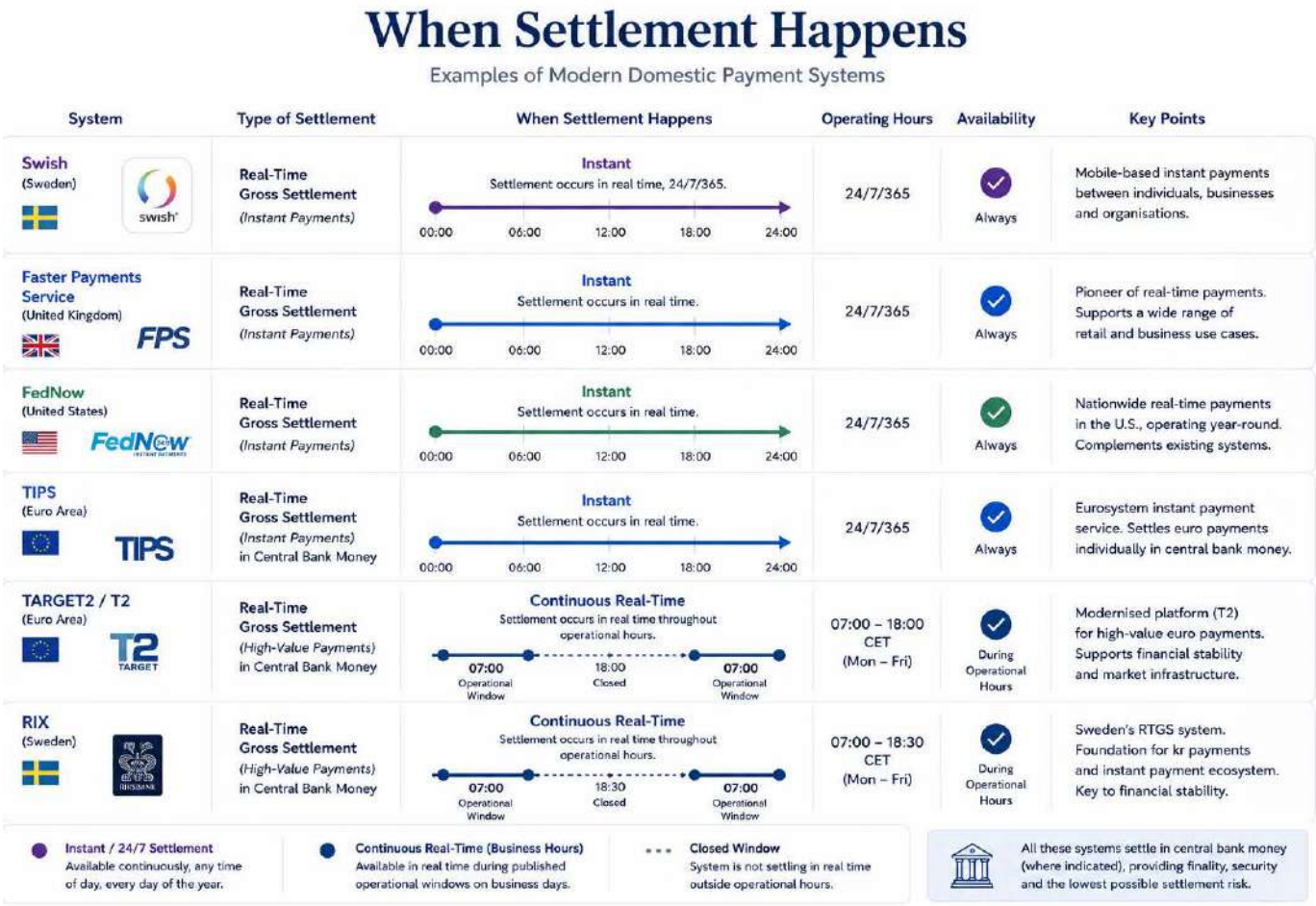
The Eurosystem's TARGET Instant Payment Settlement service enables participating financial institutions to settle euro-denominated instant payments individually in central bank money, twenty-four hours a day across Europe. It supports the growing adoption of instant payments within the European payment ecosystem.

TARGET2 and T2

For many years, TARGET2 served as the Eurosystem's Real-Time Gross Settlement platform for high-value euro payments. In 2023 it evolved into the modernised **T2** platform, continuing to provide the core infrastructure for wholesale euro settlement in central bank money and supporting the stability of the European financial system.

RIX (Sweden)

RIX is Sveriges Riksbank's Real-Time Gross Settlement system. It enables participating financial institutions to settle payments in Swedish kronor using central bank money and constitutes the foundation of Sweden's domestic financial infrastructure. RIX also supports Sweden's instant payment ecosystem and plays a central role in maintaining financial stability.



A Foundation for Everything Else

Domestic payment systems may appear routine, yet they represent one of the greatest achievements of modern financial infrastructure.

They move trillions of euros, dollars, pounds, and kronor every day with extraordinary reliability. They provide the foundation upon which households, businesses, governments, and financial markets depend. Without trusted domestic payment systems, economic activity would slow dramatically, confidence would decline, and financial stability would be placed at risk.

At the same time, domestic systems increasingly form only the first layer of a much broader payment architecture. As businesses expand across borders and digital commerce becomes global, domestic infrastructures must connect seamlessly with regional and international payment networks.

Understanding those connections is the next step in understanding how money moves around the world.

IV. Regional Payment Systems

Domestic payment systems provide the foundation for national economies. As trade and economic integration expand beyond national borders, however, countries require payment infrastructures capable of supporting regional commerce with the same efficiency and reliability as domestic transactions. Europe's response to this challenge is the **Single Euro Payments Area (SEPA)**.

SEPA represents one of the world's most successful examples of regional payment integration. It has transformed the way euro payments are made across Europe, creating a harmonised payment market that enables individuals and businesses to transfer money across borders almost as easily as they would within their own country. The creation of SEPA demonstrates how payment infrastructure can become a strategic enabler of economic integration.

Why SEPA Exists

Before SEPA, cross-border euro payments were often slower, more expensive, and considerably more complex than domestic transfers. Each country operated its own payment standards, account numbering systems, message formats, processing rules, and banking procedures. Even relatively simple transactions between neighbouring countries could involve additional fees, manual intervention, and settlement delays.

As the European Union developed its Single Market, these barriers became increasingly inconsistent with the free movement of goods, services, people, and capital. The objective was therefore straightforward: A euro payment from Stockholm to Milan should be as simple, secure, and efficient as a domestic payment within either country. SEPA was created to achieve precisely that goal.

The History of SEPA

The foundations of SEPA were established through the **European Union's Payment Services Directive (PSD)**, adopted in 2007. The Directive created the legal framework for a more integrated European payments market and encouraged greater competition, innovation, and consumer protection.

The operational implementation followed in several stages:

- **2008** – SEPA Credit Transfer (SCT) launched.
- **2009** – SEPA Direct Debit (SDD) introduced.
- **2014** – Migration from national euro payment schemes to SEPA largely completed across the euro area.
- **2017** – SEPA Instant Credit Transfer (SCT Inst) introduced, enabling near real-time euro payments.
- **2024–2025** – New European legislation accelerated the adoption of instant euro payments, making them an increasingly standard feature of European banking.

Today, SEPA covers not only the euro area but also a broader group of participating European countries, creating one of the largest integrated payment markets in the world.

How SEPA Works

Making euro payments across Europe as easy as domestic payments

SEPA (Single Euro Payments Area) enables individuals, businesses and public authorities to make euro payments across participating countries under the same rules, standards and consumer protections.

- Same rights everywhere
- Lower costs
- High security
- High efficiency

The SEPA Credit Transfer Flow (SCT)

1 Payment Initiation

The payer instructs their bank to make a payment in euros.

Key data used: IBAN of payee (and BIC if needed)

2 Originating Bank

The payer's bank validates the payment and sends it to the SEPA infrastructure.

3 SEPA Infrastructure

EPC European Payments Council

The payment is routed through SEPA schemes and rules (EPC Rulebooks) to the payee's bank.

Uses ISO 20022 messaging standard (pain.001, pacs.008)

4 Receiving Bank

The payee's bank receives the payment, validates it and makes funds available.

5 Payee

The payee is notified and can access the funds.

Funds usually available the same day.

Settlement in Central Bank Money

Interbank settlements between banks take place through national RTGS systems in central bank money, ensuring finality and safety.

What SEPA Provides

- One set of rules for euro payments
- IBAN – one standard account number
- Predictable fees and transparency
- Fast execution (usually same day)
- High straight-through processing
- Strong consumer protection
- Supports cross-border commerce

Payment Types in SEPA

SEPA Credit Transfer (SCT)
For one-off or recurring payments between bank accounts in euros.

SEPA Direct Debit (SDD)
For payments initiated by businesses or organisations with the payer's mandate.

Key Standards

- **IBAN** – International Bank Account Number
- **BIC** – (if required)
- **ISO 20022** – Rich, structured payment data

Examples of SEPA Participants

- EU Member States
- EEA Countries
- Switzerland
- Monaco, San Marino, Andorra, Vatican City

SEPA makes cross-border euro payments simple, safe and efficient.
One area. One currency. One set of rules.

How SWIFT Works

The global network that securely moves payment information between financial institutions

SWIFT is not a payment system.

It is a secure messaging network that enables banks and financial institutions worldwide to exchange standardised payment instructions and financial messages.

SWIFT moves information, not money.

- 11,000+ financial institutions in 200+ countries
- Secure, encrypted and highly reliable messaging
- Standard formats (ISO 20022) for clarity
- 24/7 availability (with some regional variations)
- The backbone of global financial communication

The Life of a Cross-Border Payment

1. **Payment Initiated** — The customer instructs their bank to make a payment abroad.
2. **Bank Creates Payment Message** — The bank creates a payment instruction (e.g., ISO 20022 payment message).
3. **Message Sent via SWIFT** — The message is sent securely over the SWIFT network to the recipient bank (or an intermediary).
4. **Message Received** — The recipient bank (or intermediary) receives and validates the message.
5. **Funds Moved Through Banking Channels** — Separately from SWIFT, funds are transferred through correspondent banking relationships or via clearing systems.
6. **Funds Available** — The recipient bank credits the beneficiary's account. The beneficiary can access the funds.

What SWIFT Does (and Does Not Do)

SWIFT DOES

- Transmit secure payment instructions and financial messages
- Use standard formats for clarity and automation
- Provide identity and validation of institutions
- Ensure end-to-end message security

SWIFT DOES NOT

- Hold accounts
- Move or settle funds
- Clear or net payments
- Guarantee delivery of funds

Settlement is performed by banks, clearing systems and central banks.

Where Settlement Happens (Outside SWIFT)

Correspondent Banking
Banks hold accounts with each other to move money internationally.

Clearing Systems
Regional systems (e.g., CHAPS, TARGET2, Fedwire) settle payments in central bank money.

Central Bank Money
Final settlement typically occurs in central bank reserves, ensuring finality.

Why It Matters

- Enables global commerce
- Reduces risk through secure communication
- Improves efficiency and straight-through processing
- Supports compliance and transparency
- Connects the world's financial institutions

SWIFT is the global language of financial communication.
It connects institutions so that money can move safely across borders.

SWIFT messages follow global standards (ISO 20022), enabling straight-through processing, compliance, and interoperability across the financial ecosystem.

IBAN – A Common Language for Bank Accounts

One of SEPA's most visible innovations is the **International Bank Account Number (IBAN)**. Before SEPA, account numbering differed significantly between countries, making cross-border payments more complex and error-prone. IBAN introduced a common international account identification standard.

Each IBAN uniquely identifies:

- the country,
- the financial institution,
- and the customer's account.

This standardisation significantly reduces processing errors while enabling automated payment processing across multiple jurisdictions. Today, IBAN has become familiar to millions of European consumers and businesses and remains one of the cornerstones of cross-border payment automation.

ISO 20022 – Speaking the Same Language

Modern payments depend upon accurate information as much as they depend upon moving money. To enable efficient automation, payment messages must be structured consistently across countries, institutions, and software platforms. SEPA therefore adopted **ISO 20022**, the international messaging standard that has become the global foundation for modern financial communication. Unlike earlier message formats, ISO 20022 supports significantly richer and more structured information, including:

- payer and beneficiary details,
- payment purpose,
- invoice references,
- regulatory information,
- compliance data,
- remittance information,
- and future extensibility.

This richer data enables higher levels of automation, improved compliance, more efficient reconciliation, and better integration with enterprise systems. ISO 20022 is now becoming the global standard not only for SEPA but also for many domestic payment systems, high-value settlement platforms, and SWIFT messaging.

SEPA Credit Transfer

The **SEPA Credit Transfer (SCT)** scheme enables euro-denominated payments between participating financial institutions. For businesses and consumers, the experience is intentionally simple. Payments are initiated using the recipient's IBAN and are processed according to common European rules regardless of whether the payment is domestic or cross-border. Standard SEPA Credit Transfers typically settle within one banking day and offer predictable pricing, high reliability, and broad interoperability across participating countries.

SEPA Instant Credit Transfer

Consumer expectations have continued to evolve. Increasingly, users expect money to move as quickly as information. To meet this demand, Europe introduced the **SEPA Instant Credit Transfer (SCT Inst)** scheme in 2017.

Unlike traditional batch-based payment processing, SEPA Instant enables participating financial institutions to settle euro payments within seconds, twenty-four hours a day, every day of the year. For consumers, businesses, and merchants, this provides immediate confirmation, improved cash flow, and new opportunities for digital commerce. As adoption continues to increase across Europe, instant payments are becoming an increasingly important component of the European payment landscape.

Strengths of SEPA

SEPA has fundamentally transformed European payments. Its principal strengths include:

- A harmonised payment market across Europe.
- Low-cost euro payments.
- Standardised payment rules and technical standards.
- High levels of interoperability between financial institutions.
- Broad adoption of IBAN and ISO 20022.
- Strong regulatory framework and consumer protection.
- Increasing availability of real-time payments through SEPA Instant.
- Excellent support for businesses operating across European markets.

Perhaps most importantly, SEPA has significantly reduced the friction associated with cross-border euro payments, strengthening both European competitiveness and economic integration.

Limitations of SEPA

Despite its considerable success, SEPA was designed to solve a specific problem. Its purpose was to harmonise **euro payments within Europe**. It was not designed as a global payment system.

Several limitations therefore remain:

- Payments are denominated in euros.
- Participation is limited to SEPA countries.
- Other currencies require alternative payment infrastructures.
- International payments beyond Europe typically rely on correspondent banking and SWIFT.
- Settlement remains tied to the traditional banking system.
- Native support for programmable payments, tokenised assets, and digital currencies is limited.

These limitations do not diminish SEPA's success. Rather, they reflect its original design objectives.

SEPA remains one of the world's most efficient regional payment infrastructures. It demonstrates how common standards, shared regulation, and coordinated investment can transform cross-border payments. At the same time, the continued growth of global digital commerce, tokenised assets, stablecoins, and programmable money raises new questions that extend beyond Europe's regional payment architecture. Understanding those global payment networks is the subject of the next chapter.

V. SWIFT

Part 1 – The Birth of Global Banking Communications

From Local Banking to a Global Financial Network

By the middle of the twentieth century, international trade had become truly global. Manufacturers sourced raw materials from multiple continents, multinational corporations established subsidiaries around the world, and financial markets became increasingly interconnected. Yet one critical component remained surprisingly primitive: communication between banks.

Moving money internationally has always required more than simply transferring value. Banks must exchange instructions, verify identities, confirm balances, manage foreign exchange, comply with regulations, and ultimately settle obligations. Before the digital age, these communications relied on methods that were slow, expensive, and vulnerable to misunderstanding.

For centuries, payment instructions travelled in much the same way as commercial correspondence—by post, courier, or telegraph. As international commerce accelerated after the Second World War, these methods became increasingly inadequate.

The Era of Correspondent Banking

Long before electronic payment systems existed, banks developed a network of correspondent relationships. A bank in Stockholm rarely held physical cash in New York or Tokyo. Instead, it maintained accounts with trusted partner banks abroad. These correspondent banks held funds on each other's behalf, enabling payments to move across borders without transporting money physically. The concept was elegant.

If a Swedish customer wished to pay a supplier in Canada, the Swedish bank would instruct its Canadian correspondent bank to credit the recipient. Settlement occurred by adjusting balances between correspondent accounts rather than moving banknotes across oceans. This system enabled international trade to flourish for decades.

However, it also introduced significant complexity. Each international payment required numerous communications:

- identification of the sending bank
- identification of the receiving bank
- beneficiary information
- currency details
- exchange rates
- settlement instructions
- confirmation messages

As payment volumes increased, managing this information became an enormous operational challenge.

Telex – The Original International Banking Network

During the 1950s and 1960s, banks relied primarily on the Telex network. Telex was essentially a global teleprinter system. Operators typed payment instructions manually, transmitting text messages over telecommunications lines to banks around the world. Although revolutionary for its time, Telex suffered from fundamental limitations.

- Messages were free-form text.

- Every bank used slightly different wording.
- Different languages introduced ambiguity.
- Manual typing created errors.
- Authentication depended largely on code words and bilateral agreements between banks.

A typical international payment might involve multiple Telex exchanges before funds could finally be released.

Errors were common.

- A misplaced digit could delay settlement for days.
- Misunderstood instructions required further correspondence.
- Human operators frequently had to telephone one another to clarify payment details.

As international banking expanded during the late 1960s, the industry recognised that Telex could no longer support global finance.

A Growing Crisis

By the early 1970s, international payments were increasing dramatically due to:

- Trade liberalisation.
- Container shipping.
- Jet travel.
- Multinational corporations.
- Expanding capital markets.

All generated rapidly growing payment volumes.

- Banks found themselves spending increasing resources simply exchanging messages.
- The problem was not moving money.
- The problem was moving information.
- Every institution developed its own procedures.
- Every bilateral relationship required separate authentication methods.
- Every payment represented operational risk.
- There was no universal language for financial messaging.

Without standardisation, international banking could never scale efficiently.

The Birth of SWIFT

Recognising this challenge, 239 banks from fifteen countries came together in 1973 to establish the Society for Worldwide Interbank Financial Telecommunication—better known simply as **SWIFT**. The objective was remarkably straightforward: Replace unstructured, insecure banking communications with a secure, standardised global messaging network.

Rather than each pair of banks maintaining unique communication arrangements, every participating institution would communicate using the same technical standards over the same trusted network. This represented a fundamental shift.

SWIFT was not created to move money. It was created to move information about money. That distinction remains one of the most misunderstood aspects of international payments today.

Going Live

Following several years of development, the SWIFT network became operational in 1977. Initially, 518 financial institutions across 22 countries connected to the network.

Instead of sending free-text Telex messages, banks exchanged highly structured electronic messages using predefined formats. Every institution understood exactly where to find:

- the ordering customer
- the beneficiary
- the currency
- the amount
- settlement instructions
- intermediary banks
- reference numbers

For the first time, international banking possessed a common digital language.

More Than a Technology Project

SWIFT was far more than a new telecommunications system. It represented an unprecedented act of international cooperation. Competing banks agreed that collaboration on infrastructure would benefit everyone. By sharing a common messaging platform, they could compete on products and services rather than on proprietary communication networks.

This cooperative model became one of the defining characteristics of modern global finance. Today, thousands of financial institutions in more than 200 countries and territories rely on SWIFT every day. Although technology has evolved dramatically since 1977, the original principle remains unchanged:

Global finance depends on trusted, standardised communication. Before value can move securely, information must move securely.

Part 2 – What SWIFT Actually Is

One of the most common misconceptions in international finance is that SWIFT is a payment system.

It is not:

- SWIFT does not hold customer funds.
- It does not clear payments.
- It does not settle transactions.
- It does not issue money.
- It does not operate bank accounts.

Instead, SWIFT provides something equally important: **a secure, standardised global messaging network that allows financial institutions to exchange payment instructions and other financial information.** Understanding this distinction is essential to understanding how international finance works.

Information Before Money

Every payment consists of two fundamentally different processes.

- The first is the exchange of information.
- The second is the movement of value.

These two activities are closely related but technically separate.

Before any bank can transfer money, it must know:

- Who is sending the payment?
- Who should receive it?
- Which banks are involved?
- Which currency is required?
- How much should be transferred?
- Which regulations apply?
- Has the payment passed compliance screening?
- How should settlement occur?

Only after these questions have been answered can value begin moving through the banking system. SWIFT provides the trusted communication layer that makes this possible.

A Global Financial Internet

A useful analogy is the Internet. When someone sends an email, the Internet carries the message. The Internet does not deliver the physical document. It delivers information describing that document.

Similarly, SWIFT delivers payment instructions. The actual movement of money occurs separately through central bank accounts, correspondent banking relationships, securities settlement systems, foreign exchange transactions and liquidity transfers.

For this reason, many experts describe SWIFT as the **communication infrastructure of global banking**.

- It connects institutions.
- It does not itself move value.

A Common Language

Before SWIFT existed, every bank communicated differently.

- Different terminology.
- Different formats.
- Different abbreviations.
- Different authentication methods.

The result was confusion, delays and operational risk.

SWIFT solved this by introducing standardised message formats. Every participating institution agreed to interpret messages in exactly the same way. This was revolutionary. Instead of reading free-text instructions, computer systems could automatically process structured information.

Automation reduced:

- manual intervention
- operational costs
- processing time
- fraud
- misunderstanding
- reconciliation errors

Standardisation became the foundation of global payment processing.

The SWIFT Network

At its core, SWIFT is a highly secure private communications network connecting financial institutions around the world.

Participants include:

- commercial banks
- central banks
- investment banks
- custodians
- securities depositories
- broker-dealers
- payment institutions
- clearing organisations
- market infrastructures
- corporations

Each institution receives a unique identifier known as a **Business Identifier Code (BIC)**, commonly called the **SWIFT code**.

Examples include:

- DEUTDEFF — Deutsche Bank Germany
- HANDSESS — Svenska Handelsbanken Sweden
- NDEASESS — Nordea Sweden
- CHASUS33 — JPMorgan Chase USA

These identifiers function much like international postal addresses. When a payment instruction is sent, every institution knows exactly where the message should be delivered.

Secure by Design

Financial messages are among the world's most valuable forms of digital information. If altered or intercepted, enormous financial losses could occur. Security has therefore always been central to SWIFT's design.

The network provides:

- strong authentication
- encrypted communications
- message integrity
- non-repudiation
- resilience
- continuous monitoring

Every institution connecting to SWIFT must comply with strict operational and cybersecurity requirements. Over time, these have evolved into the **Customer Security Programme (CSP)**, which establishes mandatory security controls designed to reduce cyber risk across the global community. Unlike the public Internet, SWIFT operates as a trusted private network dedicated to financial communications.

More Than Payments

Although most people associate SWIFT with international payments, payment instructions represent only part of the traffic flowing across the network. SWIFT messages also support:

- securities trading
- treasury operations
- foreign exchange
- trade finance
- documentary credits
- guarantees
- cash management
- correspondent banking
- corporate treasury
- investment funds

In effect, SWIFT has become the universal language of international financial operations.

Scale of the Network

Over five decades, SWIFT has grown into one of the world's most critical financial infrastructures. Today the network connects more than 11,000 financial institutions across more than 200 countries and territories. Every business day, tens of millions of secure financial messages are exchanged. These messages support trillions of dollars of economic activity.

Without SWIFT, international banking would still be possible—but significantly slower, more expensive, and considerably more risky. Its importance lies not in moving money directly, but in enabling thousands of independent financial institutions to communicate with certainty, precision and trust.

A Critical Distinction

Understanding the difference between **messaging**, **clearing**, and **settlement** is fundamental. These concepts are often confused, yet they represent distinct stages of the payment process.

Messaging answers the question: "*What should happen?*"

SWIFT provides this capability.

Clearing determines: "*Who owes what to whom?*"

Domestic payment systems, automated clearing houses, and correspondent banking arrangements perform this function.

Settlement finally answers: "*When does ownership of the funds actually change?*"

Settlement occurs through central bank money, commercial bank accounts, or correspondent accounts. SWIFT therefore sits at the beginning of the payment chain. It tells the financial system what transaction should occur Other infrastructures are responsible for ensuring that the underlying value is transferred and finally settled.

This separation of responsibilities has been one of the principal reasons why the global financial system has been able to scale securely over the past fifty years.

It also explains why emerging technologies—including instant payments, central bank digital currencies and stablecoins—are not necessarily competitors to SWIFT. Many of these innovations still require trusted messaging, identity, compliance and interoperability. The future of global payments is

therefore likely to combine new methods of moving value with robust networks for exchanging trusted financial information.

Part 3 – Correspondent Banking: How Money Really Moves

If SWIFT does not move money, then what actually happens when someone sends an international payment? The answer lies in one of the oldest and most important mechanisms in international finance: **correspondent banking**.

For more than a century, correspondent banking has formed the foundation of cross-border payments. While messaging technologies have evolved dramatically, the underlying movement of value still relies largely on a global network of banks holding accounts with one another. To understand international payments, it is therefore necessary to distinguish between the **communication of payment instructions** and the **settlement of funds**.

SWIFT handles the first. Correspondent banking handles much of the second.

Banking Beyond National Borders

Most commercial banks operate primarily within their own countries. A Swedish bank may have branches across Sweden, but it does not normally maintain full banking operations in every country around the world. Yet its customers expect to send money almost anywhere. To make this possible, banks establish relationships with trusted financial institutions in other jurisdictions.

These are known as **correspondent banks**. A correspondent bank provides services on behalf of another bank, including:

- holding deposits
- executing payments
- providing local currency liquidity
- processing foreign exchange
- clearing cheques
- settling securities
- facilitating trade finance

Rather than building thousands of overseas branches, banks can access global markets through correspondent relationships.

The Network Behind Global Payments

Imagine a customer of a bank in Stockholm who wishes to send EUR 50,000 to a supplier in Buenos Aires. The Swedish bank may have no direct relationship with the Argentine bank. Instead, the payment travels through one or more intermediary banks. A simplified route might look like the picture on the next page.

Throughout this journey, SWIFT messages instruct each bank what action to perform. The actual money moves through balances maintained between the correspondent institutions.

Nostro and Vostro Accounts

The key to correspondent banking is a pair of mirror-image accounts known as **Nostro** and **Vostro** accounts. The terminology originates from Latin. **Nostro** means *ours.* **Vostro** means *yours.* The difference depends entirely on perspective.

Suppose Nordea maintains a euro account at Deutsche Bank in Frankfurt. From Nordea's perspective, this account is **our money held by you**. It is therefore a **Nostro account**.

From Deutsche Bank's perspective, exactly the same account represents **your money held by us**. For Deutsche Bank, it is therefore a **Vostro account**.

Nothing changes physically. Only the viewpoint changes.

For Nordea: "Our account at Deutsche Bank" = Nostro

For Deutsche Bank "Nordea's account with us" = Vostro

Every correspondent banking relationship is built upon this simple accounting principle.

Moving Balances Instead of Cash

One of the greatest misconceptions about international payments is the belief that money physically travels across borders. In reality, most international payments involve adjustments to account balances.

Suppose Bank A owes Bank B EUR 1 million. Rather than shipping currency, Bank A instructs its correspondent to reduce its balance and increase Bank B's balance.

- Ownership changes.
- The physical money does not move.
- This principle is similar to transferring funds between accounts within the same bank.
- The balances change.
- The underlying assets remain in place.

Correspondent banking simply extends this principle across countries.

Why Multiple Banks Are Often Needed

Very few banks maintain direct correspondent relationships with every financial institution worldwide. Instead, global banking resembles an interconnected network.

A payment may pass through:

- one intermediary bank
- two correspondent banks
- several currency correspondents
- specialist settlement institutions

Each participant performs a specific role. Each deducts fees for its services. Each introduces operational complexity.

As a result, a payment travelling from Sweden to Brazil might involve three or four financial institutions before reaching its destination. Every step requires accurate messaging. Every institution depends upon SWIFT instructions.

Liquidity Is the Real Challenge

Maintaining correspondent banking relationships requires capital. Banks must pre-fund accounts around the world in multiple currencies. These balances provide the liquidity needed to settle international transactions. Imagine a multinational bank maintaining accounts in:

- US dollars

- euros
- pounds sterling
- Japanese yen
- Swiss francs
- Australian dollars
- Canadian dollars
- Singapore dollars

Each account ties up capital. Each balance earns relatively little return.

Collectively, trillions of dollars remain locked inside correspondent banking networks simply to ensure that payments can settle quickly. This is one of the major economic costs of today's international payment system.

Trust as Infrastructure

Correspondent banking is built upon trust. A bank agrees to hold funds for another institution because it has confidence in its financial strength, governance, compliance standards and operational resilience.

Consequently, correspondent relationships are carefully selected and continuously monitored.

Banks assess:

- financial stability
- creditworthiness
- anti-money laundering controls
- sanctions compliance
- operational resilience
- cybersecurity
- regulatory supervision

If confidence declines, correspondent relationships may be terminated.

This phenomenon, often called **de-risking**, has reduced banking access in parts of the developing world where compliance costs are high and transaction volumes are relatively low.

The Strengths of Correspondent Banking

Despite its complexity, correspondent banking has enabled global commerce for decades. Its advantages include:

- worldwide reach
- high reliability
- regulatory oversight
- support for virtually every major currency
- compatibility with existing banking infrastructure

Few systems have demonstrated comparable resilience over such a long period. Even today, the majority of international commercial payments continue to depend upon correspondent banking in one form or another.

Its Limitations

The traditional model also has significant drawbacks.

- Payments may require several intermediaries.
- Settlement can take days.
- Fees accumulate at multiple stages.
- Liquidity remains trapped in pre-funded accounts.
- Transparency is often limited, making it difficult for customers to know where a payment is or why deductions have been made.

These limitations have become increasingly visible as consumers have grown accustomed to real-time domestic payment systems and instant digital services. They have also created strong incentives for innovation.

Initiatives such as SWIFT gpi, ISO 20022, central bank digital currencies, tokenised deposits and regulated stablecoins all seek, in different ways, to reduce friction while preserving the trust and security on which international finance depends.

Correspondent banking is therefore not disappearing. Instead, it is evolving. Understanding its strengths and weaknesses provides the foundation for understanding the next generation of global payment infrastructures explored later in this Whitepaper.

Part 4 – Compliance, Sanctions, Fees and the Future of Global Payments

"*Trust is the most valuable currency in international banking.*"

If correspondent banking provides the plumbing of international finance and SWIFT provides the communications network, then compliance provides the confidence that allows the entire system to operate.

A payment that moves from Stockholm to Singapore, São Paulo or Sydney today does far more than transfer money. It also carries information that allows financial institutions to determine whether the payment is legitimate, whether the parties involved may legally transact, whether money laundering risks exist, whether sanctions apply, and whether regulatory reporting is required.

Over the past three decades, compliance has evolved from a relatively small operational function into one of the defining characteristics of international banking. Every major financial institution now invests billions of euros annually in compliance, financial crime prevention, cyber security and operational resilience.

Understanding SWIFT therefore requires understanding not only technology, but trust.

Compliance

Every international payment passes through multiple layers of control before reaching its destination. These checks are designed to answer fundamental questions.

- Who is sending the money?
- Who is receiving it?
- Where did the money originate?
- Why is the payment being made?
- Is it legal?
- Does it comply with international regulations?
- Could it finance crime or terrorism?

Compliance is therefore not an obstacle to payments. It is what makes global payments possible. Without trusted compliance processes, banks would simply refuse to transact with one another.

Know Your Customer (KYC)

Banks must understand who their customers are. This process is known as **Know Your Customer (KYC).** Before opening an account, financial institutions typically verify:

- Identity
- Legal existence
- Ownership structure
- Ultimate Beneficial Owners (UBOs)
- Source of wealth
- Source of funds
- Business activities
- Expected transaction behaviour

Corporate customers often require extensive documentation. For multinational corporations this process may involve hundreds of documents.

Anti-Money Laundering (AML)

Money laundering attempts to disguise the criminal origin of funds. Banks therefore monitor transactions continuously. Typical warning signs include:

- unusually large transfers
- unexpected payment destinations
- circular transactions
- rapid movement through multiple jurisdictions
- unusual customer behaviour
- inconsistent payment purposes

Modern AML systems increasingly rely on Artificial Intelligence and machine learning. Instead of checking only individual transactions, banks analyse behavioural patterns across millions of payments.

Counter Terrorist Financing (CTF)

Banks must also prevent payments supporting terrorist organisations.

This often requires:

- customer screening
- payment monitoring
- intelligence sharing
- regulatory reporting

Although only a tiny proportion of global payments relate to terrorist financing, banks must demonstrate that adequate controls exist.

Sanctions

Sanctions have become one of the most visible aspects of international payments. Governments may prohibit financial institutions from dealing with:

- countries
- organisations
- companies
- vessels

- aircraft
- individuals

Sanctions are imposed for geopolitical, security or foreign policy reasons. Examples include:

- United Nations sanctions
- European Union sanctions
- United Kingdom sanctions
- United States OFAC sanctions

Every international payment is normally screened against these lists.

Why SWIFT Is Often Mentioned in Sanctions

One common misunderstanding deserves clarification. SWIFT does **not** decide sanctions. Governments do. SWIFT does **not** freeze money. Banks do. SWIFT simply provides secure messaging.

However, if banks are prohibited from sending messages to certain institutions, international payments become extremely difficult. The widely reported removal of certain Russian banks from SWIFT after the invasion of Ukraine illustrates this distinction. The sanctions were political decisions. SWIFT implemented the resulting legal obligations.

Reconciliation

Making a payment is only part of the process. Every institution involved must also confirm that:

- the correct amount arrived
- correct currency
- correct beneficiary
- correct fees
- correct accounting entries

This process is called reconciliation.

Large international banks reconcile millions of transactions every day. Historically this has required substantial manual effort. Today reconciliation is increasingly automated through:

- ISO 20022
- AI
- intelligent matching
- straight-through processing

Improved reconciliation reduces:

- operational costs
- fraud
- errors
- disputes

Fees

International payments involve many participants. Each participant may charge a fee.

Typical costs include fees from:

- Customer Bank

- Correspondent Bank
- FX Provider
- Receiving Correspondent
- Receiving Bank

Each institution contributes services including:

- payment processing
- liquidity
- foreign exchange
- compliance
- settlement
- operational risk

Although individual fees may appear modest, complex payment chains can become expensive.One reason new payment technologies have attracted interest is their potential to reduce intermediary costs.

Why Cross-Border Payments Are Expensive

Domestic payments are comparatively simple. International payments require:

- different currencies
- different regulations
- different time zones
- different banking systems
- different legal frameworks
- multiple liquidity pools
- multiple compliance checks
- multiple settlement systems

Each additional layer adds cost. The objective of international payment innovation has therefore always been to reduce friction without reducing trust.

Operational Risk

Banks must also manage operational risk. Examples include:

- cyber attacks
- network outages
- fraud
- human error
- system failures
- incorrect beneficiary details
- liquidity shortages

SWIFT has invested heavily in cyber security. The **Customer Security Programme (CSP)** has become a global benchmark for protecting financial institutions against cyber threats.

Strengths of SWIFT

Despite frequent criticism, SWIFT remains one of the world's greatest infrastructure achievements. Its strengths include:

- Global reach
- More than 11,000 financial institutions.
- Over 200 countries and territories.
- Standardisation
- Common message formats.
- Common operational procedures.
- Common governance.
- Security
- Highly resilient communications.
- Strong authentication.
- Extensive cyber-security framework.
- Interoperability
- Connects banks of every size.
- Supports multiple currencies.
- Supports many financial products.
- Scalability
- Processes tens of millions of messages every day.
- Exceptional operational reliability.
- Trust

Perhaps SWIFT's greatest achievement. Banks trust messages because they trust the network.

Weaknesses

SWIFT also has limitations.

- It was designed during the 1970s.
- Although continually modernised, today's environment demands:
- faster settlement
- 24/7 operation
- richer data
- greater transparency
- lower costs
- programmability
- real-time visibility
- Reduced dependency upon correspondent banking.

Some limitations originate not within SWIFT itself but within correspondent banking. Messages may move within seconds. Money may still require days.

The Migration to ISO 20022

One of the largest infrastructure transformations in financial history is currently underway. Financial institutions worldwide are migrating from traditional MT messages to ISO 20022. Benefits include:

- richer payment data
- better automation
- improved compliance
- better reconciliation
- improved fraud detection
- enhanced customer experience

- greater interoperability

This migration will continue throughout the second half of this decade.

The Future

The future of international payments is unlikely to be dominated by a single technology. Instead, multiple infrastructures will coexist. Domestic systems will continue processing local payments. Regional systems such as SEPA will continue integrating Europe. SWIFT will remain the dominant global financial messaging network. Real-time payment systems will continue expanding. Stablecoins and tokenised deposits will introduce new settlement mechanisms. Central Bank Digital Currencies (CBDCs) may emerge in selected markets. Artificial Intelligence will increasingly automate compliance, reconciliation and fraud detection. Rather than replacing existing infrastructure overnight, innovation is likely to occur through gradual integration.

A Payment in 2035

Imagine an exporter in Sweden selling machinery to a customer in Singapore.

- The customer initiates payment through their banking application.
- Artificial Intelligence verifies identity.
- Compliance checks complete automatically.
- Foreign exchange is executed instantly.
- Liquidity is reserved automatically.
- Payment instructions travel through ISO 20022.
- Settlement occurs in real time.
- Both companies update their ERP systems automatically.
- Invoices reconcile without human intervention.
- The customer receives confirmation within seconds.

Neither company needs to understand the underlying infrastructure. As with today's internet, complexity disappears behind a simple user experience.

Summary

SWIFT is frequently described as the backbone of international payments. That description is well deserved. Yet SWIFT's true achievement is not moving money. It is enabling trust.

For more than fifty years it has allowed thousands of financial institutions operating under different legal systems, currencies and regulations to communicate securely using common standards. The future of global payments will undoubtedly introduce new technologies, new settlement models and new digital assets.

However, the fundamental requirements will remain unchanged. Payments must be trusted. They must be secure. They must be interoperable. And above all, they must enable economic activity.

Technology will continue to evolve. Trust will remain the foundation upon which every payment system is built.

VI. Cross-Border Payments

Why Moving Money Across Borders Remains Difficult

Sending an email from Stockholm to Singapore takes only a few seconds. Sending money between the same two cities is considerably more complicated.

This contrast illustrates one of the great paradoxes of the digital economy. Information moves around the world almost instantly, yet moving value remains surprisingly complex. Despite enormous technological advances, international payments continue to involve multiple financial institutions, regulatory frameworks, currencies, compliance procedures, and settlement mechanisms.

For consumers, a cross-border payment may appear as a simple instruction submitted through a banking app. Behind the scenes, however, dozens of processes may be executed before the beneficiary finally receives the funds. Understanding these processes helps explain why international payments remain slower, more expensive, and more complex than domestic transfers.

The Cross-Border Payment Challenge

Unlike domestic payments, cross-border payments rarely occur within a single legal, technical or financial environment. Instead, they must bridge differences in:

- currencies
- banking systems
- legal frameworks
- payment infrastructures
- regulations
- operating hours
- financial institutions
- languages
- compliance requirements

Each additional layer increases complexity.

A payment that crosses five borders is not simply five domestic payments connected together. It is a coordinated process involving numerous independent organisations.

Foreign Exchange (FX)

One of the largest challenges is currency conversion. Domestic payments normally involve only one currency. International payments frequently involve two—or sometimes even three or four.

For example:

- A Swedish importer buys machinery from Japan.
- The importer pays in Swedish kronor.
- The exporter invoices in Japanese yen.
- The banks may settle in US dollars.
- Three currencies are now involved.

Each conversion introduces:

- exchange-rate risk
- pricing
- spreads

- liquidity requirements
- settlement complexity

Foreign exchange therefore becomes an integral component of international payments. The global foreign exchange market processes more than US$7 trillion every day, making it the world's largest financial market.

Liquidity

Money cannot simply appear in another country. Banks must already have funds available where payments need to be settled. This is why correspondent banks maintain **Nostro accounts** around the world. A Swedish bank expecting payments in US dollars maintains dollar liquidity within the United States.

Similarly, it may maintain:

- euros in Europe
- pounds in London
- yen in Japan
- Swiss francs in Switzerland

Maintaining these balances is expensive. Large amounts of capital remain tied up waiting for future payment instructions. This is often described as **trapped liquidity**. Reducing trapped liquidity has become one of the major objectives of payment innovation.

Time Zones

The world never sleeps. Banks do.

- Financial markets operate within business hours.
- Central banks operate within national schedules.
- Settlement systems close overnight.
- Weekends differ between countries.
- Public holidays vary.

Now consider a payment traveling:

1. Sydney
2. Singapore
3. Dubai
4. Frankfurt
5. London
6. New York

Every location operates in a different time zone. A payment arriving after the receiving system's cut-off time may wait until the following business day. Time therefore becomes an operational constraint. Real-time technology cannot overcome a settlement system that has already closed.

Anti-Money Laundering (AML)

Every international payment carries risk. Banks must ensure that funds are not connected to:

- organised crime
- corruption
- tax evasion

- fraud
- terrorism
- sanctions violations

Every payment is therefore analysed before being released.

Increasingly this analysis is performed using Artificial Intelligence. The objective is simple: Move legitimate payments quickly. Stop suspicious ones.

Know Your Customer (KYC)

Before banks trust one another, they must trust their customers. Financial institutions therefore verify:

- identity
- ownership
- business activity
- beneficial owners
- source of wealth
- source of funds
- expected transaction behaviour

Large multinational corporations may undergo KYC reviews lasting several months.

Banks continuously update this information throughout the customer relationship. KYC therefore becomes a prerequisite for efficient payments. Without trust, payments stop.

Intermediaries

Many international payments involve multiple banks. Illustratively:

1. Customer
2. Local Bank
3. Correspondent Bank
4. Correspondent Bank
5. Receiving Bank
6. Beneficiary

Every intermediary contributes value. Each also introduces:

- processing
- compliance
- fees
- operational risk
- potential delay

This explains why international payments frequently cost significantly more than domestic transfers.

Cut-Off Times

Every settlement system has deadlines. Payments arriving before the cut-off may settle today. Payments arriving afterwards may settle tomorrow.

A payment initiated on Friday afternoon may not reach its destination until Monday—or even later if public holidays intervene.

Consequently, payment speed depends not only upon technology but also upon operational calendars. Twenty-four-hour digital commerce increasingly challenges these traditional banking schedules.

Risk

International payments expose financial institutions to multiple forms of risk.

- **Credit Risk -** Will the counterparty fulfil its obligations?
- **Liquidity Risk -** Are sufficient funds available?
- **Operational Risk -** Will systems continue operating correctly?
- **FX Risk -** Will exchange rates move before settlement?
- **Compliance Risk -** Does the payment satisfy regulatory requirements?
- **Country Risk -** Do geopolitical developments affect the transaction?
- **Settlement Risk -** Will one party deliver funds while the other fails?

Banks manage these risks continuously throughout the payment lifecycle.

Why Cross-Border Payments Take Time

Consumers often ask: "*Why can't international payments be as fast as sending an email?*"

The answer is that money carries legal consequences. Emails merely transfer information. Payments transfer ownership. Ownership changes require:

- verification
- authentication
- compliance
- liquidity
- currency conversion
- settlement
- legal finality

Every step adds security. Every step also consumes time.

The Cost of Complexity

International payments incur costs because multiple organisations contribute services. Typical cost components include:

- foreign exchange
- correspondent banking
- liquidity management
- compliance
- sanctions screening
- reconciliation
- settlement
- technology
- operational resilience

The objective of payment innovation is therefore not simply to make payments faster. It is to reduce unnecessary complexity while maintaining trust.

A Practical Example

Imagine that Anna in Stockholm purchases specialist manufacturing equipment from Osaka. She instructs her Swedish bank to transfer payment. Immediately, several processes begin.

1. Her identity is verified.
2. Her account balance is checked.
3. The payment is screened for sanctions.
4. AML systems analyse the transaction.
5. Foreign exchange converts Swedish kronor into Japanese yen.
6. Liquidity is reserved.
7. Payment messages are transmitted through SWIFT.
8. Correspondent banks settle obligations.
9. Japanese banking systems process the incoming payment.
10. The beneficiary's bank credits the supplier.
11. Finally, confirmation travels back through the chain.

For Anna, the experience involved pressing a single button. Behind the scenes, dozens of organisations, systems and regulatory controls worked together to complete the transaction safely.

Why This Matters

International trade depends upon confidence. Companies will only sell internationally if they trust that payment will arrive. Banks will only facilitate payments if they trust one another. Governments will only permit international financial flows if appropriate safeguards exist. Cross-border payments therefore sit at the intersection of:

- finance
- technology
- law
- regulation
- geopolitics
- risk management

Few infrastructures influence global commerce more directly.

Looking Ahead

The limitations of today's cross-border payment architecture are becoming increasingly apparent.

- Businesses expect real-time settlement.
- Consumers expect twenty-four-hour availability.
- Governments seek greater transparency.
- Technology companies demand programmable payments.
- Meeting these expectations will require continued evolution.
- SWIFT is modernising.
- ISO 20022 is introducing richer payment data.
- Regional payment systems continue expanding.

Stablecoins, tokenised deposits, and central bank digital currencies are beginning to offer alternative settlement mechanisms. The future of international payments will not eliminate trust. It will seek to deliver trust with less friction. That challenge lies at the heart of the next generation of global payment infrastructure.

VII. Stablecoins

The Next Evolution in Moving Value

Money has continually evolved throughout history.

- From barter to coins.
- From coins to banknotes.
- From banknotes to bank accounts.
- From paper instructions to electronic payments.

Today, another stage of this evolution is taking place.

Digital assets are introducing entirely new ways of representing and transferring value. Among these innovations, **stablecoins** have emerged as one of the most significant developments in modern finance. Unlike cryptocurrencies such as Bitcoin, stablecoins are designed not as speculative assets, but as digital representations of traditional money. For the first time, value can be transferred globally, continuously, and programmatically over digital networks while maintaining a stable value linked to an existing currency. Understanding stablecoins is therefore essential to understanding the future of payments.

What Is a Stablecoin?

A stablecoin is a digital token whose value is designed to remain stable by being linked to an external asset. Most commonly, that asset is a fiat currency such as:

- US Dollar
- Euro
- British Pound
- Swiss Franc

Unlike Bitcoin or Ether, whose prices fluctuate continuously, a stablecoin aims to maintain a fixed value. For example:

- **1 USDC ≈ 1 US Dollar**
- **1 EURC ≈ 1 Euro**

The objective is not investment. The objective is stability.

Why Stablecoins Exist

Traditional payment systems work extremely well within national and regional banking systems. However, they were largely designed decades ago. Modern businesses increasingly require:

- global availability
- 24/7 operation
- instant settlement
- lower costs
- programmable transactions
- integration with digital platforms

Traditional banking infrastructures often struggle to meet these expectations because payments remain dependent upon:

- banking hours
- correspondent banking
- multiple intermediaries
- liquidity management
- settlement windows

Stablecoins attempt to address these challenges by representing traditional money directly on digital networks. Instead of moving payment instructions between banks, stablecoins enable the movement of digital representations of value.

A Simple Comparison

Traditional payment

1. Customer
2. Bank
3. Correspondent Bank(s)
4. Settlement
5. Receiving Bank
6. Customer

Stablecoin payment

1. Customer
2. Blockchain Network
3. Customer

The reality is naturally more complex, but the illustration highlights the reduction in intermediaries.

How Stablecoins Work

When a stablecoin is issued, an equivalent amount of traditional assets is normally held in reserve. For example:

1. A customer deposits USD 1 million
2. Issuer creates 1 million USDC
3. Reserve assets remain held
4. USDC circulates digitally
5. Customer redeems
6. USDC destroyed

The digital token therefore represents a claim backed by reserve assets. Confidence depends upon confidence in those reserves.

Reserve Assets

High-quality stablecoins typically maintain reserves consisting of:

- cash
- central bank deposits
- short-term government securities
- highly liquid investments

Independent audits and reserve reporting have become increasingly important. Transparency builds confidence.

Stablecoins versus Bitcoin

Stablecoins are frequently confused with cryptocurrencies. Their objectives are fundamentally different.

Bitcoin	**Stablecoins**
Price fluctuates	Designed to remain stable
Investment asset	Payment asset
Limited supply	Supply expands with demand
Often viewed as digital gold	Digital cash
High volatility	Low volatility
Primarily store of value	Medium of exchange

Bitcoin attempts to create an independent monetary asset. Stablecoins attempt to improve how existing money moves.

Examples of Stablecoins

USD Coin (USDC)

One of the world's largest regulated stablecoins is **USD Coin (USDC).** USDC is issued by **Circle Internet Financial**. Each USDC token is designed to represent one US dollar. Its reserves primarily consist of:

- cash
- short-term US Treasury securities

USDC has become widely used for:

- international payments
- institutional settlement
- digital asset trading
- treasury management
- decentralised finance

Because it is backed by dollar-denominated reserve assets, its value closely follows the US dollar.

Tether (USDT)

The world's largest stablecoin by circulation is **Tether (USDT)**. USDT is issued by **Tether Limited**. Each USDT token is designed to represent one US dollar. Its reserves primarily consist of:

- cash and bank deposits
- short-term US Treasury securities
- reverse repurchase agreements
- money market funds and other liquid assets

USDT has become widely used for:

- international payments
- cross-border remittances
- digital asset trading
- treasury and liquidity management
- decentralised finance

Because it is backed by dollar-denominated reserve assets, its value is intended to closely track the US dollar. As the largest stablecoin by market capitalisation, USDT plays a central role in global digital asset markets and is widely used as a bridge between traditional finance and blockchain-based payment networks.

Within the European Union, however, USDT faces significant regulatory restrictions under the **Markets in Crypto-Assets Regulation (MiCA)**. As Tether has not obtained authorisation as an issuer of an asset-referenced token or electronic money token under the MiCA framework, many regulated crypto-asset service providers (CASPs) in the EU have delisted or restricted USDT for their customers. Consequently, while USDT continues to be widely used globally, regulated financial institutions and licensed CASPs operating within the EU generally rely on MiCA-compliant stablecoins, such as USD Coin (USDC), for regulated payment and settlement services.

Euro Coin (EURC)

The European equivalent is **EURC**. EURC is also issued by Circle and represents one euro. Its purpose is similar: Provide a regulated euro-denominated digital settlement asset that can operate across blockchain networks. For European businesses, EURC offers the possibility of combining euro stability with digital programmability.

Advantages of Stablecoins

Stablecoins introduce several important characteristics.

Continuous Availability

Transactions can occur

- 24 hours
- 7 days
- 365 days

without depending upon traditional banking hours.

Faster Settlement

Transfers may settle within seconds or minutes. Traditional cross-border payments may require days.

Global Reach

Digital assets move across global blockchain networks. Geographical distance becomes less significant.

Programmability

Perhaps the greatest innovation. Money can become programmable. Payments may execute automatically when predefined conditions are satisfied.

Examples include:

- automatic escrow
- supply-chain payments
- machine-to-machine payments
- streaming salaries
- programmable trade finance

Money becomes software.

Transparency

Every transaction may be recorded on a blockchain. This can improve:

- auditability
- traceability
- automation
- reconciliation

Challenges

Stablecoins also introduce new challenges.

Regulation

Different jurisdictions apply different regulatory frameworks. Questions include:

- Who may issue stablecoins?
- How should reserves be managed?
- What consumer protections are required?

Europe's **Markets in Crypto-Assets Regulation (MiCA)** represents one of the world's first comprehensive stablecoin regulatory frameworks.

Reserve Management

Confidence depends entirely upon reserve quality. Poor reserve management may undermine confidence. Transparency therefore becomes essential.

Operational Risk

Stablecoins depend upon:

- software
- blockchains
- digital wallets
- private keys
- cyber security

Technology introduces new operational risks alongside traditional financial risks.

Adoption

Most businesses continue operating through conventional banking infrastructure. Stablecoin adoption remains at an early stage. Integration with existing financial systems continues to evolve.

Tokenised Deposits

Stablecoins are not the only approach to digital money. Banks are increasingly exploring **tokenised deposits**.

Unlike stablecoins issued by specialised companies, tokenised deposits represent ordinary commercial bank deposits that have been placed onto distributed ledger technology. From the customer's perspective, money remains a bank deposit. Only the technology changes.

Potential benefits include:

- programmability
- faster settlement
- improved reconciliation
- integration with smart contracts

Many banks consider tokenised deposits attractive because they preserve the existing banking model while modernising payment infrastructure.

Central Bank Digital Currencies (CBDCs)

Central banks are also exploring digital forms of sovereign money. These are known as **Central Bank Digital Currencies (CBDCs).** Unlike stablecoins: CBDCs are liabilities of the central bank. Stablecoins are liabilities of private issuers.

Potential objectives include:

- supporting payment innovation
- strengthening financial inclusion
- improving settlement efficiency
- preserving monetary sovereignty
- complementing physical cash

CBDCs may be designed for:

- Retail use
- Consumers and businesses.
- Wholesale use
- Financial institutions only.

Many central banks remain in pilot phases, while a smaller number have already launched operational systems.

Stablecoins, Tokenised Deposits and CBDCs

These three forms of digital money are often presented as competitors. In reality, they may coexist.

Stablecoins	Tokenised Deposits	CBDCs
Private issuer	Commercial bank	Central bank
Backed by reserves	Bank deposit	Central bank money
Global reach	Banking ecosystem	National monetary system
Highly programmable	Highly programmable	Depends on design

Each addresses different use cases. Future payment systems are likely to combine all three.

Why Stablecoins Matter

The significance of stablecoins extends beyond cryptocurrency. They represent a new payment architecture. Rather than relying entirely upon multiple intermediaries, banking hours, and correspondent networks, digital value can move directly across programmable infrastructure.

For domestic payments, existing banking systems already perform extremely well. For global, digital, always-on commerce, however, new approaches are emerging. Stablecoins should therefore not be viewed primarily as speculative instruments. They should be understood as an important step in the continuing evolution of payment infrastructure.

Looking Ahead

Throughout this Whitepaper we have followed the evolution of moving value:

1. Barter
2. Cash
3. Cheques
4. Telegraph
5. Correspondent Banking
6. Cards
7. SWIFT
8. Internet Banking
9. SEPA
10. Instant Payments
11. Stablecoins

Each generation has reduced friction while expanding the scale of commerce. Stablecoins are unlikely to replace banks, payment systems, or central bank money overnight. Instead, they represent another layer within an increasingly interconnected financial ecosystem. The future of payments will almost certainly include domestic payment systems, regional infrastructures such as SEPA, global messaging through SWIFT, commercial bank deposits, central bank money, tokenised deposits, and regulated stablecoins working together. The question is no longer whether digital money will become part of the financial system.

The question is how these different forms of money will coexist—and how they can be integrated to move value more efficiently, more securely, and more intelligently than ever before.

VIII. Blockchain Settlement

If stablecoins materially improve settlement efficiency, why have they not already displaced correspondent banking in trade finance?

A New Model for Moving Value

For centuries, moving money has depended upon trusted intermediaries.

- Banks maintain accounts.
- Central banks settle obligations.
- Correspondent banks bridge international markets.
- Payment networks exchange messages.
- Clearing houses calculate balances.

Every institution plays a specific role in ensuring that value moves safely from one party to another. Blockchain technology introduces a different approach. Rather than relying upon a central institution to maintain a ledger of ownership, blockchain creates a **shared ledger** that is synchronised across many independent computers. Every participant sees the same transaction history, and every change must be agreed upon according to predefined rules.

The result is a fundamentally different settlement model. Instead of asking a trusted intermediary to update its ledgers, participants agree collectively on who owns what. For payment systems, this represents one of the most significant innovations since the invention of electronic banking.

What Is Blockchain Settlement?

Settlement is the point at which ownership changes irrevocably. In traditional banking, settlement normally occurs after multiple steps involving clearing, reconciliation and updates to accounts held by banks or central banks.

With blockchain settlement, the ledger itself becomes the settlement system. When a transaction has been validated and permanently recorded on the blockchain, ownership changes directly on the shared ledger. There is no separate reconciliation between multiple ledgers because every participant references the same source of truth. In simple terms:

- Traditional banking updates **many ledgers**.
- Blockchain updates **one shared ledger**.

Distributed Ledgers

A blockchain is a form of **Distributed Ledger Technology (DLT).** Instead of storing records in one central database, identical copies of the ledger are maintained across many independent computers, known as **nodes**. Whenever a new transaction occurs:

- the transaction is broadcast to the network,
- validated according to agreed rules,
- grouped into a block,
- added to the blockchain,
- replicated across every participating node.

Every participant therefore sees the same transaction history. Changing historical records would require changing every copy of the ledger simultaneously—an extraordinarily difficult task on a well-secured network.

Digital Wallets

Unlike traditional bank accounts, blockchain assets are normally held in **digital wallets**. A wallet does not actually store money. Instead, it stores the cryptographic credentials that allow a user to control digital assets recorded on the blockchain. A wallet can therefore be compared to a secure digital key ring rather than a physical purse. Wallets may exist as:

- mobile applications
- desktop software
- dedicated hardware devices
- institutional custody platforms

Some are controlled directly by users. Others are managed by regulated financial institutions.

Public and Private Keys

Every wallet is built around two cryptographic keys.

Public Key

The public key functions much like a bank account number. It can safely be shared with others. People use it to send digital assets to the wallet.

Private Key

The private key is entirely different. It proves ownership. Whoever controls the private key controls the associated digital assets. For this reason, private keys must never be shared. Losing a private key can mean losing permanent access to the assets it controls. The phrase often used within digital asset communities is: **"Not your keys, not your coins."** It highlights the importance of understanding custody arrangements.

Custody

Digital assets can be held in two broad ways.

Self-Custody

The owner controls the private keys directly. Advantages include:

- complete control
- independence
- direct ownership

Challenges include:

- responsibility for security
- recovery risks
- key management

Custodial Services

A regulated institution manages the keys. This resembles traditional banking.

Professional custody often provides:

- institutional security
- insurance
- governance
- compliance
- operational resilience

Many businesses prefer custodial solutions because they reduce operational risk.

Consensus

One obvious question arises. If no central authority maintains the ledger, who decides which transactions are valid? The answer is **consensus.** Consensus is the process through which the network agrees upon the current state of the ledger. Different blockchain networks use different consensus mechanisms. Examples include:

Proof of Work

Participants compete using computing power. The first successful participant validates the next block. Bitcoin uses this model.

Proof of Stake

Participants secure the network by committing digital assets as collateral. Validation rights are allocated according to predefined rules. Ethereum now operates using Proof of Stake.

Different consensus models seek different balances between:

- security
- decentralisation
- scalability
- energy consumption
- performance

Gas

Executing transactions on blockchain networks requires computing resources. Users therefore pay transaction fees known as **gas**. Gas compensates network participants for validating and processing transactions. Gas fees vary depending upon:

- network demand
- transaction complexity
- blockchain design

Simple transfers generally require relatively little gas. Complex smart contracts consume more computational resources and therefore incur higher fees. Gas can be viewed as the operating cost of using a blockchain.

Settlement Finality

One of the most important concepts in financial infrastructure is **settlement finality.** Traditional payment systems distinguish between:

- payment initiation,

- clearing,
- settlement,
- confirmation.

Blockchain simplifies this process. Once a transaction reaches sufficient confirmation according to the rules of the blockchain, ownership is considered final. No separate reconciliation between multiple institutions is normally required. Settlement therefore becomes embedded within the network itself. Different blockchains achieve finality in different ways. Some provide deterministic finality. Others rely upon statistical confidence as additional blocks are added. Understanding finality is essential for financial institutions using blockchain for settlement.

Twenty-Four Hour Operation

- Traditional banking largely follows business hours.
- Central banks close overnight.
- Settlement systems have cut-off times.
- Weekends interrupt processing.
- Public holidays delay payments.
- Blockchain networks operate continuously.
- Twenty-four hours a day.
- Seven days a week.
- Three hundred and sixty-five days a year.

This continuous availability makes blockchain particularly attractive for:

- international commerce
- financial markets
- treasury management
- digital asset trading
- global liquidity management

Time zones become significantly less important.

Transparency

Every blockchain transaction is recorded permanently. On public blockchains, anyone can inspect:

- transaction history
- wallet balances
- timestamps
- network activity

Importantly, wallets are represented by cryptographic addresses rather than personal names. This creates **pseudonymity**, not complete anonymity. Transparency offers several advantages. Auditors can verify transactions. Businesses can automate reconciliation. Regulators may trace asset movements. Financial institutions gain improved operational visibility. Transparency therefore becomes an operational advantage rather than merely a technical feature.

Programmability

Perhaps the greatest innovation introduced by blockchain is **programmable money.** Traditional payments move value. Blockchain enables value to move according to software-defined conditions.

This is achieved through **smart contracts**. A smart contract is software stored on a blockchain that executes automatically when predefined conditions are satisfied.

Examples include:

- "If goods are delivered, release payment."
- "If interest is due, distribute automatically."
- "If delivery fails, refund immediately."

Money therefore becomes capable of interacting directly with software. This opens entirely new possibilities.

- Supply-chain finance.
- Insurance claims.
- Trade finance.
- Machine-to-machine payments.
- Subscription services.
- Tokenised securities.
- Decentralised financial applications.

Programmability transforms payments from isolated transactions into components of larger digital business processes.

Traditional Settlement versus Blockchain Settlement

Traditional financial infrastructure typically follows this sequence:

1. Customer
2. Commercial Bank
3. Clearing System
4. Central Bank Settlement
5. Receiving Bank
6. Beneficiary

Blockchain settlement simplifies the architecture:

1. Wallet
2. Blockchain Network
3. Settlement
4. Wallet

The simplicity of this illustration should not obscure the complexity of the underlying technology. Blockchain replaces institutional complexity with technological complexity.

Strengths

Blockchain settlement offers several important advantages.

- Continuous availability.
- Near real-time settlement.
- Shared ledger.
- Reduced reconciliation.
- High transparency.
- Programmable transactions.
- Global accessibility.
- Improved automation.
- Strong cryptographic security.

These characteristics explain why financial institutions are increasingly exploring blockchain-based settlement.

Challenges

Blockchain also introduces important challenges.

- Scalability.
- Regulatory uncertainty.
- Private key management.
- Cyber security.
- Interoperability with existing banking systems.
- Governance.
- Digital identity.
- Consumer protection.
- Energy consumption for certain consensus models.

Financial institutions therefore continue evaluating where blockchain offers genuine advantages and where traditional payment systems remain more appropriate.

Looking Ahead

Blockchain settlement should not be viewed as a replacement for banking. Rather, it represents a new settlement layer that can complement existing financial infrastructure. Domestic payment systems remain highly efficient. SEPA provides exceptional regional integration. SWIFT continues connecting the global banking system. Blockchain introduces new capabilities that existing infrastructures were never designed to provide:

- continuous operation,
- shared ledgers,
- programmability,
- and direct digital settlement.

The future of payments is therefore unlikely to be defined by a single technology. Instead, it will be characterised by increasing interoperability between traditional banking infrastructure and distributed ledger technology. Ultimately, blockchain is not simply about moving digital assets. It is about rethinking how value itself can move in a digital world—securely, transparently, continuously, and intelligently.

IX. The New Infrastructure

The Move Towards Programmable Settlement

The global payments industry is entering its most significant transformation since the creation of SWIFT more than fifty years ago. This transformation is not about replacing banks. Nor is it about replacing existing payment systems. It is about adding a new layer of infrastructure capable of supporting digital assets, programmable money, instant settlement, and twenty-four-hour global commerce.

Just as the Internet transformed the movement of information, distributed ledger technology is beginning to transform the movement of value. Around the world, financial institutions, payment companies, technology providers, central banks, and regulators are investing billions of dollars in this new infrastructure. Although their approaches differ, they share a common objective: **To make money programmable.**

From Payments to Programmable Settlement

Traditional payment systems were designed primarily to move money. The next generation of infrastructure is designed to move money **and** execute business logic simultaneously. Instead of simply transferring value, future payment systems may automatically:

- release escrow funds
- pay suppliers when goods arrive
- settle securities instantly
- distribute royalties
- pay interest
- reconcile invoices
- execute foreign exchange
- settle trade finance

Money becomes software. Payments become workflows. Settlement becomes programmable. This is the industry's direction of travel.

The Emerging Ecosystem

Unlike previous generations of payment infrastructure, there is no single dominant platform. Instead, an ecosystem is emerging.

- Banks.
- Fintech companies.
- Stablecoin issuers.
- Card networks.
- Settlement platforms.
- Custody providers.
- Distributed ledger infrastructures.

Together they are building what may become the next generation of financial market infrastructure.

Atlas

Atlas, a product from Valuno Group AB in Sweden, represents a modern payment orchestration platform designed for the emerging digital asset economy. Rather than replacing existing payment systems, Atlas seeks to connect them.

- Traditional bank transfers.
- SEPA.
- SWIFT.
- Stablecoins.
- Digital asset infrastructure.
- Compliance.
- Foreign exchange.
- Settlement.

By integrating multiple payment rails into a single orchestration layer, Atlas illustrates how future payment platforms may operate across both traditional and blockchain-based financial systems. Its objective is not to choose one infrastructure over another. Its objective is to use the most appropriate infrastructure for each payment.

Circle

Circle has become one of the world's leading providers of regulated stablecoin infrastructure. Its best-known products include:

- USDC
- US Dollar Coin.
- EURC
- Euro Coin.

Circle's vision extends beyond issuing digital currencies. It provides APIs, treasury services, payment infrastructure and developer tools enabling businesses to integrate stablecoin payments into their own applications. Circle demonstrates how digital currencies can become components of mainstream financial infrastructure rather than isolated cryptocurrency products.

Ripple

Ripple focuses on improving international payments. Its technology seeks to reduce the cost and complexity of cross-border settlement by using distributed ledger technology and digital liquidity solutions. Ripple's infrastructure supports:

- cross-border transfers
- foreign exchange
- liquidity optimisation
- institutional payments

Rather than viewing blockchain as an alternative financial system, Ripple positions it as an enhancement to existing banking infrastructure.

Visa

Visa remains one of the world's largest payment networks. Far from resisting digital assets, Visa has become one of the industry's most active innovators. Recent initiatives include:

- stablecoin settlement
- digital wallets
- tokenisation
- programmable payments
- digital identity

Visa increasingly views itself not simply as a card company but as a global payments technology platform capable of connecting traditional banking with digital assets.

Mastercard

Mastercard has adopted a similar strategy. Its investments include:

- digital asset infrastructure
- stablecoin integration
- digital identity
- tokenisation
- open banking
- programmable commerce

Mastercard recognises that future commerce will involve multiple forms of money operating together rather than replacing one another.

Fireblocks

One challenge introduced by digital assets is secure custody.

- Private keys must be protected.
- Transactions must be authorised securely.
- Institutions require governance.

Fireblocks has become one of the world's leading providers of institutional digital asset custody and transfer infrastructure. Its platform enables:

- secure key management
- institutional wallets
- policy-based approvals
- digital asset transfers
- treasury management

Fireblocks illustrates how entirely new categories of financial infrastructure have emerged alongside blockchain technology.

Fnality

One limitation of today's payment systems is that settlement often occurs using commercial bank money. Fnality explores another model. Its objective is to enable financial institutions to settle transactions using tokenised central bank money. Participating banks can therefore achieve:

- instant settlement
- reduced counterparty risk
- improved liquidity efficiency
- financial market interoperability

Fnality focuses primarily on wholesale financial markets rather than retail payments.

Partior

Partior was established through collaboration between major financial institutions to improve international payments using distributed ledger technology. Its objective is straightforward. Reduce:

- intermediaries
- settlement delays
- operational complexity
- liquidity requirements
- while maintaining regulatory compliance.
- Partior illustrates an important trend.

Increasingly, banks are collaborating rather than competing when building new infrastructure.

Kinexys (formerly JPM Coin)

One of the clearest demonstrations that traditional banking is embracing programmable settlement comes from JPMorgan. Originally launched as **JPM Coin**, the platform has evolved into **Kinexys**. Rather than creating a public cryptocurrency, Kinexys enables institutional clients to move tokenised commercial bank deposits across a permissioned blockchain. Applications include:

- treasury management
- institutional settlement
- cross-border payments
- liquidity optimisation
- programmable transactions

The significance of Kinexys lies less in its technology than in what it represents. One of the world's largest banks has concluded that programmable settlement is becoming part of mainstream financial infrastructure.

Different Approaches—A Common Direction

These organisations differ significantly.

- Some issue stablecoins.
- Some build custody infrastructure.
- Some optimise correspondent banking.
- Some develop wholesale settlement systems.
- Some orchestrate multiple payment rails.
- Some focus on institutional banking.
- Yet they are all responding to the same structural changes.
- The financial industry increasingly demands:
- continuous operation
- real-time settlement
- programmability
- greater transparency
- reduced reconciliation
- better liquidity utilisation
- lower operational costs

- greater interoperability

The destination is remarkably similar.

Why Programmability Matters

Traditional payments answer one question. *Has the money moved?* Programmable settlement answers a different question. *What should happen when the money moves?*

Imagine:

- A shipping container arrives.
- Sensors confirm delivery.
- Ownership transfers automatically.
- Payment settles immediately.
- Invoice reconciles automatically.
- Accounting records update.
- Tax reporting completes.
- Audit trail generated.

No manual intervention. No reconciliation. No separate settlement process. Money becomes part of an automated business process.

The Convergence of Traditional Finance and Digital Assets

The payments industry is no longer divided into two competing worlds.

- Traditional finance.
- Digital assets.

Instead, the two are increasingly converging.

Banks issue tokenised deposits. Stablecoin issuers work with regulated financial institutions. Card networks integrate blockchain settlement. Central banks explore digital currencies. Technology companies provide orchestration layers connecting everything together. The future is unlikely to belong exclusively to banks or exclusively to blockchain. It will belong to organisations capable of integrating both.

The New Payment Architecture

The payment stack of the future may resemble the Internet itself.

- Applications
- Payment Orchestration Platforms
- Traditional Banking
- Stablecoins
- Tokenised Deposits
- CBDCs
- Settlement Networks
- ↓
- Digital Infrastructure

Customers may never know which payment rail has been selected. They simply expect value to arrive safely, instantly and at the lowest possible cost.

Looking Ahead

The evolution of payments has always followed the same direction.

- Reduce friction.
- Increase trust.
- Expand opportunity.

Programmable settlement represents the next stage of that journey. The organisations described in this chapter are unlikely to be the only winners. New participants will emerge. Technologies will continue evolving. Regulations will mature. Business models will change. But one trend appears increasingly clear. The future of payments is not simply digital.

It is **programmable**.

Money is evolving from a passive store of value into an active component of digital business processes. Just as software transformed communication, commerce and manufacturing, programmable settlement is beginning to transform finance. The infrastructure of the future is already being built.

X. The Sweet Spot

Where Innovation Becomes Sustainable

Throughout this Whitepaper, we have explored how payment infrastructure has evolved over centuries—from barter and cash to correspondent banking, SWIFT, SEPA, blockchain, stablecoins and programmable settlement. One conclusion has emerged consistently. Technology alone does not create successful payment systems. Neither does regulation. Nor does customer demand. The most successful innovations emerge only when all three reinforce one another.

This is what we describe as **the Sweet Spot**.

It is the point where technological capability, regulatory acceptance and genuine customer need intersect to create solutions that are commercially viable, operationally scalable and socially valuable.

This framework is not limited to payments. It applies equally to innovation in healthcare, energy, manufacturing, transport and digital services. However, few industries demonstrate its importance more clearly than financial services, where technology evolves rapidly within one of the world's most heavily regulated environments.

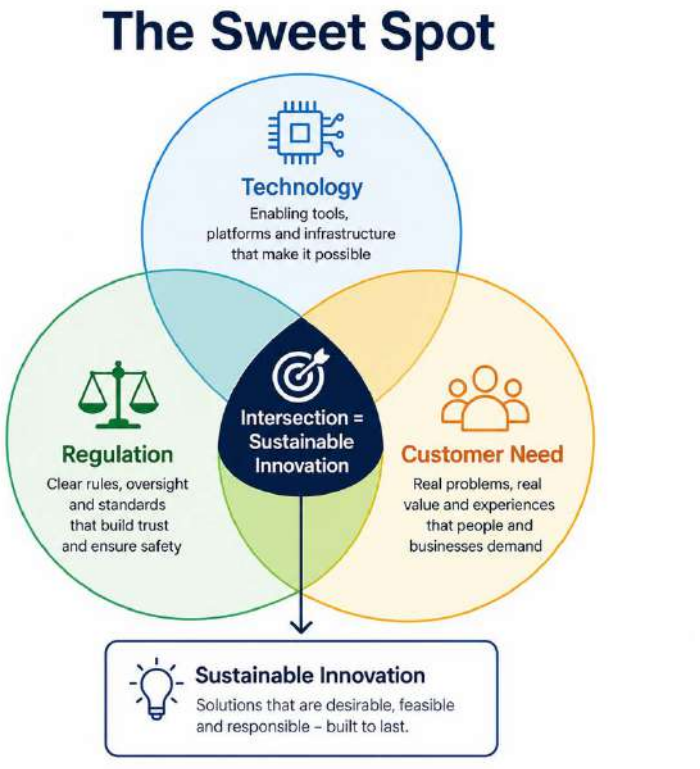
The Sweet Spot therefore provides a useful strategic framework for understanding why some innovations succeed while others fail.

The Three Circles

Imagine three overlapping circles.

- **Technology**
- **Regulation**
- **Customer Need**

Where all three overlap lies the Sweet Spot. Each circle represents a necessary condition for sustainable innovation. No single circle is sufficient on its own.



Technology

Every major transformation begins with new technological possibilities.

- Artificial intelligence.
- Cloud computing.
- Distributed ledger technology.
- Tokenisation.
- Stablecoins.
- Open banking.
- Real-time payments.
- Quantum-resistant cryptography.

These innovations expand what is technically possible.

- They make payments faster.
- Cheaper.
- Smarter.
- More automated.
- More secure.

Yet history repeatedly demonstrates that technological superiority alone rarely guarantees commercial success. Many excellent technologies have failed because they arrived before the market was ready. Others failed because regulation prevented adoption. Technology creates opportunity. It does not guarantee adoption.

Regulation

Financial services depend upon trust. Trust depends upon regulation. Unlike many industries, payment infrastructure operates within strict legal frameworks designed to protect consumers, preserve financial stability and combat financial crime. Regulation establishes:

- licensing
- prudential requirements
- capital rules
- governance
- consumer protection
- operational resilience
- anti-money laundering
- sanctions compliance

Innovation that ignores regulation rarely succeeds over the long term. Equally, regulation that discourages innovation risks limiting competitiveness. The objective is therefore not to choose between regulation and innovation. The objective is to enable innovation within trusted regulatory frameworks.

Recent developments such as the European Union's **Markets in Crypto-Assets Regulation (MiCA)** illustrate this balance. Rather than prohibiting digital assets, MiCA seeks to provide legal certainty that encourages responsible innovation while maintaining financial stability. Regulation therefore becomes an enabler rather than merely a constraint.

Customer Need

Perhaps the most overlooked element of innovation is the customer.

Technology companies sometimes become fascinated by technical possibilities. Regulators focus appropriately on safety and stability. Customers ask a simpler question.

Does this solve a real problem?

Successful payment innovations address genuine needs.

- Faster settlement.
- Lower costs.
- Greater transparency.
- Reduced reconciliation.
- Global reach.
- Improved user experience.
- Better liquidity management.

If customers experience no meaningful improvement, even the most sophisticated technology will struggle to achieve widespread adoption. Innovation succeeds when it creates value that customers recognise and are willing to adopt.

The Sweet Spot

When technology, regulation and customer need align, innovation accelerates.

- Technology provides new capabilities.
- Regulation creates trust.
- Customer demand creates adoption.

The intersection of these three forces produces sustainable competitive advantage.

History provides numerous examples.

- Payment cards succeeded because electronic payment technology matured, regulatory frameworks developed, and consumers demanded greater convenience.
- SEPA succeeded because Europe possessed both political commitment and technological standardisation, while businesses required simpler cross-border euro payments.
- Instant payments gained momentum because technological capability aligned with consumer expectations for immediate transactions.
- Stablecoins are now following a similar path. Distributed ledger technology has matured, regulatory frameworks are emerging, and businesses increasingly seek faster, programmable global settlement.

The Sweet Spot therefore explains not only where innovation succeeds today, but where it is most likely to emerge tomorrow.

The Wrong Places to Compete

Understanding the Sweet Spot also explains why many innovations fail.

Technology Without Regulation

A technically impressive solution that cannot operate within regulatory frameworks may attract attention but struggle to achieve institutional adoption. Financial institutions require legal certainty. Without it, investment remains limited.

Regulation Without Customer Value

Perfect regulatory compliance alone does not create successful products. Customers will not adopt solutions simply because they satisfy regulatory requirements. Innovation must improve the customer experience.

Customer Demand Without Technology

Markets frequently identify problems long before technology can solve them effectively. Many payment innovations failed historically because the supporting infrastructure had not yet matured. Timing matters.

Atlas as an Example

Atlas illustrates how the Sweet Spot can be applied in practice. Rather than attempting to replace existing payment systems, Atlas seeks to integrate them. Its architecture combines:

- traditional banking,
- SEPA,
- SWIFT,
- stablecoins,
- digital assets,
- foreign exchange,
- compliance,
- and payment orchestration.

From a technological perspective, Atlas embraces programmable settlement, blockchain connectivity and modern API-based infrastructure.

From a regulatory perspective, it is designed to operate within established financial regulatory frameworks, recognising that trust and compliance remain fundamental requirements for institutional adoption.

From the customer's perspective, Atlas addresses practical business needs.

- Faster international settlement.
- Lower operational complexity.
- Greater flexibility.
- Multiple payment rails.
- Improved transparency.
- Simplified reconciliation.

Whether Atlas ultimately succeeds will depend not only upon technology but upon its ability to remain within the Sweet Spot where all three dimensions continue to reinforce one another.

A Framework for Strategic Decision-Making

The Sweet Spot can also guide strategic decisions. Whenever a new payment technology emerges, organisations should ask three questions.

- **Technology** - Is the solution technically mature and scalable?
- **Regulation** - Can it operate within trusted legal and regulatory frameworks?
- **Customer Need** - Does it solve a genuine problem that customers are prepared to adopt?

If the answer to all three questions is yes, the opportunity deserves serious consideration. If one dimension is missing, caution is appropriate.

XI. Trends

The Forces Shaping the Next Generation of Payments

The payments industry has always evolved gradually. For decades, improvements focused on increasing efficiency within existing infrastructures. Payment cards replaced cash. Electronic banking replaced paper instructions. SEPA simplified European payments. SWIFT modernised international messaging.

Today's transformation is different. Multiple technological, regulatory and commercial developments are occurring simultaneously. Artificial intelligence, digital identity, stablecoins, tokenisation, open banking, programmable money and real-time treasury are converging to create a fundamentally different financial ecosystem.

No single trend will define the future. Together, however, they are reshaping how money moves around the world.

MiCA – Regulation for the Digital Asset Economy

Innovation requires trust. Trust requires regulation.

For many years, one of the greatest barriers to institutional adoption of digital assets was regulatory uncertainty. Banks, payment companies and institutional investors often recognised the technological potential of blockchain but lacked a clear legal framework within which to operate.

The European Union addressed this challenge through the **Markets in Crypto-Assets Regulation (MiCA).** MiCA is the world's first comprehensive regulatory framework governing crypto-assets, stablecoins and crypto-asset service providers. Its objectives include:

- protecting consumers
- ensuring financial stability
- increasing market integrity
- encouraging responsible innovation
- creating a harmonised European market

Rather than preventing innovation, MiCA seeks to enable it within trusted regulatory boundaries. For Europe, MiCA represents an important competitive advantage by providing greater legal certainty than many other jurisdictions.

Artificial Intelligence

Artificial Intelligence is rapidly becoming embedded throughout payment infrastructure. Initially, AI focused on fraud detection. Today, its applications extend far beyond security. Financial institutions increasingly use AI for:

- payment routing
- liquidity forecasting
- treasury optimisation
- foreign exchange management
- customer service
- credit assessment
- sanctions screening
- Anti-Money Laundering (AML)

- reconciliation
- operational resilience

Perhaps most importantly, AI enables decision-making based upon vast quantities of payment data that would be impossible for humans to analyse manually. Future payment systems will increasingly become intelligent systems.

ISO 20022

Payments are becoming richer in data. Historically, financial messages contained relatively limited structured information. ISO 20022 changes this. By providing a common global language for financial messaging, ISO 20022 enables payments to carry significantly more business information. This improves:

- automation
- reconciliation
- regulatory reporting
- compliance
- fraud detection
- straight-through processing
- customer experience

ISO 20022 is now being adopted across domestic payment systems, SEPA, SWIFT and many capital market infrastructures. It represents one of the largest global infrastructure transformations currently underway.

Digital Identity

Every payment begins with identity. Before money moves, participants must know who is paying, who is receiving and whether the transaction should be trusted. Digital identity is therefore becoming a strategic component of payment infrastructure. Future digital identity solutions may combine:

- government-issued identities
- biometric authentication
- corporate credentials
- digital certificates
- cryptographic signatures
- verifiable credentials

Instead of repeatedly proving identity through paper documents, individuals and businesses may increasingly use secure digital credentials recognised across multiple organisations. Digital identity improves:

- security
- customer experience
- fraud prevention
- compliance
- cross-border commerce
- Trust increasingly begins with trusted identity.

Programmable Money

Money is evolving from a passive asset into an active participant in business processes. Traditionally, payments execute because a person instructs a bank. Programmable money executes because predefined conditions have been satisfied. Examples include:

- automatic supplier payments
- escrow release
- machine-to-machine payments
- automated royalties
- trade finance
- subscription billing
- supply-chain settlement

Programmability transforms payments from isolated financial events into integrated components of digital workflows. This may become one of the defining characteristics of future financial infrastructure.

Embedded Finance

Financial services are increasingly moving into non-financial applications. Consumers may now obtain:

- payments
- lending
- insurance
- investment services
- foreign exchange

without ever visiting a traditional bank.

This trend is known as **Embedded Finance**. Examples include:

- E-commerce platforms offering financing.
- Ride-sharing applications issuing payment cards.
- Accounting software initiating payments.
- Marketplaces providing working capital.

Financial services increasingly appear where customers need them rather than where financial institutions traditionally operated. Payments become invisible. Customer experience becomes central.

Treasury Automation

Corporate treasury functions are also evolving rapidly. Historically, treasury departments spent considerable time:

- monitoring bank balances
- managing liquidity
- executing foreign exchange
- reconciling payments
- forecasting cash flow

Many of these activities are becoming increasingly automated.

Artificial Intelligence.

- Application Programming Interfaces (APIs).
- Real-time banking.
- Stablecoins.
- Programmable settlement.

Together they enable treasury teams to focus less on administration and more on strategic decision-making. Treasury is evolving from operational management towards intelligent financial orchestration.

Open Finance

Open Banking introduced secure data sharing between banks and authorised third parties. Open Finance expands this concept. Rather than sharing only payment account information, Open Finance seeks to create secure, customer-controlled access across a broader range of financial products. Potential areas include:

- investments
- pensions
- insurance
- mortgages
- savings
- business finance
- digital assets

Customers gain greater control over their financial information. Competition increases. Innovation accelerates. Financial ecosystems become increasingly interconnected.

Real-Time Treasury

Payments are becoming instantaneous. Treasury management is following the same direction. Future treasury functions increasingly operate continuously rather than once or twice each business day. Real-time treasury enables organisations to monitor:

- global liquidity
- foreign exchange exposure
- incoming payments
- outgoing obligations
- investment positions
- risk

As payments accelerate, treasury operations must also accelerate.

- Real-time visibility improves:
- cash utilisation
- working capital
- investment decisions
- risk management

Financial management becomes increasingly proactive rather than reactive.

Cross-Border Commerce

Perhaps the most significant trend is the continued expansion of global commerce.

- Businesses of every size increasingly operate internationally.
- Digital marketplaces connect buyers and sellers across continents.
- Freelancers work globally.
- Software companies serve customers worldwide.
- Supply chains span multiple jurisdictions.

Traditional payment infrastructures were designed for a world in which international transactions were relatively infrequent. Today's economy is different. Cross-border payments are becoming routine rather than exceptional. Businesses increasingly expect international payments to be:

- instant
- transparent
- predictable
- programmable
- available around the clock

The pressure to modernise payment infrastructure will therefore continue increasing.

The Convergence of Trends

Although these developments are often discussed separately, they are closely interconnected. Artificial Intelligence depends upon richer payment data provided by ISO 20022. Programmable money depends upon digital identity and trusted regulatory frameworks. Embedded Finance depends upon APIs and Open Finance. Real-time treasury depends upon instant payments. Stablecoins depend upon regulation such as MiCA. The future will not be shaped by one innovation alone. It will be shaped by the convergence of many innovations occurring simultaneously.

Looking Ahead

The next decade will probably witness more change in payment infrastructure than the previous fifty years combined.

- Traditional banks will continue modernising.
- Fintech companies will continue innovating.
- Central banks will explore digital currencies.
- Technology companies will develop new payment experiences.
- Artificial Intelligence will automate increasingly complex financial decisions.
- Regulation will continue evolving to support innovation while preserving trust.
- Throughout these changes, one principle will remain constant.
- Payments exist to enable economic activity.
- The technologies may change.
- The infrastructure will evolve.
- The customer experience will become increasingly seamless.

But the objective remains unchanged. To move value securely, efficiently and intelligently between people, businesses and nations. The future of payments is therefore not defined by a single technology. It is defined by the convergence of technology, regulation and customer need—working together to create a more connected, more automated and more programmable financial world.

XII. Looking Forward

Ten Predictions for the Next Decade

Predicting the future of payments has never been easy. Few people foresaw the rapid adoption of payment cards, internet banking, smartphones, or instant payments. Even fewer anticipated that stablecoins, distributed ledger technology and programmable settlement would become topics discussed by central banks, governments and the world's largest financial institutions.

History also teaches an important lesson. New payment technologies rarely replace existing systems overnight. Instead, new layers are added to existing infrastructure. Cash did not disappear when cards arrived. Cards did not disappear when mobile payments emerged. SWIFT did not replace domestic payment systems.

The future is therefore likely to be evolutionary rather than revolutionary. Based on the trends explored throughout this Whitepaper, the following ten predictions describe the direction in which payment infrastructure is most likely to develop during the coming decade.

Prediction 1 – Payments Become Invisible

Customers increasingly care less about how payments are made and more about the experience they receive. The best payment is the one that requires no conscious effort. Future payments will increasingly disappear into business processes, software platforms and digital services. Consumers will simply buy. Businesses will simply trade. Applications will determine automatically which payment infrastructure offers the fastest, safest and most cost-effective route. The payment itself becomes invisible.

Prediction 2 – Treasury Becomes Real Time

Corporate treasury departments have traditionally worked with yesterday's information. Bank statements arrived overnight. Liquidity positions were updated periodically. Foreign exchange was managed during market hours. That model is disappearing. Treasury will increasingly operate continuously. Artificial Intelligence, APIs, real-time payments and programmable settlement will enable companies to monitor and optimise liquidity every minute of every day. Cash management becomes dynamic rather than periodic.

Prediction 3 – SWIFT Survives—But Evolves

Predictions of SWIFT's demise have appeared repeatedly over the past two decades. They are likely to remain incorrect. SWIFT performs an essential role. It provides trusted global financial messaging. What will change is the information flowing across the network. ISO 20022 will enrich payment messages. Greater automation will reduce manual processing. Integration with real-time settlement systems will continue expanding. SWIFT's future is unlikely to resemble its past. It will remain a cornerstone of international finance while evolving alongside new settlement technologies.

Prediction 4 – Stablecoins Become Infrastructure

Today, stablecoins are often discussed primarily within the context of digital assets. During the coming decade they are likely to become something much more important. Infrastructure. Businesses will increasingly use stablecoins for: cross-border settlement, treasury management, liquidity optimisation, digital commerce, machine-to-machine payments. Customers may not even realise stablecoins are being used behind the scenes. Just as few people understand how internet routing functions today, few future users will care how settlement occurs provided it is fast, secure and reliable.

Prediction 5 – Banks Become Orchestration Platforms

Banks have traditionally processed payments through proprietary infrastructures. Future banks are likely to become payment orchestrators. Rather than relying upon a single payment rail, they will intelligently select among:

- domestic payment systems
- SEPA
- SWIFT
- stablecoins
- tokenised deposits
- central bank digital currencies

The customer will request a payment. The bank will determine the optimal route. Choice becomes automated.

Prediction 6 – Settlement Becomes Programmable

Settlement has traditionally marked the end of a transaction. Increasingly, settlement becomes the beginning of a business process. Money will execute software. Payments will automatically trigger:

- invoice reconciliation
- ownership transfer
- tax reporting
- inventory updates
- trade documentation
- insurance claims
- royalty payments

Business logic becomes integrated directly into settlement. Money becomes programmable infrastructure.

Prediction 7 – Artificial Intelligence Automates Treasury

Artificial Intelligence will transform financial decision-making. Future treasury platforms will increasingly predict:

- cash flow
- liquidity requirements
- foreign exchange exposure
- working capital
- payment routing
- fraud
- credit risk

Rather than simply presenting information, treasury systems will increasingly recommend actions—and in many cases execute them automatically within predefined governance frameworks. Treasury professionals will focus less on operations and more on strategic financial management.

Prediction 8 – Corporate Wallets Complement Traditional Accounts

Corporate bank accounts will remain fundamental. However, many organisations are likely to operate digital wallets alongside traditional banking relationships. These wallets may hold:

- stablecoins

- tokenised deposits
- digital securities
- tokenised treasury assets

Digital wallets will become operational tools for global commerce, particularly where continuous settlement and programmable payments provide clear advantages. Banks are likely to offer wallet services as naturally as they provide current accounts today.

Prediction 9 – Tokenisation Expands Beyond Payments

Payments represent only one application of distributed ledger technology. The coming decade is likely to witness increasing tokenisation of:

- government bonds
- corporate bonds
- equities
- real estate
- trade finance
- carbon credits
- investment funds
- commercial deposits
- Supply chains.
- Identity.
- Contracts.

Virtually any asset represented digitally may ultimately become tokenised. Payments will simply connect these digital assets together.

Prediction 10 – Digital Identity Becomes Part of Payment Infrastructure

Every payment begins with trust. Trust begins with identity. Future payment systems will increasingly integrate secure digital identity directly into payment infrastructure.

- Individuals.
- Businesses.
- Devices.
- Artificial Intelligence agents.

All will require trusted digital identities. Payments will increasingly carry not only value but also verifiable credentials confirming who initiated the transaction and under what authority. Identity becomes as important as money itself.

One More Prediction

There is perhaps one additional prediction worth making. The organisations that succeed during the coming decade will not necessarily invent entirely new technologies. They will integrate existing technologies more effectively than their competitors. Competitive advantage will come from combining:

- Artificial Intelligence.
- Digital identity.
- Programmable settlement.

- Open Finance.
- Real-time treasury.
- Trusted regulation.
- Customer-centric design.

The winners will be those capable of orchestrating complexity while presenting customers with simplicity.

The Future Is Hybrid

One mistake appears repeatedly throughout the history of financial innovation. The belief that one technology will replace all others. History suggests otherwise.

- Cash still exists.
- Cards continue growing.
- Bank transfers remain essential.
- SEPA continues expanding.
- SWIFT continues modernising.
- Stablecoins continue developing.
- Tokenised deposits continue emerging.

Future payment infrastructure will therefore be hybrid.

- Multiple forms of money.
- Multiple settlement mechanisms.
- Multiple payment rails.

Working together rather than competing exclusively with one another.

Final Reflection

The movement of value has always shaped civilisation. From barter and coins to banknotes, telegraphs, correspondent banking, payment cards, SWIFT, SEPA and blockchain, each generation has sought to make commerce more efficient, more secure and more inclusive.

The next generation will not simply move money faster.

- It will make money smarter.
- Programmable.
- Intelligent.
- Connected.
- Invisible.

The institutions that embrace this transformation will help shape the financial infrastructure of the twenty-first century. Those that fail to adapt will increasingly find themselves operating within infrastructures designed for a different era.

The future of payments has already begun. The question is no longer whether it will arrive. The question is who will help build it.

Appendices

The following appendices provide a practical reference for readers who wish to understand the terminology, standards and infrastructure discussed throughout this Whitepaper.

Appendix A

Glossary

AML (Anti-Money Laundering)
Processes and controls designed to detect and prevent money laundering and financial crime.

API (Application Programming Interface)
Software interface allowing systems to exchange information automatically.

CBDC (Central Bank Digital Currency)
A digital form of sovereign money issued by a central bank.

Clearing
The calculation of obligations between financial institutions before settlement.

Consensus
The mechanism by which participants in a blockchain agree on the validity of transactions.

Correspondent Banking
A network of banks holding accounts with one another to facilitate international payments.

Custody
The secure storage and management of financial assets or cryptographic keys.

Digital Identity
A trusted digital representation of an individual, organisation or device.

Embedded Finance
Financial services integrated directly into non-financial products and applications.

FX (Foreign Exchange)
The conversion of one currency into another.

Gas
The transaction fee paid to execute operations on many blockchain networks.

IBAN (International Bank Account Number)
A globally standardised bank account identifier used throughout SEPA and many other countries.

ISO 20022
The international standard for modern financial messaging.

KYC (Know Your Customer)
Customer identification and verification procedures required by financial institutions.

Liquidity
Funds immediately available to meet payment obligations.

MiCA
The European Union's Markets in Crypto-Assets Regulation.

MT Messages
The traditional SWIFT message standards.

Nostro Account
A bank's account held in a foreign currency at another bank.

Open Finance
The extension of Open Banking to a wider range of financial products and services.

Programmable Money
Money capable of executing predefined instructions through software.

RTGS (Real-Time Gross Settlement)
Immediate settlement of individual payments in central bank money.

SEPA (Single Euro Payments Area)
Europe's harmonised payment system for euro transactions.

Settlement
The final and irrevocable transfer of ownership of funds.

Stablecoin
A digital token designed to maintain a stable value relative to a reference asset such as a fiat currency.

SWIFT
The Society for Worldwide Interbank Financial Telecommunication, providing secure financial messaging between institutions.

Tokenisation
The digital representation of assets on distributed ledger technology.

Treasury Management
The management of an organisation's liquidity, funding and financial risk.

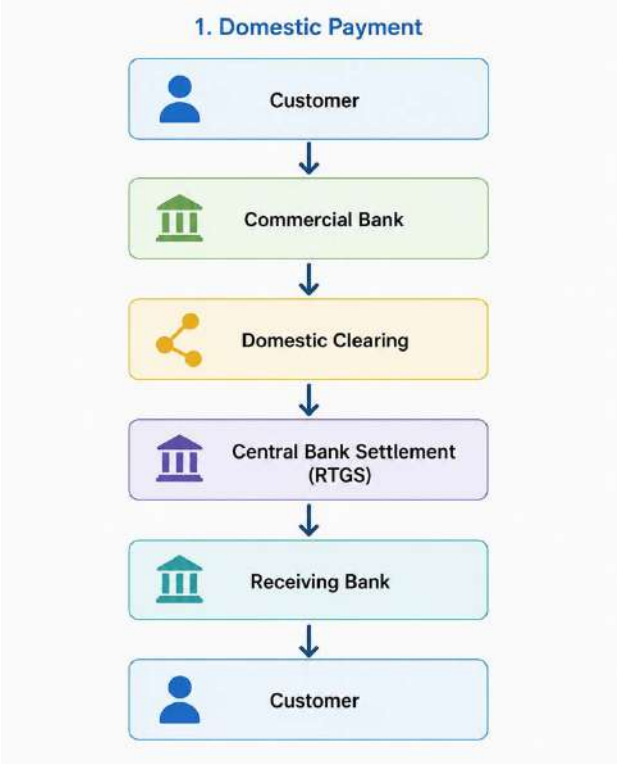
Vostro Account
A foreign bank's account held by another bank.

Wallet
A software or hardware application that stores cryptographic credentials controlling digital assets.

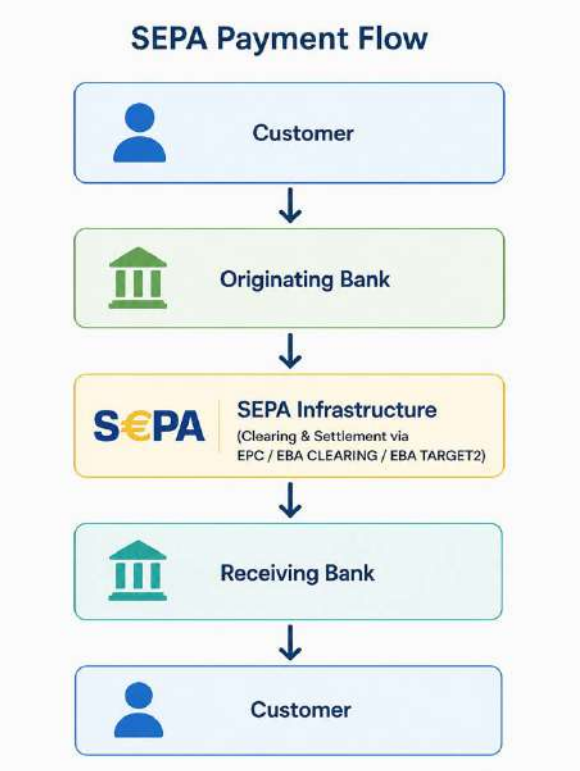
Appendix B

Payment Architecture Diagrams

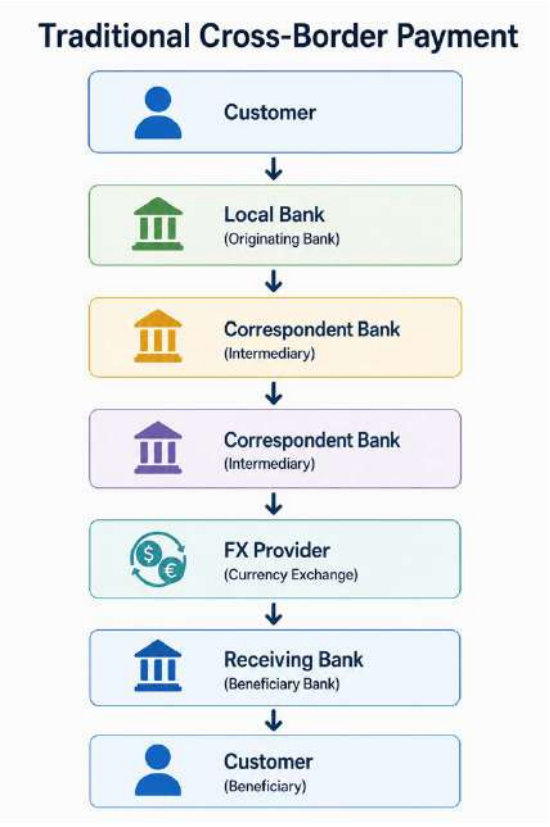
1. Domestic Payment



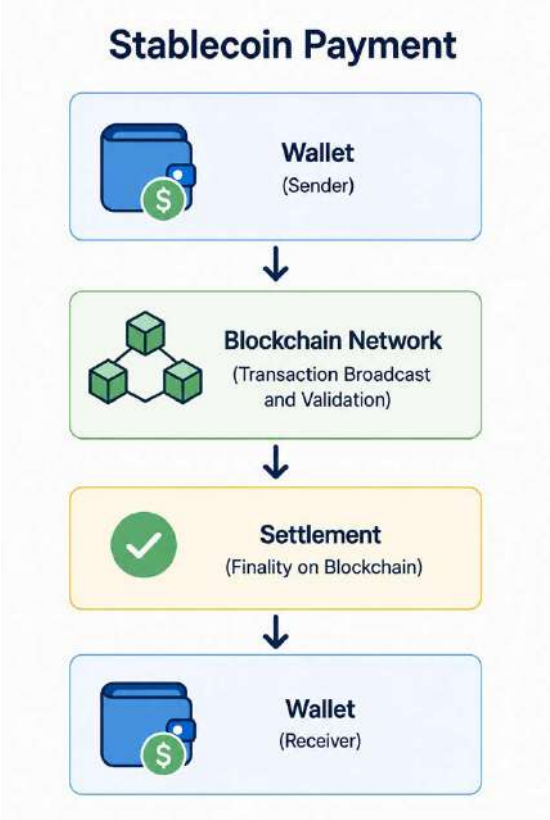
2. SEPA Payment



3. Traditional Cross-Border Payment

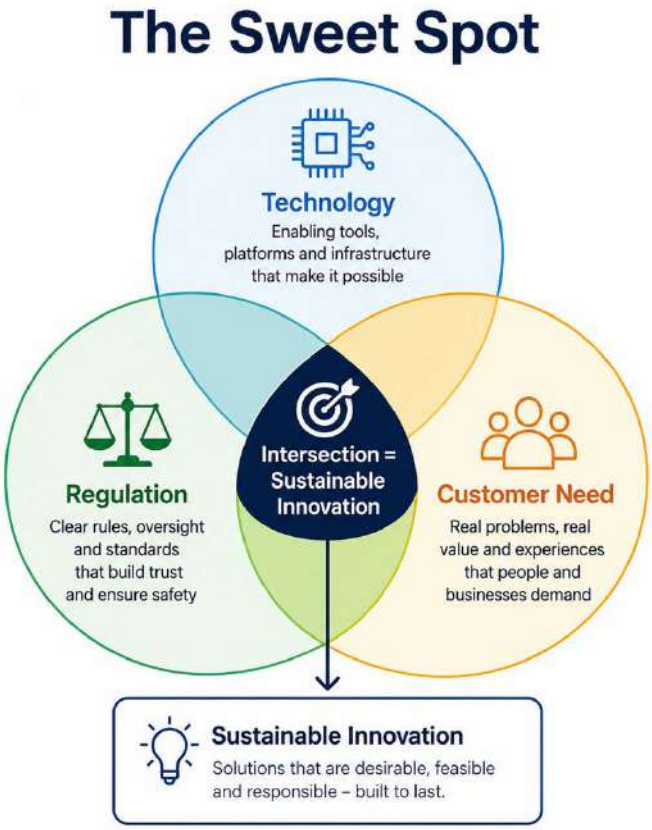


4. Stablecoin Payment



5. Programmable Settlement

6. The Sweet Spot



Appendix C

ISO 20022 Overview

ISO 20022 is the global standard for financial messaging.

It provides:

- structured payment data
- richer remittance information
- common terminology
- interoperability
- improved automation
- better compliance
- enhanced reconciliation

Major users include:

- SWIFT
- SEPA
- TARGET Services
- FedNow
- many domestic payment systems
- securities settlement systems

ISO 20022 is expected to become the dominant global language for financial messaging during the second half of this decade.

Appendix D

SEPA at a Glance

Full Name

Single Euro Payments Area

Purpose

To make euro payments across Europe as simple as domestic payments.

Launched

- PSD adopted: 2007
- SEPA Credit Transfer: 2008
- SEPA Direct Debit: 2009
- SEPA Instant: 2017

Key Features

- Euro payments
- IBAN
- ISO 20022
- Low cost
- High automation
- Cross-border interoperability

Strengths

- Excellent for European payments
- Highly standardised
- Fast
- Secure

Limitations

- Euro-focused
- Regional rather than global
- Limited support for programmable assets

Appendix E

SWIFT MT Messages

Traditional SWIFT messages are grouped into categories.

Examples include:

Category	Purpose
MT1xx	Customer Payments
MT2xx	Financial Institution Transfers
MT3xx	Treasury and FX
MT5xx	Securities
MT7xx	Trade Finance
MT9xx	Cash Management

Examples:

MT103

Customer Credit Transfer

MT202

Bank-to-Bank Transfer

MT202 COV

Cover Payment

SWIFT is gradually migrating from MT messages to ISO 20022 while maintaining interoperability during the transition period.

Appendix F

MiCA Overview

Markets in Crypto-Assets Regulation

Objectives:

- Harmonised European regulation
- Consumer protection
- Market integrity
- Financial stability
- Innovation

Covers:

- Stablecoins
- Crypto-assets
- Crypto-Asset Service Providers (CASPs)
- Custody
- Trading
- Issuance

MiCA represents one of the world's first comprehensive regulatory frameworks for digital assets.

Appendix G

Suggested Further Reading

International Standards

- ISO 20022 Financial Messaging Standard
- CPMI – Cross-border Payments Programme
- Financial Stability Board (FSB) reports on cross-border payments

European Union

- Markets in Crypto-Assets Regulation (MiCA)
- Payment Services Directive (PSD2)
- Instant Payments Regulation
- European Payments Council (EPC) RuleWhitepapers

Central Banking

- Bank for International Settlements (BIS)
- European Central Bank (ECB)
- Sveriges Riksbank
- Federal Reserve
- Bank of England

Payment Infrastructure

- SWIFT documentation
- SEPA documentation
- TARGET Services
- FedNow
- Faster Payments Service (UK)

Digital Assets

- Circle – USDC and EURC
- Fireblocks
- Ripple
- Fnality
- Partior
- Kinexys (formerly JPM Coin)

Books

- *The Future of Money* – Eswar S. Prasad
- *Layered Money* – Nik Bhatia
- *The Ascent of Money* – Niall Ferguson (or watch the excellent television series that was developed together with the book, it is available for purchase on Amazon)
- *The Pay Off* – Gottfried Leibbrandt & Natasha de Terán