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# DIGITAL PAYMENTS AND THE NEW ECONOMY

HOW CASHLESS INNOVATION IS TRANSFORMING  
GLOBAL FINANCE, INCLUSION, AND GROWTH



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INSIGHTS  
FROM GLOBAL  
PRACTICES.  
LESSONS FOR  
A BETTER  
FUTURE.

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# Digital Payments and the New Economy

*How Cashless Innovation Is Transforming  
Global Finance, Inclusion, and Growth*

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Payment systems, regulations, technologies, and market conditions evolve rapidly. While reasonable care has been taken to present accurate and useful analysis at the time of writing, the author and publisher do not guarantee that all information will remain current or complete.



## Dedication

To the people, merchants, workers, families, and communities whose daily economic lives are shaped by how money moves.

And to everyone working to build payment systems that are not only faster, but also safer, fairer, more inclusive, and more resilient.

And to our lovely sons:

Shivaay Vishwakarma & Sanchit Vishwakarma

## Preface

Digital payments are often discussed as a matter of convenience. We tap, scan, click, transfer, and receive money with less friction than before. To many users, the shift from cash to digital appears to be a simple improvement in speed and ease.

But digital payments are much more than a convenient way to pay.

They are becoming part of the infrastructure of modern economic life. They shape how households receive income, how merchants sell, how governments distribute public support, how banks manage trust, how fintech firms build services, and how economies create records of activity.

This book was written to examine that deeper transformation.

The central argument is simple: digital payments should not be judged only by speed, transaction volume, or cashless adoption. They should be judged by the quality of the economic infrastructure they create. A good payment system should be useful, affordable, secure, inclusive, privacy-conscious, resilient, and trusted.

The book looks across several global payment pathways. India's UPI demonstrates the power of interoperable public rails. Brazil's Pix shows how a central-bank-led instant payment system can enter everyday retail life. Kenya's mobile money experience shows how payments can become first-entry financial access in low-infrastructure settings. Sweden's cash-light economy highlights resilience and inclusion questions. China's platform-based payments show the power and risk of embedded ecosystems. The United

States illustrates how legacy card infrastructure shapes digital transformation.

These examples are not presented as one-size-fits-all models. They are used to show that payment transformation is deeply contextual. What works in one market depends on institutions, infrastructure, regulation, merchant behavior, user trust, technology access, and social needs.

The book also examines the hidden costs of digital convenience: fraud, privacy loss, digital exclusion, merchant burden, operational outages, platform dependence, and cross-border friction. Digital payments can create enormous public value, but only when they are governed carefully and designed for real users under real conditions.

This book is written for fintech professionals, banking and payments leaders, policymakers, regulators, digital transformation teams, financial inclusion practitioners, students, researchers, consultants, and readers interested in the future of money.

It is not a technical manual. It is not a narrow fintech market report. It is a practical and globally grounded explanation of how digital payments are reshaping finance, inclusion, regulation, commerce, and economic participation.

A good payment system does not merely move money.

It helps society move forward.

## Method Note

This book draws on public knowledge, institutional reports, industry developments, policy discussions, and comparative examples from different payment ecosystems. It uses country cases and payment models as analytical examples rather than exhaustive country studies.

This book is authored from a practitioner-researcher perspective, integrating professional interpretation, infrastructure analysis, policy awareness, and practical examination of payment systems. Its objective is to elucidate digital payments in a manner that is beneficial to professionals, students, policymakers, and general readers seeking to comprehend the broader implications of payment transformation.

Several themes guide the analysis:

First, digital payments are seen as economic infrastructure, not just consumer products. Second, financial inclusion involves active, safe, affordable use, not just account ownership. Third, payment-system success is measured by trust, resilience, affordability, merchant acceptance, consumer protection, data governance, and public value, not just transaction volume. Fourth, examples like UPI, Pix, M-PESA, cash-light societies, platform payments, and card-centric systems show different pathways without ranking models. Fifth, payment systems evolve quickly. Regulations, technologies, market structures, fraud patterns, and adoption levels may change post-publication. Readers should consult current official sources, central bank publications, regulatory updates, and industry reports for updated data.

## Who This Book Is For

This book is for readers who want to understand digital payments beyond everyday convenience.

It is especially useful for:

- ☐ fintech professionals working on payments, wallets, embedded finance, or digital platforms;
- ☐ banking and payments leaders responsible for modernization, customer experience, or payment strategy;
- ☐ policymakers and regulators thinking about payment infrastructure, inclusion, consumer protection, and resilience;
- ☐ product managers and digital transformation teams working in financial services or commerce;
- ☐ financial inclusion practitioners and development professionals;
- ☐ researchers, students, and educators studying fintech, banking, public infrastructure, or digital finance;
- ☐ merchants, consultants, and business leaders interested in how payment systems affect commerce and customer behavior;
- ☐ general readers interested in the future of money.

The book does not require deep technical knowledge. It explains payment systems in clear language while still addressing the strategic, policy, and governance issues that matter to professionals.

## How to Read This Book

The book can be read from beginning to end as a structured journey through the evolution, architecture, global models, risks, and future of digital payments.

It can also be read selectively.

Readers interested in history and basic concepts may begin with Chapters 1 and 2.

Readers interested in developed and developing economy differences may focus on Chapters 3, 4, 5, and 6.

Readers interested in value creation and risks may focus on Chapters 7 and 8.

Readers interested in global examples may begin with Chapter 9.

Readers interested in the future of payments, cross-border systems, and regulation may focus on Chapters 10, 11, and 12.

Professionals looking for practical lessons may go directly to Chapter 13 and Appendix A.

The appendices provide additional support through a practical policy checklist, glossary, country profile notes, future trends, and annotated further reading.

# Reader's Map

## Part I: Foundations

### **Chapter 1 - The Long Evolution: From Cash to Programmable Trust**

Explains how payments evolved from barter and cash to banking records, cards, mobile payments, QR codes, and programmable trust.

### **Chapter 2 - What Digital Payments Are-and Why Architecture Matters**

Explains the architecture beneath the visible payment moment: identity, authorization, settlement, interoperability, data, fraud, and resilience.

## Part II: Digital Payments Across Economic Contexts

### **Chapter 3 - Beyond Cash: Why the World Moved Forward-but Not Fully Away**

Explores why digital payments grew, why cash declined in many contexts, and why cash still matters for resilience, privacy, budgeting, and inclusion.

### **Chapter 4 - Digital Payments in Developed Economies: Efficiency and Integration**

Examines digital payments as optimization infrastructure in mature financial systems.

### **Chapter 5 - Leapfrogging in Developing Economies: Public Rails and Merchant Acceptance**

Shows how public rails, QR codes, real-time payments, and merchant acceptance can help developing economies bypass older infrastructure constraints.

## **Chapter 6 - Access at the Edge: Mobile Money, Remittances, and Low-Infrastructure Settings**

Explains how mobile money, agent networks, and remittances create first-entry financial access in low-infrastructure environments.

## **Part III: Value, Risk, and Global Lessons**

### **Chapter 7 - How Value Is Created for Households, Firms, and Governments**

Explains how digital payments create value for households, merchants, firms, governments, and the wider economy.

### **Chapter 8 - The Hidden Costs: Fraud, Privacy, Exclusion, and Digital Risks**

Examines the risks behind digital convenience, including fraud, privacy loss, exclusion, merchant burden, platform dependence, and outages.

### **Chapter 9 - Country Case Snapshots: India, Brazil, Kenya, Sweden, China, and the United States**

Compares six payment pathways and extracts practical lessons from different country models.

## **Part IV: The Future of Payments**

### **Chapter 10 - The Next Phase: Embedded Finance, Cross-Border Rails, and Resilience**

Explores embedded payments, digital identity, artificial intelligence, data governance, CBDCs, and future payment infrastructure.

### **Chapter 11 - Cross-Border Payments, Remittances, and the Unfinished Global Problem**



Explains why cross-border payments remain costly, slow, opaque, and difficult despite domestic payment progress.

## **Chapter 12 - Regulation, Consumer Protection, and the Politics of Payment Design**

Shows why payment systems are public-interest infrastructure and why governance is part of payment design.

## **Chapter 13 - Practical Lessons for Banks, Fintechs, Merchants, and Policymakers**

Turns the book's analysis into practical lessons for major payment ecosystem stakeholders.

## **Closing and Reference Material**

### **Conclusion - Digital Payments and the New Economy**

Summarizes the book's central message: the future of payments should be trusted, inclusive, interoperable, resilient, and governed for public value.

#### ***Appendix A - A Practical Policy Checklist***

*Provides a checklist for evaluating digital payment systems.*

#### ***Appendix B - Glossary of Payment Terms***

*Explains key terms used throughout the book.*

#### ***Appendix C - Country Profile Notes***

*Summarizes the country examples discussed in the book.*

#### ***Appendix D - What to Watch Next***

*Highlights major future trends in payments.*

#### ***Appendix E - Annotated Further Reading***

*Provides useful sources for deeper study.*

#### ***References and Selected Reading***

*Lists relevant institutional, policy, and research sources.*

## Acknowledgments

This book represents the culmination of years devoted to professional observation, research, and a profound interest in the influence of financial technology on economic realities. I express my sincere gratitude to the numerous professionals, researchers, practitioners, policymakers, and institutions whose contributions have significantly advanced global understanding in the areas of digital payments, financial inclusion, payment infrastructure, and responsible financial innovation.

I also recognize the contributions of colleagues, mentors, collaborators, and professional networks within the domains of banking, technology, software delivery, and financial services, who have significantly influenced my comprehension of the factors contributing to the success or failure of complex systems in practice.

In conclusion, I wish to extend my heartfelt thanks to those readers who engage with this topic out of genuine curiosity. Although digital payments might appear commonplace, they are now deeply intertwined with issues of trust, accessibility, resilience, privacy, and economic engagement. I earnestly hope that this book helps readers perceive payment systems not just as tools for transactions, but as vital infrastructure that shapes the daily experiences of individuals and businesses alike.

# **Chapter 1**

## **The Long Evolution: From Cash to Programmable Trust**

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### **From barter to organized exchange**

Long before anyone could scan a QR code, tap a phone, or send money across borders through an app, people faced a basic economic problem: how to exchange value in a society.

In the earliest forms of trade, exchanges depended on bartering. A farmer with grain needed to find someone who wanted grain and also had something the farmer wanted in return. Economists often call this the “double coincidence of wants.” In simple terms, both sides had to want exactly what the other side offered at the same time.

This worked in small communities where people knew one another, and their needs were limited. However, as societies became larger and trade became more complex, barter became inefficient. It was difficult to compare the values of different goods. It was difficult to store the value for later use. It was difficult to move value across the distance. Most importantly, barter depends heavily on personal trust and immediate need.

Money emerged as a solution to these limitations. Shells, metals, livestock, grains, and other objects were used as early forms of value representation. Over time, coins and standardized currency became more common because they

solved three problems simultaneously. They act as a medium of exchange, unit of account, and store of value.

Farmers no longer needed to exchange grain directly for shoes. The farmer could sell grain for money and later use that money to buy shoes, tools or food. This may sound simple today, but it was one of the most important steps in the economic history of the world. This allowed trade to expand beyond immediate personal relationships.

The story of payments begins here, with the gradual replacement of direct exchange by systems of shared trust.

## **Currency and the rise of institutional trust**

Coins and paper currency did more than make trade easier. They created a common language of values. A coin carried social meaning because people trusted that others would accept it. A paper note worked because people trusted the authority behind it.

This marks a major shift. Trust is no longer personal. This has become institutionalized.

When a government issues a currency, people do not need to know one another personally to exchange goods and services. They need to trust the currency system. Trust depends on political authority, legal recognition, stability, and social acceptance.

Cash became powerful because it is simple. It works without electricity, Internet, a bank account, or a password. This provides users with immediate control. It also offers privacy. Cash transactions usually do not create detailed records visible to banks, platforms, or governments.

For centuries, these strengths have made cash the dominant payment method for everyday life. Even today, cash remains useful because it is physical, familiar, and resilient to crises. However, cash has its limitations. It can be stolen. Storing, transporting, counting, and securing them is expensive. It is difficult to use for remote transactions. This creates limited transaction records. It does not easily support digital commerce either.

As economies have grown more complex, the limits of physical money have become increasingly visible. This created space for the next major development: banking payments.

## **Banking and the movement from money to records**

Banking introduced a new idea: money did not always need to move physically for payments to occur.

When people deposit money into banks, the banks record their balances. A payment could then be made by changing the records rather than by physically moving coins or notes. Checks, account books, deposit ledgers, and clearing arrangements transformed payments into a record-keeping process.

This was a major step toward modernizing digital payments.

For example, a check is not money itself. It is an instruction. It instructs a bank to transfer value from one account to another. The actual movement of value occurs through trust in the banking system and its records.

This has changed the nature of payments. Instead of carrying cash, people can rely on institutions to maintain

balances and settle obligations. Payments have become less visible but more scalable. Large transactions have become easier. Businesses can operate across distances. Governments can collect and distribute funds more efficiently.

The banking era introduced a pattern that continues today: payment innovation often reduces the need for physical movement and increases reliance on trusted record-keeping.

## **Cards, networks, and electronic payments**

The twentieth century introduced another layer of abstraction: payment cards and electronic networks.

Cards have changed the payment experience. Customers no longer need to carry large amounts of cash. Merchants can accept payments through card terminals. Banks, card networks, processors, issuers, and acquirers are coordinated behind the scenes.

To the customer, the experience appears simple. The card is presented, the transaction is authorized, and the perpetrator walks away with the goods or services. However, behind that simple act was a complex system of messaging, authorization, fraud checks, clearing, and settlement.

This was an important turning point in the study. Payments are no longer only about money and banks. These have become networked systems.

Card payments create enormous convenience, especially in retail and travel. They have supported modern consumer commerce. They also introduced mature dispute

mechanisms, credit access, and global acceptance networks to address these issues.

However, card systems also introduce new costs and dependencies. Merchants often pay fees. Transactions pass through multiple intermediaries. Settlement may take time. The system worked well in many developed economies, but it required infrastructure that was not equally available everywhere in the world.

This explains why payment evolution did not follow the same path in all countries. In some places, cards have become the dominant bridge between cash and digital payments. In contrast, mobile phones and account-to-account systems became more important.

## **The internet and the rise of remote commerce**

The Internet has changed payment expectations.

Before online commerce, most consumer payments occurred in person. Buyers and sellers are usually in the same location. Cash, cards, or checks could work because the transaction had a physical setting.

Online commerce has removed this setting. A buyer can purchase goods from a seller in another city or country without ever meeting them. This has created new payment requirements. Payments must be remote, secure, traceable, and reliable.

Payment gateways, online card processing, fraud detection, encryption, and digital authentication have become essential. A payment system is now needed to answer the following questions:

Can the buyer be trusted?

Can the seller be trusted?

Is the card or account valid?

Is the transaction fraudulent?

Can the payment be reversed if something goes wrong?

The rise of e-commerce has made payments more than just a checkout function. Payments have become a part of the trust infrastructure for the Internet economy.

Without reliable digital payment systems, online retail, subscription services, app stores, digital marketplaces, and global freelance platforms would not have scaled similarly.

## **Mobile phones and the payment revolution**

If the Internet moved commerce online, mobile phones moved digital payments into everyday life.

Smartphones integrate identity, communication, location, authentication, and payment interfaces into one device. This has made it possible for people to pay, receive, verify, and manage money from almost anywhere.

In developed economies, mobile wallets often become a convenience layer on top of existing cards and bank accounts. A phone has replaced the physical wallet for many daily transactions. Contactless payments, stored credentials, and in-app payments have made commerce faster and smoother.

In developing and low-infrastructure economies, phones play a different role. It was not merely a convenient layer. It often becomes the first practical financial interface.

This distinction is crucial.



In countries with strong banking and card infrastructure, mobile payments may improve speed and user experience. In a country where many people lack access to branches, cards, or formal accounts, mobile payments may provide the first entry into financial participation.

Therefore, the same device can have different meanings in different economies. For one user, it is convenient. The second is inclusion.

One of the most important but sometimes underestimated innovations in digital payments is the use of QR codes.

Traditional card acceptance often requires terminals, merchant accounts, network arrangements, and hardware costs. This worked well for larger merchants but could be difficult for small shops, street vendors and informal sellers.

QR codes lower this barrier.

A small merchant can display a printed code or generate one through a mobile application. Customers can scan and pay. This reduced the need for expensive hardware and allowed digital payments to reach smaller businesses.

This is particularly important in developing economies. Merchant acceptance is the bridge between payment access and its everyday usefulness. A consumer may have a digital wallet or bank-linked app, but if the nearby shop, vegetable seller, taxi driver, or repair worker does not accept digital payment, the system remains limited to cash transactions.

QR-based acceptance has helped digital payments move from formal retail to daily commerce. This has allowed digital payment systems to become visible in markets, roadside shops, small services, and informal business settings.

This is one reason why systems such as India's UPI and Brazil's Pix have become important. They not only enabled digital transfers. They helped to normalize real-time payments in everyday merchant transactions.

## **Money becomes data**

The most important change in the digital era is not only that money moves faster. This is because money becomes data.

Cash transactions leave limited routine information. Digital transactions can create a timestamp, location clue, merchant identifier, device signal, user profile, counterparty record, and transaction history.

This creates new value. Users can track their spending. Merchants can maintain these records. Lenders can use transaction history to assess creditworthiness. Governments can directly distribute benefits. Fraud detection systems can detect unusual patterns. Businesses can analyze customer behavior and improve their operations.

However, this also creates new risks.

When money becomes data, privacy becomes increasingly fragile. Payment histories can reveal sensitive information about lifestyle, health, religion, politics, relationships, and financial stress of individuals. The same data that enable better services can also enable surveillance, profiling, exclusion, or commercial exploitation.

Therefore, digital payments must be understood as social infrastructure, not just technical infrastructure. They reorganized visibility. They change who can see, analyze, and act on economic activity.

Therefore, the future of payments is not only about speed. It concerns data rights, trust, accountability, and governance.

## **From physical trust to programmable trust**

Payment history can be understood as a long movement from physical to programmable trust. In barter, trust is personal. People traded directly with those they knew or could evaluate their credibility.

In cash systems, trust has become social and institutional. People accepted currency because they trusted that others would accept it, too.

In banking systems, trust is transferred to ledgers and institutions. Records replaced physical movements.

In card and electronic systems, trust is transferred to networks. Authorization, processing, clearing, and settlement are coordinated through specialized intermediaries.

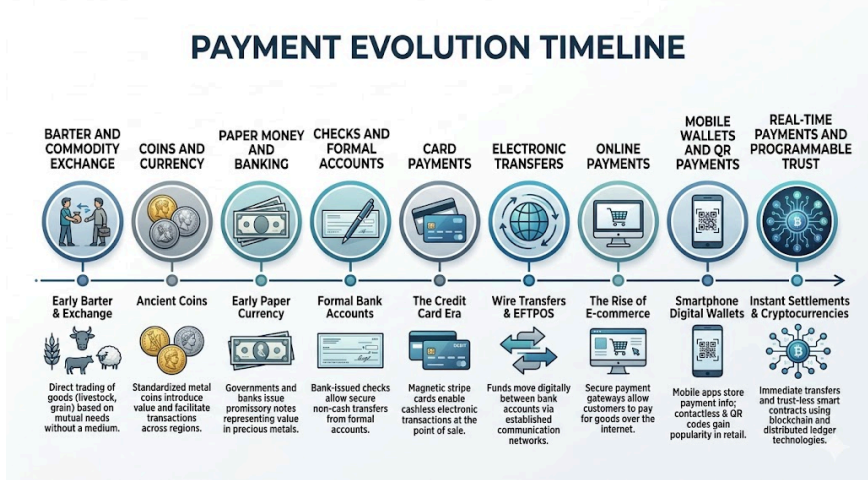
In digital payment systems, trust is increasingly programmable. Rules, identity checks, authentication, fraud detection, data analytics, APIs, and automated settlement shape whether a transaction succeeds.

This does not imply that human trust is lost. This means that trust is embedded in the systems.

A user may trust an app because it is easy to use and understand. A merchant may trust a payment rail because the settlement is reliable. A regulator may trust a system because it can be audited. A bank may trust a transaction because fraud control approves it. These forms of trust are partly social, institutional, and technical.

This is why the phrase “programmable trust” captures the present moment. Digital payments are not simply electronic cash. They are rule-based systems for moving values across connected economies.

**Figure 1.1: Payment Evolution Timeline**



*Figure 1.1: Payment Evolution Timeline*  
The evolution of payments shows a gradual movement from direct exchange and physical money to electronic networks, mobile systems, and programmable trust.

**Source note:** Author-created illustration based on the chapter’s historical synthesis of payment evolution.

## Why the evolution matters

Understanding this evolution is important because it prevents a shallow view of digital payment.

Digital payments are sometimes described as being only about convenience: faster checkouts, easier transfers, and fewer coins and notes. Convenience is real, but it is not the complete story.

Every major payment innovation has changed more than just the payment moment. This has changed the structure of commerce.

- Coins expanded trade beyond direct barter.
- Banks expanded trust through the use of records.
- Cards expand consumer payment networks.
- The Internet has expanded remote commerce.
- Mobile phones have expanded payment access.
- QR codes have expanded merchant acceptance.
- Real-time rails have expanded expectations regarding speed.
- Digital records have expanded the data layer of money.

Each stage reduced one type of friction while creating new dependencies. This pattern continues today.

Digital payments reduce distance, delay, and handling costs. However, they also create dependence on devices, networks, platforms, identity systems, cybersecurity, and governance. They widen access in some contexts while excluding users who lack connectivity, literacy, documentation, or confidence. They improve transparency while raising privacy issues.

The lesson from history is that every new payment method is not automatically better. The lesson is that payment systems must be judged by how well they balance speed, trust, access, cost, privacy, and resilience.

## **Chapter takeaway**

The history of payments is one of reducing friction and relocating trust.

Digital payments are the latest stage in this long evolution of payment systems. They matter because they are built for a world in which software, connectivity, and data are central to the economy.

However, the same history also warns us that every payment system carries trade-offs. A payment system can be fast and unfair. It can be convenient and exclusionary. It can be innovative and fragile.

The real question is not whether payments will become more digital. They already have. The deeper question is whether digital payment systems are designed to support trust, inclusion, resilience, and public value.

## **Transition to Chapter 2**

The long history of payments shows how societies have repeatedly reduced friction by changing the location of trust. However, to understand digital payments properly, we need to look beneath the visible payment moment.

A tap, scan, or transfer may appear simple to the user, but it depends on architecture: identity, authorization, settlement, interoperability, and governance. The next chapter explains what digital payments are and why their architecture matters.

## **Chapter 2**

# **What Digital Payments Are and Why Architecture Matters**

### **Digital payments are not one thing**

The phrase digital payments sounds simple, but it covers many different systems. A person may tap a card, scan a QR code, send money through a mobile app, pay through an online checkout, receive wages into a wallet, or transfer money instantly from one bank account to another, for example. All of these are digital payments, but they do not function in the same way.

This distinction is important because the user experience often hides the underlying architecture. Two people may both pay with a phone, but one transaction may run through a card network, whereas another may move through a real-time account-to-account rail. A third may use the stored value in a wallet. Fourth, they may rely on a mobile money system supported by agents and telecommunications infrastructure.

To the user, these payments may feel similar to each other. The user taps, scans, clicks, or confirms. However,

each system has different rules, costs, risks, settlement processes, and governance structures.

This is why architecture is important. Digital payment is not only a front-end interface. It is a complete system for identity, authorization, messaging, clearing, settlement, fraud control, dispute handling, and regulation.

A simple payment moment can depend on a highly complex infrastructure.

## **Major types of digital payments**

Digital payments can be grouped into several categories. Each solves a different problem and has different trade-offs.

### **Card payments**

Card payments are among the most widely used digital payment methods, particularly in developed economies. Credit and debit cards allow consumers to pay merchants without using cash. They are supported by large networks, issuing banks, acquiring banks, processors, and merchant service providers.

Cards have become popular because they are convenient, familiar, and widely accepted. They also offer mature dispute and chargeback mechanisms that can increase consumer trust.

Nevertheless, the use of cards entails the involvement of multiple intermediaries, which can lead to increased merchant fees and heightened complexity in settlement processes. While these costs may be manageable for large merchants, they can pose significant financial burdens or challenges for small merchants, particularly in developing economies, when it comes to card acceptance.



## **Bank transfers and account-to-account payments**

Account-to-account payments move money directly between bank accounts or regulated transaction accounts. In traditional systems, these transfers can take time. In modern fast payment systems, they can occur instantly or near instantly.

Real-time account-to-account payments are important because they can reduce dependence on card networks and the number of intermediaries involved in a transaction. They are useful for peer-to-peer transfers, bill payments, government disbursements, and merchant payment.

Systems such as India's UPI and Brazil's Pix show how account-to-account rails can become mass-market infrastructure when they are easy to use, interoperable, and widely accepted by the public.

## **Mobile wallets**

Mobile wallets allow users to store payment credentials, account links, or values on a mobile device. Some wallets are simply front-end interfaces for the cards. The others are linked to bank accounts. Some store values directly within the wallet.

This difference is significant. A wallet that stores card credentials is not the same as a mobile money wallet in a low-infrastructure setting. In one case, the wallet improves convenience for an already-banked user. In contrast, wallets may provide the first practical access to digital finance.

Mobile wallets are powerful because they combine payment, identity, authentication, and user interfaces into one device. Therefore, they have become central to modern payment ecosystems.

## **QR payments**

QR payments allow users to scan a code and initiate a payment. The code may represent a merchant account, wallet address, payment request, or transaction detail.

QR payments are especially important because they reduce the cost of merchant participation. A small merchant may not require a card terminal. A printed QR code or a low-cost mobile application may be sufficient.

This has major implications for financial inclusion and the digitization of small businesses. QR-based payments can help digital payments reach street vendors, local shops, transport providers and informal businesses.

## **Mobile money**

Mobile money is especially important in low-infrastructure countries. It allows users to store value and send or receive money through a mobile phone, often without requiring a traditional bank account or a credit card.

Mobile money systems often depend on agent networks to function. Agents help users deposit cash, withdraw cash, register accounts, and resolve basic issues. This makes mobile money a hybrid system that is partly digital, partly physical, and partly social.

The importance of mobile money is that it can serve users who are not fully reached by banks or other financial institutions. In some contexts, it is not merely a convenient payment method. This is a first-entry financial infrastructure.

## **Online and embedded payments**

Online payments support e-commerce, subscriptions, app stores, digital services, marketplaces and remote

transactions. Embedded payments go further by making payments part of the service itself.

A ride-sharing app automatically charges the user. A streaming service is renewed every month. A food delivery platform processes payments inside the app. In these cases, payments become almost invisible.

This creates convenience but also raises questions about consent, recurring charges, user control, data use, and platform dependency.

## **The visible payment and the hidden system**

Digital payments often appear simple on the surface. Customers either scan a QR code or tap their phone. The merchant receives the confirmation. The transaction appears to be complete.

However, several things happened behind that moment.

The system must identify both the payer and payee. It must be confirmed that the payer has the authority to make the payment. It must check whether the transaction appears suspicious. It must route the payment message correctly. One account must be debited and another credited. It must notify the parties involved. It may be necessary to settle funds between financial institutions. It must preserve the records. It may also be necessary to support dispute resolution in the future.

This hidden system makes digital payments reliable.

A payment interface may appear modern, but if the hidden architecture is weak, the system will struggle. Users may

face failed transfers, fraud, delays, unclear settlements, poor customer support, or limited recourse.

Therefore, payment design must be evaluated below the surface.

## **The three core functions: identity, authorization, and settlement**

Most digital payments depend on three core functions: identity, authorization, and payment settlement.

### **Identity**

Identity answers the question: Who is involved in a transaction?

In cash transactions, identity may not matter much. A person hands over cash, and the transaction is completed. In a digital transaction, the system must know which account, wallet, device, merchant, or user is involved in the transaction.

Identity can be based on bank account numbers, phone numbers, email addresses, aliases, QR codes, wallet IDs, device credentials, or government-linked identity systems.

A good identity design makes payments easier. A person should not have to remember long account numbers for ordinary transactions. This is why aliases, phone numbers, QR codes, and saved beneficiaries are useful features.

However, identity design also creates risks. If someone can impersonate a user, control a device, or trick a person into sending money to the wrong recipient, fraud can increase significantly.

## Authorization

Authorization answers the question: Is this person allowed to make this payment?

Authorization may involve a PIN, password, biometric check, one-time password, device confirmation, token, or risk-based authentication process. The goal is to prevent unauthorized transactions while keeping legitimate transactions simple.

This is a difficult balancing act.

If the authorization is too weak, fraud increases. If it is too difficult, users become frustrated or are excluded. Older users, low-literacy users, people with disabilities, and users with weak connectivity may struggle to complete complex security steps.

A good payment system uses proportional security. Low-risk, low-value transactions may require simple confirmation. Higher-risk transactions may require more stringent checks.

## Settlement

Settlement answers the question: When and how does money finally move?

From the user's perspective, a payment may appear to be instant. However, behind the scenes, settlement may occur immediately, later in batches, or through netting arrangements between institutions.

Settlement design affects merchants' confidence. A merchant wants to know when the funds are final and usable. Delayed or uncertain settlements can weaken trust, especially for small businesses with tight cash flows.

Settlement also affects systemic risks. Large payment systems require clear rules regarding liquidity, finality, reversals, and responsibility when something goes wrong.

Therefore, settlement is not just a back-office process. It is central to the payment trust.

*Figure 2.1: Digital Payment Architecture Stack*

## Digital Payment Architecture Stack

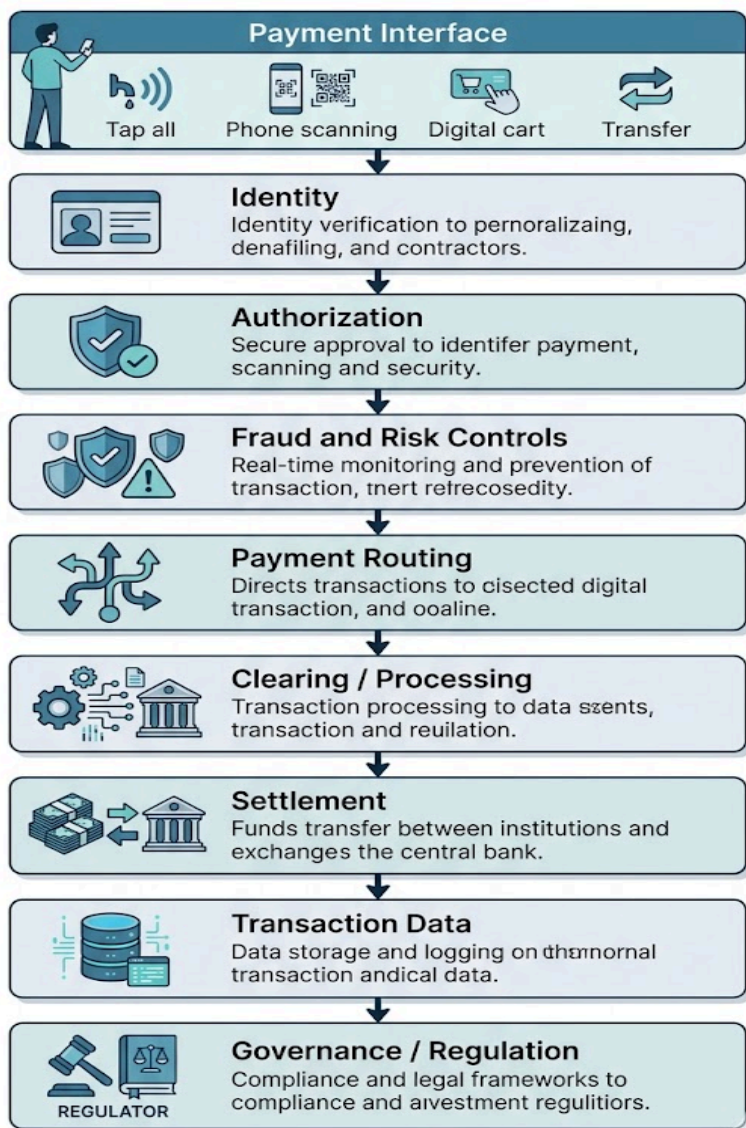


Figure 2.1: Digital Payment Architecture Stack. Digital payment depends on multiple layers, including identity, authorization, risk

*control, routing, processing, settlement, data, and governance. The user sees a simple payment moment, but the system depends on a complex infrastructure below the surface.*

*Source note: Author-created illustration based on the chapter's conceptual explanation of the digital payment architecture.*

## **Interoperability: the difference between a product and infrastructure**

Interoperability is one of the most important concepts in digital payments.

Interoperability means that different users, banks, wallets, apps, merchants, and service providers can transact across the same or compatible systems.

Without interoperability, payment systems become isolated. A user of one wallet may not be able to pay a merchant using a different wallet. A bank customer may not be able to send money easily to another bank's customer. Merchants may need to display multiple QR codes or maintain multiple accounts.

Closed systems can also be successful. They may offer a strong user experience and rapid innovation. However, their public value is limited if they fragment the market.

Interoperable systems are more likely to become part of the infrastructure. They allow users and merchants to connect without the need to belong to the same provider. They reduce duplication of effort. They support competition at the service layer while keeping the core payment rail broadly usable.

This is one reason why public or quasi-public rails can be powerful. They can provide a common foundation while



allowing banks, fintechs, and applications to compete on experience, features, and customer service.

## **Merchant acceptance: where payment systems become real**

A payment system becomes meaningful only when it works where people spend their money.

A user may have a mobile wallet, card, or real-time payment app, but if local merchants do not accept it, the system remains limited to cash payments. Merchant acceptance is one of the most important bridges between payment access and usefulness.

In developed economies, merchant acceptance often depends on card terminals, online checkout systems, payment gateways and point-of-sale integration.

In developing economies, QR codes and mobile acceptance may be more important. They allow small merchants to accept payments without the need for expensive hardware.

Merchant acceptance is not only a technical issue. This is also an economic issue. Merchants care about:

- ☐ fees
- ☐ settlement time
- ☐ reliability
- ☐ customer demand
- ☐ dispute rules
- ☐ tax visibility

- ☐ ease of reconciliation
- ☐ dependence on platforms

If digital payments are too expensive or confusing for merchants, their adoption may remain shallow. If payments are affordable, reliable, and easy to reconcile, merchants have a stronger reason to participate in the system.

This is especially important for small businesses, where even small costs or delays can be significant.

## **Data: the invisible output of digital payments**

Every digital payment generates data.

This data may include the amount, time, merchant, payer, payee, device, location, channel and transaction type. Over time, these records create a pattern.

Payment data can also be useful. It can help users track spending, merchants manage business activities, lenders assess creditworthiness, governments deliver support, and fraud systems detect suspicious behavior.

However, payment data also pose risks. It can reveal sensitive information about people's lives. It can be used for profiling, surveillance, pricing decisions or exclusion. This can strengthen the power of platforms that control payment interfaces.

Therefore, payment architecture must include data governance.

Important questions include the following:

Who collects the data?

Who can access it?  
How long is it stored?  
Can it be shared with third parties?  
Can users understand or control its use?  
What protections exist against its misuse?

Digital payments are not only about moving money; they are also about creating information. This information can create public value but can also create new forms of power.

## **Fraud and dispute handling**

Fraud is one of the biggest challenges in digital payment systems.

As payments become faster, fraud can also occur more quickly. Scammers may use fake links, impersonation, social engineering, account takeovers, mule accounts, or false merchant requests.

This creates design tension. Users want payments to be instantaneous and frictionless. However, safety often requires friction: warnings, confirmations, limits, checks, and delays for suspicious activities.

A good digital payment system does not rely solely on user caution. It builds safety into the systems.

This may include:

- ☐ transaction alerts
- ☐ recipient confirmation
- ☐ velocity checks

- ☐ fraud scoring
- ☐ suspicious-pattern detection
- ☐ transaction limits
- ☐ dispute channels
- ☐ customer support
- ☐ education campaigns

Dispute handling is especially important in this context. Users are more likely to trust digital payments if they know what happens when something goes wrong with the payment.

If a payment fails, who will fix it?

If the money is sent to the wrong person, what can be done?

If a user is scammed, who bears the responsibility?

If a merchant does not deliver, is there any recourse?

Architecture matters because it determines whether users are protected only before or after payment.

## **Why architecture differs across countries**

Digital payment systems vary because countries start from different places.

A country with strong card networks may build digital wallets on its existing card infrastructure. Countries with weak card acceptance may prioritize account-to-account rails or QR systems. Countries with limited banking access may rely more heavily on mobile money and agent networks. A highly digital country may focus on resilience and fallback systems.

This explains the absence of a single universal payment model.

The United States has a strong card infrastructure; therefore, digital wallets often sit on top of cards. India built UPI as an interoperable account-to-account system. Brazil built Pix as a central bank-led instant payment system. Kenya's mobile money ecosystem emerged partly because phone-led access matched local needs better than branch-led banking did. Sweden's cash-light economy raises questions about resilience and inclusion.

Each architecture reflects the history, institutions, regulations, market structure, and user behavior.

Therefore, a payment system should be judged based on how well it solves the problems of its context.

## **Public rails and private interfaces**

A key design question is the relationship between public infrastructure and private innovation.

Public rails can provide interoperability, broad access, standardization and trust. Private firms can provide user-friendly applications, customer service, merchant tools, analytics, and innovation.

The strongest systems often combine both methods.

A common rail can prevent this fragmentation. Private interfaces can improve the user experience. Public rules can protect both fairness and resilience. Market competition can improve the quality of services.

Achieving this balance is challenging. Excessive public control may slow down innovation. Excessive private control may lead to concentration, high fees, or exclusion. A good

payment architecture requires a careful balance between openness, safety, competition, and accountability.

This is why payments are not merely technical. These are governance systems.

## **Why architecture matters for inclusion**

The architecture determines who can participate.

If a system necessitates the use of a smartphone, it may inadvertently exclude individuals who utilize basic mobile phones. Similarly, if the system mandates the provision of robust documentation, it may marginalize migrants or informal workers. Furthermore, if the system demands substantial data usage, it may disadvantage users with limited internet connectivity. The requirement for costly terminals may also preclude small merchants from participation. Additionally, a lack of accessible design may result in the exclusion of elderly or disabled individuals. Finally, the absence of recourse mechanisms may expose vulnerable users to significant financial losses.

Inclusion is not achieved simply by launching digital payment products. It must be integrated into the architecture.

This includes low-cost onboarding, simple interfaces, agent support, low-data options, accessible design, merchant affordability and clear dispute pathways.

The deeper lesson is that payment systems are not neutral in their effects. They include some users easily and make participation difficult for others.

## **Why architecture matters for resilience**

The architecture also determines whether a payment system can survive stress.

Digital payments depend on electricity, telecommunication networks, cloud services, devices, banks, processors, and cybersecurity systems. If these measures fail, payments may fail.

This is important because payment systems are part of everyday life. If people cannot pay for food, transportation, medicine, or fuel during an outage, payment failure becomes a social issue.

Resilient architecture includes redundancy, fallback channels, offline or low-connectivity options, incident responses, strong cybersecurity, and sometimes continued access to cash.

A fully digital system that works only under perfect conditions does not have a strong infrastructure. This is a fragile convenience.

## **Why architecture matters for governance**

Finally, the architecture determines who has the power.

- Who controls access to rail?
- Who sets fees?
- Who owns the transaction data?
- Who can block or reverse the payments?
- Who decides liability?
- Who can join the ecosystem?
- Who is responsible for outages or fraud events?

These questions do not involve technical details. They shape the fairness and public value of payment systems.

A fast but closed payment system may create dependency. An open but poorly governed system may create risks. A system that collects excessive data may reduce privacy.

A system with no clear dispute resolution rules may weaken trust. Therefore, architecture is where technology, economics, and regulations meet.

**Table 2.1: Payment Forms and Their Uses**

| <b>Payment Form</b>         | <b>Main Strength</b>  | <b>Main Limitation</b>  | <b>Typical Use</b>   |
|-----------------------------|---|---|--|
| Cash                        | No device needed; private; resilient in outages                     | Not suitable for remote commerce; handling risk; weak records | Everyday small purchases, fallback use                             |
| Cards                       | Broad acceptance; mature dispute frameworks; familiar to users      | Merchant fees; multiple intermediaries                        | Retail, e-commerce, travel   |
| Account-to-account payments | Fast settlement; fewer layers; useful for transfers and merchant QR | Requires strong identity, fraud controls, and user support    | Peer-to-peer transfers, bill pay, merchant payments                |
| Mobile wallets              | Convenient interface; can combine identity and loyalty              | Depends on underlying rail or stored-value model              | In-app payments, mobile commerce, peer payments                    |
| Mobile money                | Useful where banking access is limited; supports cash-in/cash-out   | Can remain cash dependent; agent quality matters              | Transfers, remittances, daily trade in low-infrastructure settings |



| Payment Form | Main Strength   | Main Limitation                            | Typical Use                                |
|--------------|---|--|--|
| QR payments  | Low-cost merchant acceptance; easy for small businesses | Requires user education and fraud controls | Small merchants, retail, informal commerce |

## Chapter takeaway

Digital payments are not a single technology. They are a family of systems built on various architectures.

The visible payment moment— tap, scan, click, or transfer—is only the surface. Beneath it are identity systems, authorization rules, settlement processes, data flows, fraud controls, merchant economics, and governance choices.

Architecture matters because it shapes who can participate, what it costs, how fast money moves, how data are used, how fraud is handled, and how resilient the system remains when conditions are imperfect.

A digital payment system becomes a valuable infrastructure only when its architecture supports trust, inclusion, affordability, interoperability, and resilience.

## Transition to Chapter 3

Chapter 2 shows that digital payments are not a single technology but a set of architectures. These architectures determine who can participate, how money moves, and how trust is maintained in the system. The next chapter addresses a broader question: why did the world move beyond cash in the first place, and why has cash not disappeared completely?

## **Chapter 3**

# **Beyond Cash: Why the World Moved Forward - but Not Fully Away**

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### **Cash is simple, but not sufficient for every economy**

Cash has survived for centuries because it solves many everyday problems. It is simple, familiar, immediate, and widely understood by the general public. It does not require electricity, mobile data, bank accounts, passwords, or payment networks. A cash transaction can be completed directly between two people without waiting for a third party to intervene.

This is why cash remains important, even in highly digital economies. It operates during network failures. This helps people control their spending. It provides privacy. This is useful for small transactions. It is often preferred by people who do not trust banks, applications, or digital systems. It can also serve elderly, undocumented, unbanked, or technology-uncomfortable users.

However, cash has its limitations.

It is difficult to use remotely. It cannot easily support e-commerce, app-based services, subscriptions, online marketplaces, or international digital work. They must be stored, counted, transported, and secured. They can be stolen or lost. This creates weak records. This is inefficient

for governments and firms that need to distribute or reconcile payments on a large scale.

As economies have become more digital, mobile, and interconnected, these limits have become more visible. The world has not moved beyond cash because cash has stopped working. It moved beyond cash because many new forms of economic life required something more flexible than cash.

## **The rise of remote commerce**

One of the strongest forces behind digital payments is the rise of remote commerce.

In traditional commerce, the buyer and seller are usually in the same place. A person walks into a shop, selects a product, and pays with cash or card. Payments were made in a physical setting.

The Internet has changed this. A buyer can now purchase from a seller in another city or country. Customers can subscribe to digital services. A freelancer can work for a client abroad. Families can order groceries, medicine, or household items online. A small business can sell through a marketplace without owning a physical store.

Cash does not function naturally in this world. Remote commerce requires remote payments.

This has given digital payments a structural advantage. Cards, payment gateways, bank transfers, digital wallets, and embedded checkout systems have become essential to online commerce. Without reliable digital payments, the modern Internet economy would be much smaller.

Therefore, moving beyond cash was not only about consumer preference. It was related to the economic

structure. Once commerce moved online, payments also had to move online.

## **The smartphone as payment infrastructure**

Smartphones have accelerated this shift. Smartphones are not just communication devices. It is also an identity, authentication, shopping, banking, navigation, and payment device. This combination makes digital payments easier to adopt.

Before the advent of smartphones, digital payments often required a desktop computer, card terminal, bank branch, or formal online banking process. Smartphones have moved these functions into people's pockets.

This change in behavior occurred in several ways.

- ☐ People can pay bills from home.
- ☐ They can send money instantly.
- ☐ They can scan QR codes.
- ☐ They can use mobile wallets.
- ☐ They can receive alerts.
- ☐ They can shop inside the apps.
- ☐ They can manage accounts without visiting branches.

For developed economies, smartphones have made payments faster and more convenient. For developing economies, it often creates a new path for financial participation. In low-infrastructure settings, it could become the first practical financial interface.

This is why digital payments have grown alongside mobile connectivity. Payment access increasingly depends not only on bank access but also on phone ownership, network coverage, digital identity, and user confidence.

## **Platforms made digital payments normal**

Digital payments have also expanded because platforms have made them feel normal.

Ride sharing, food delivery, e-commerce, streaming, travel booking, gaming, app stores, online education, and digital marketplaces all rely on embedded payments. Payments are no longer a separate event. This is part of the service.

- ☐ A user books a ride, and the fare is charged automatically.
- ☐ A person subscribes to a streaming service, and the renewal occurs in the background.
- ☐ A customer orders food, and the payment is built into the app.
- ☐ Freelancers receive payments through platforms.
- ☐ A merchant sells through a marketplace and receives a digital settlement.

In this environment, cash is inconvenient because the service itself is digital. Payments must fit within the digital flow.

This is why many people adopted digital payments, not because they wanted a new payment method, but because they wanted access to digital services. Payments followed the behavior.

When daily life moved into apps, payments moved with them.

## **Speed became an expectation**

Another reason the world has moved beyond cash is that speed has become a social expectation.

People have become accustomed to instant messages, searches, maps, bookings, and confirmations. Over time, they began to expect money to move at a similar speed.

Traditional payment systems often do not meet this expectation. Bank transfers can be slow. Checks could take days. Merchant settlements may be delayed. Cross-border payments can be expensive and uncertain.

Fast payment systems have changed the benchmark. They showed that ordinary users could send and receive money in real time or near-real time. Once people experience instant payment, delayed payment begins to feel outdated and inconvenient.

This shift is particularly important in developing economies. Faster payments can help small merchants manage their cash flow. They can help households receive urgent support and assistance. They can help governments distribute benefits efficiently. They can reduce dependence on physical cash.

Speed is not only convenient. In many contexts, speed changes the liquidity, trust, and economic participation.

## **Governments had reasons to support digital payments**

Governments have also played a major role in moving beyond cash.

Digital payments can help governments distribute money more directly to the public. Pensions, subsidies, wages, tax refunds, emergency relief, and welfare transfers can be sent to accounts or wallets instead of being delivered through physical cash channels.

This can reduce leakage, improve auditability, lower administrative costs, and create clearer records. During crises, digital payment rails can help public support reach people more quickly.

Governments are also concerned about formalization. Cash-heavy economies can make it difficult to measure business activities, tax flows, and income patterns. Digital payments create records that can make parts of the economy more transparent.

This visibility can be beneficial for several reasons. It can support credit access, tax administration, public planning and fraud reduction. However, it can also raise concerns about surveillance, overreach, and loss of privacy.

Therefore, government support for digital payments is practical and political. Payment systems affect public administration, welfare delivery, taxation, regulations, and state capacity.

## **Merchants followed customer behavior and business logic**

Merchants adopted digital payments because customer expectations changed, and digital payments can improve business operations.

Merchants may accept digital payments because customers request them. However, over time, merchants may also benefit from better records, faster reconciliation, remote

payment capability, reduced cash handling, and easier integration with accounting or inventory systems.

The benefits are practical for small merchants. Digital payments can reduce the risk of cash holding. They can make it easier to receive payments from customers who do not carry cash. They can create transaction histories that may support future credit access.

For larger merchants, digital payments support omnichannel marketing. Customers may browse online, buy in-store, return through an app, and receive refunds digitally. These experiences require an integrated payment system.

However, merchant adoption is not automatic. Merchants are also concerned about fees, settlement delays, disputes, tax visibility, fraud, and platform dependence. A payment system that is convenient for users but costly for merchants may face resistance from merchants.

This is why merchant economics is important. The world moves beyond cash only when both sides of a transaction see value.

## **The pandemic accelerated an existing shift**

The COVID-19 pandemic did not create digital payments but accelerated their adoption.

During lockdowns and social distancing, remote payments, online shopping, contactless payments and digital transfers became more necessary. Many consumers have tried digital payment methods for the first time. Many merchants quickly adopted online or contactless options. Governments have used digital channels to distribute support.



The pandemic compressed years of behavior change into a shorter period.

However, it is important not to overstate the pandemic as the origin story. Digital payments were already growing before this. E-commerce, smartphones, mobile wallets, QR payments, and real-time rails have already expanded. The pandemic intensified trends that were already underway.

Once users and merchants became comfortable with digital habits, many continued using them after restrictions were eased. This is how temporary necessity became a lasting behavior.

## **Why cash did not disappear**

Despite these forces, cash has not disappeared.

There are several reasons for this.

First, cash is resilient to crises. It can operate during power cuts, network failures, cyber incidents, and system outages. A fully digital payment system may be efficient during normal times but is fragile during disruption.

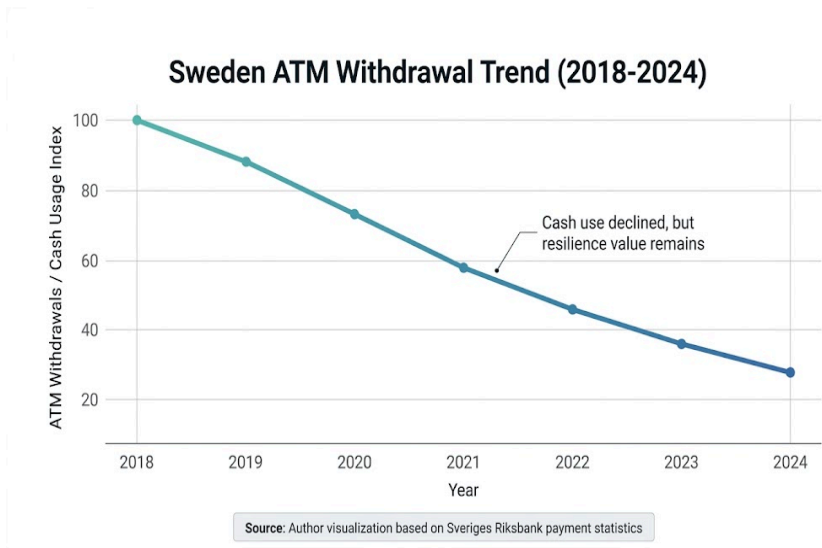
Second, cash is inclusive of some users. Not everyone has a smartphone, stable Internet, formal identification, or confidence in using apps. Some users depend on cash because digital systems are not designed for them to use.

Third, cash supports privacy. Cash transactions do not automatically create detailed digital records. Some people value privacy for legitimate reasons.

Fourth, cash helps with budgeting. Many households use physical currency to control their spending. Digital payments can feel abstract, especially when they are instant or invisible.

Fifth, cash remains culturally relevant. Payment behavior is shaped by habits, trust, and social norms. These changes do not occur overnight.

This is why the future is unlikely to be purely cashless. It is more likely to be mixed: digital payments are expanding, and cash use is declining in many settings, but cash retains a role in resilience, privacy, and inclusion.



*Figure 3.1: Sweden ATM Withdrawal Trend, 2018-2024*

*Sweden illustrates how cash use can decline sharply in a highly digital economy while remaining relevant for resilience, inclusion, and public preparedness.*

*Source note: Author-created visualization based on Sveriges Riksbank payment statistics and public reporting of cash use and payment behavior.*

## Cash as fallback infrastructure

Cash should not be viewed as an outdated payment method. In some contexts, it is a fallback infrastructure.

When digital systems fail, cash can keep basic commerce functioning. During outages, disasters, cyberattacks, or telecommunications disruptions, people still need to buy food, medicine, transportation, and fuel. If no alternative exists, payment failure may become a social problem.

This is why some highly digital economies still debate the public role of cash in their economies. The question is not whether cash will again dominate daily payments. The question is whether societies should preserve sufficient cash access to remain resilient.

A payment ecosystem can be modern and still requires redundancy.

A good infrastructure does not rely on a single channel. This includes backup options. For payments, this may involve cash, offline digital functions, multiple rails, or emergency procedures.

As digital payments become more central to life, resilience becomes increasingly important.

## **Privacy and the changing meaning of money**

Moving beyond cash also changes the relationship between money and privacy.

Cash allows people to transact without creating detailed routine data trails or records. Digital payments create records. These records may be useful, but they also make economic behaviors more visible.

This visibility can help both users and institutions. It can reduce theft, support budgeting, improve credit assessment, detect fraud, and help governments deliver benefits to the

poor. However, it can also enable profiling, surveillance, targeted manipulation, discrimination, or platform lock-in.

The key point is that cash is not always good, and digital payments are not always risky. Digital payments require stronger governance because they make data central to money movement.

A society that moves beyond cash must decide how payment data are collected, stored, shared, and protected.

Without these decisions, convenience can quietly become exposure.

## **The danger of assuming every user is digital-ready**

Digital payment systems often assume ideal users.

This user has a smartphone, stable connectivity, formal identity, digital literacy, confidence with apps, and access to support if something goes wrong.

However, many real users do not fit this profile.

- ☐ Some participants shared phones with family members.
- ☐ Some live in areas with limited connectivity.
- ☐ Some have low literacy.
- ☐ Some are elderly or disabled.
- ☐ Some of them lack formal documents.
- ☐ Some fear making mistakes.
- ☐ Some cannot afford data plans.
- ☐ Some of them do not understand fraud risks.

- ☐ Some have no easy way to contact the support team.

If payment systems are designed only for ideal users, they can exclude the very people they claim to serve.

Therefore, moving beyond cash requires careful design. Digital payments must be accessible, affordable, comprehensible, and recoverable. Otherwise, digitalization may deepen inequality, instead of reducing it.

## **A plural payment future**

The most realistic future is not simply cashless. It is plural.

Different payment methods serve different purposes.

Cash may remain useful for small transactions, emergencies, privacy, and for users outside the digital mainstream. Cards may remain strong in developed markets because of their familiarity and dispute frameworks. Mobile wallets may dominate app-based and contactless experiences in the future. Real-time account-to-account rails may increase in peer-to-peer transfers and merchant payments. Mobile money may remain essential in low-infrastructure settings such as rural areas. Cross-border systems may gradually become faster and more interoperable.

The key question is not which payment method will "win." A better question is whether the payment ecosystem supports choice, trust, resilience, and inclusion.

A healthy payment system does not force every user to use a single channel. It provides reliable options for different needs and conditions of patients.

## Why the world moved beyond cash

The world has moved beyond cash because modern economic life demands payment systems that can support remote commerce, mobile interaction, platform services, government transfers, faster settlement, better records, and broader access.

Cash remains useful, but it cannot fully support the demands of a digital economy.

Therefore, moving beyond cash is not just a story of technology. This is a story of changing economic organizations.

- ☐ Commerce became remote.
- ☐ Services have become app-based.
- ☐ Users expected speed.
  
- ☐ Governments require efficient disbursement.
- ☐ Merchants want better records.
- ☐ Platforms have embedded payments into daily life.
- ☐ Mobile phones have become financial interfaces.

Digital payments have grown because they match this new environment.

However, the fact that the world has moved beyond cash does not mean that cash has no role. This means that cash is no longer the only foundation of payment life.

### **Evidence Point**

Although cash use is declining in many digital economies, it has not disappeared. The key lesson is not the total replacement. It is changing everyday use. Cash is becoming less central for routine payments in many markets, while remaining important for fallback, privacy, budgeting, and inclusion.

## **Chapter takeaway**

The world has moved beyond cash because cash cannot fully support remote, mobile, data-rich, and real-time economic activity.

However, the world has not moved entirely away from cash because cash still provides resilience, privacy, simplicity, and inclusion for many users.

Therefore, the future of payments is not a simple march toward total cashlessness. It is a design challenge to build digital systems that are fast and convenient without becoming fragile, exclusionary, or overly intrusive.

Digital payments succeed when they expand the choice and trust of users. They fail when they remove alternatives before users and institutions are ready to do so.

## **Transition to Chapter 4**

Cash remains important, but digital systems now shape an increasing share of economic life. The next chapter examines developed economies, where digital payments do not usually solve first-access problems. Instead, they optimized already mature financial systems by making commerce faster, more integrated, data-rich, and convenient.

# **Chapter 4**

## **Digital Payments in Developed Economies: Efficiency and Integration**

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### **The optimization story**

In developed economies, digital payments mostly solve optimization problems rather than first-access problems.

Most people in these economies already had access to banks, cards, ATMs, formal accounts, and merchant acceptance networks before mobile wallets and instant payments became commonplace. This means that digital payments do not usually create the first doorway into the financial system. Instead, they made an already mature system faster, more convenient, more integrated, and data-rich.

This distinction is important.

In a low-infrastructure setting, digital payments may help someone receive money safely for the first time. In developed economies, digital payments often reduce checkout friction, support online commerce, improve reconciliation, enable subscription models, and make financial behavior easier to track.



The value is still significant. It is simply a different kind of value.

Digital payments in developed economies are best understood as efficient infrastructure. They sit quietly inside daily life, helping transactions occur with less visible effort.

## **From payment as event to payment as background**

In cash-based commerce, payments are visible events. A buyer withdraws money. A seller counts it. Change may be returned. The transaction has a physical dimension.

Digital payments reduce visibility.

- ☐ A card tap takes a few seconds.
- ☐ Mobile wallet payments may feel almost automatic.
- ☐ A subscription is renewed in the background.
- ☐ A ride-sharing trip ends without a separate payment.
- ☐ An online order is completed with stored credentials.
- ☐ Refunds are returned to the original payment method without physical handling.

This shift from visible to background payments is one of the defining features of developed market digitalization.

This changes consumer expectations. People expect payments to be fast, seamless, and integrated into the service. A slow checkout or failed payment feels like a service failure rather than merely a payment problem.

Therefore, payment quality has become a part of product quality.

A company may have a good product, but if the payment flow is confusing, unreliable, or slow, users may abandon the transaction. In digital commerce, payment is not merely a back-office function. This is part of the customer experience.

## **Contactless payments and everyday speed**

Contactless payments are a good example of how small design changes can create large behavioral shifts in consumers.

The difference between inserting a card, entering a PIN, waiting for approval, and simply tapping a card or phone may seem small. However, across millions of transactions, these seconds matter. They reduce queues, speed up public transportation, improve retail flow, and facilitate small purchases.

Contactless payments also helped normalize the idea that payments should require minimal effort. Once users become accustomed to tapping, slower methods feel outdated.

This is important in developed economies because many payment improvements do not dramatically change access. They are improvements in time, comfort, reliability and expectation.

These improvements may not appear revolutionary in a single transaction. However, on a large scale, they reshape daily commercial behavior.

## **E-commerce and the need for trusted remote payment**

Developed economies also saw digital payments grow because commerce moved online.

E-commerce requires trusted remote payments. Buyers and sellers do not meet face-to-face. The buyer must trust that the payment will be processed safely. The seller must trust that the funds will arrive. The payment system must manage identity, fraud, authorization, dispute rules, and settlements.

This has made payment infrastructure central to online retail.

Online checkout systems, stored cards, payment gateways, fraud detection, tokenization, digital wallets, and buy-now-pay-later services all emerged from the need to make remote commerce easier.

The user sees a simple checkout page. Behind it are multiple layers of payment design: card networks, acquiring banks, processors, fraud tools, risk rules and settlement arrangements.

In developed economies, this hidden infrastructure has helped e-commerce become ordinary. Without it, online retail would have remained limited and uncertain.

## **Embedded payments and invisible commerce**

Digital payments also enable embedded commerce.

Embedded payments occur when payments are directly built into a service or platform. Users do not experience payment as a separate step. Instead, payments become part of the overall service flow.

Examples include:

- ☐ ride-sharing apps
- ☐ food delivery platforms
- ☐ streaming subscriptions

- ☐ software-as-a-service tools
- ☐ app stores
- ☐ digital marketplaces
- ☐ automatic bill payments
- ☐ in-app purchases
- ☐ subscription boxes
- ☐ travel platforms

This type of payment design makes commerce feel smoother. It also changes how consumers think about their spending. When payment becomes invisible, the act of paying may feel less intentional.

This creates both value and risks.

This value is convenient. The risks include reduced awareness, subscription fatigue, unauthorized recurring charges, and spending that feels disconnected from money.

Therefore, developed economies face different types of payment challenges. The problem is not always a lack of access. Sometimes, the problem is too much seamlessness without sufficient user control.

## **Data-rich commerce**

One of the most important effects of digital payments in developed economies is the creation of structured transaction data for consumers.

Every digital payment can generate useful information.

- ☐ amount

- ☐ time
- ☐ merchant
- ☐ location
- ☐ channel
- ☐ payment instrument
- ☐ customer profile
- ☐ transaction category
- ☐ refund or dispute history
- ☐ spending pattern

This data helps households, firms, banks, platforms and governments.

For households, transaction data can support budgeting, alerts, spending summaries, fraud notifications and financial planning.

For merchants, it can support reconciliation, inventory planning, customer analytics, loyalty programs and sales forecasting.

For banks and fintech firms, it can support risk scoring, fraud detection, personalization, and customer engagement.

For governments, aggregated digital payment data can improve economic visibility, although it raises privacy and governance questions.

This data layer is one reason why digital payments should be understood as infrastructure. Digital payment is not only a money movement. This is also an information event.

In developed economies, the information value of payments is often as important as the payment itself is.

## **Operational efficiency for firms**

Digital payments improve firm operations in various ways.

First, they reduce cash handling requirements. Firms spend less time counting, storing, transporting, and securing their cash.

Second, they improve the reconciliation process. Digital records can be matched with invoices, receipts, orders, inventories, and accounting systems.

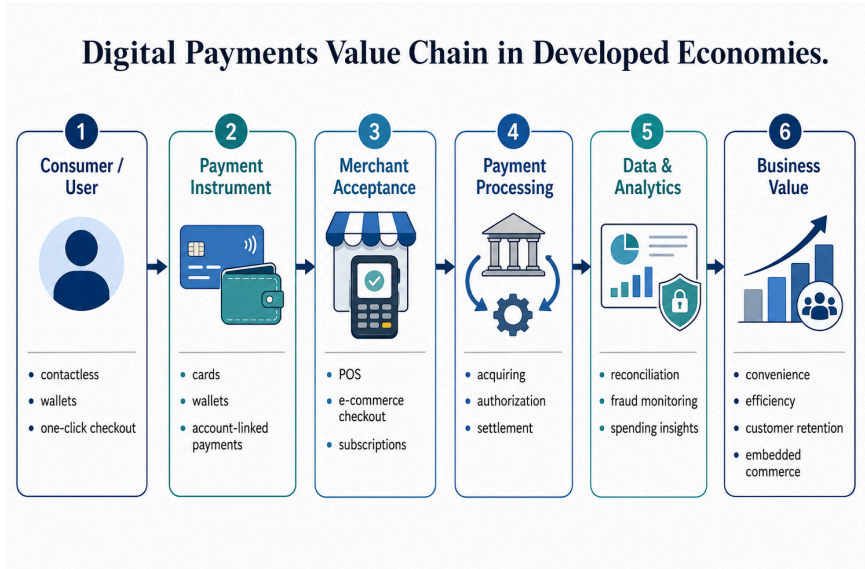
Third, they support automation. Recurring billing, subscription models, automatic refunds, and digital receipts reduce the amount of manual work.

Fourth, they improve the customer experience. Fast and reliable payments reduce friction during checkout.

Fifth, they support omnichannel commerce. A customer may browse online, buy in-store, return through an app, and receive a refund digitally. This requires an integrated payment system.

These efficiencies can be significant for large businesses. For small businesses, even simple digital records can improve their daily management.

In developed economies, payment modernization is often part of a broader business modernization.



*Figure 4.1: Digital payment value chain in developed economies. In developed economies, digital payments create value by connecting consumer convenience, merchant acceptance, payment processing, data analytics and business efficiency.*

*Source note: Author-created illustration based on the chapter's synthesis of digital payment value creation in developed economies.*

## **The United States: a card-centric digital transition**

The United States is a useful case study because its payment evolution has been strongly shaped by card infrastructure.

Credit and debit cards have become deeply embedded in the lives of American consumers. Card networks, issuing banks, merchant acquirers, rewards programs, chargeback rules, and consumer protection laws have created a powerful ecosystem.

As a result, many digital wallets in the United States have not replaced cards. They wrapped the cards in a better interface. A consumer using a phone wallet may still pay through a card network behind the scenes.

This shows how payment evolution is dependent on the path. New systems are often built on older systems rather than replacing them immediately.

The United States also illustrates why cash can decline without disappearing entirely. The Federal Reserve's consumer payment diary has shown that cash use has fallen over time, but cash remains relevant for some users, small-value transactions, and fallback situations.

Therefore, the American payment landscape is layered.

- ☐ cash remains present
- ☐ cards remain dominant
- ☐ digital wallets grow
- ☐ account-to-account options develop
- ☐ instant payment rails expand slowly
- ☐ embedded payments become more common

This layered structure is typical of many developed economies in the world. The future arrives on top of past.

## **Europe and the push for integration**

Many European economies show another developed market pattern: integration and standardization.

European payment modernization has often focused on cross-border usability, bank transfers, card acceptance, open



banking, and regulatory frameworks that promote competition and consumer protection.

The European context highlights an important point: developed economies do not only optimize convenience. They also attempt to manage the market structure.

Payment systems are not only about consumers and merchants. They involve banks, fintech firms, regulators, card networks, data rules, and competition policies.

Open banking and account-to-account payments are examples of broader shifts. They aim to create more competition and provide users with greater control over payment initiation and account data. However, they also require strong security, consent management, liability rules, and technical standards.

This again shows why architecture is important. A payment system is not only a product. This is a regulated ecosystem.

## **Sweden: cash-light, but not risk-free**

Sweden is often described as one of the world's most cash-light economies. In many everyday settings, digital payments are normal, and cash use has declined sharply.

This makes Sweden an important case study. This shows what happens when digital payments become deeply embedded in daily life.

The benefits are clear. Payments are fast, convenient, and widely accepted methods. Consumers and firms operate in highly digitized environments. Cash handling declines. Digital records improve convenience and efficiency of the process.

However, Sweden also shows that a cash-light society is not automatically risk-free.

If too many people depend on digital payments, outages, cyber incidents, banking disruptions, or telecommunications failures become increasingly serious. Individuals who struggle with digital systems may face exclusion. Older users, people with disabilities, rural populations, and those who prefer cash may find it harder to participate.

This is why Swedish policy discussions often return to the concepts of resilience and access. Even a highly digital society may still need cash or fallback payment options.

The Swedish lesson is simple: digital success creates new responsibilities for the government.

## **Efficiency can create dependence**

Digital payments reduce friction, but reduced friction can also create a dependence.

Consumers may depend on a few wallet providers, operating systems, platforms, and card networks. Merchants may depend on payment processors and marketplaces. Banks may rely on technology providers. Governments may depend on digital rails for public transportation.

This dependence is not always detrimental. Specialization and scale can improve reliability and enhance service quality. However, this concentration can create vulnerabilities.

If a major platform fails, millions of users may be affected. If one payment provider changes its fees, many merchants may have little bargaining power. If transaction data are concentrated in a few ecosystems, privacy and competition concerns grow.

Developed economies, therefore, face a mature payment challenge: how to preserve the efficiency of digital payments without creating fragile dependence on too few systems.

## **Merchant fees and bargaining power**

Merchant fees remain one of the most important issues in developed payment systems.

Card payments and digital payment services create value for merchants. They can increase sales, reduce cash handling, improve customer convenience, and support online shopping. However, they also impose costs.

Large merchants may negotiate better terms for their transactions. Small merchants often have less bargaining power than larger merchants. This can create tension between consumer convenience and merchant economics.

A payment system that is convenient for users may still be expensive for the merchants. If the cost is too high, merchants may raise prices, set minimum purchase amounts, discourage certain payment methods or absorb lower margins.

This is why payment policies in developed economies often involve competition, transparency, and fee regulation debates.

Efficiency must be measured from both sides of a transaction.

## **Privacy and consumer profiling**

Developed economies also face privacy challenges because digital payments are closely connected to data-driven commerce.

Digital transactions can reveal what a person bought, where, when, how often, and through which channel. Over time, these records can become highly informative.

This data may improve fraud detection and personalization processes. This may help users manage their money. However, it can also support profiling, targeted advertising, price discrimination, and broader surveillance.

The question is not whether payment data should be available. It must exist for digital systems to function properly. The questions are how much data should be collected, how long it should be stored, who can access it, and what users understand about its use.

In developed economies, where digital payments are deeply integrated into platforms, privacy is a central payment issue.

## **Resilience in a highly digital economy**

Resilience is sometimes less visible in developed economies because systems usually function well.

However, when systems fail, this dependence becomes evident.

Payment outages can disrupt retail, transportation, fuel purchases, online commerce, and essential services. Cyberattacks can reduce trust. A cloud failure can simultaneously affect multiple firms. Telecommunications outages can interrupt mobile payments. Banking system issues can prevent users from accessing funds.

This is why digital payment resilience is important. Mature systems require redundancy, incident response, fallback options, and clear communication.

Cash may remain a part of this resilience. Therefore, offline payment capabilities, multiple payment rails, backup processing, and regulatory continuity requirements are necessary.

A modern economy does not become resilient by eliminating alternatives. It becomes resilient by ensuring that payment options remain available under imperfect conditions.

## **The developed-economy lesson**

In developed economies, digital payments are not primarily about first access. They are related to efficiency, integration, data, and experience.

- ☐ They make payments more quickly.
- ☐ They make commerce smoother.
- ☐ They support e-commerce and embedded services.
- ☐ They improve record keeping and analytics.
- ☐ They reduce operational frictions.
- ☐ They create new business models.

However, they also create new concerns.

- ☐ merchant fees
- ☐ data privacy
- ☐ platform concentration
- ☐ behavioral overspending
- ☐ system outages
- ☐ exclusion of non-digital users

☐ dependence on a few infrastructures

This means that developed economies must evaluate digital payments not only by adoption rates but also by the quality of the ecosystem they create.

The strongest developed-market payment systems are not simply the most cashless systems. They combine convenience with competition, privacy, resilience, and user choice.

### **Key Insight**

In developed economies, the most important value of digital payments is often not first-time financial access. It optimizes already mature systems: faster checkout, better records, improved customer experience, and deeper integration with digital services.

## **Chapter takeaway**

In developed economies, digital payments mainly serve as an optimization infrastructure.

They make mature financial systems faster, more integrated, and data-rich. They support e-commerce, embedded finance, subscription models, platform services, and operational efficiencies.

However, optimization has trade-offs. A highly digital payment ecosystem can become dependent, concentrated,

privacy-invasive, or fragile if resilience and governance do not keep pace.

Therefore, the goal is not simply to remove cash or maximize digital transactions. The goal is to build payment ecosystems that are efficient, trustworthy, competitive and resilient.

## **Transition to Chapter 5**

Developed economies show how digital payments can optimize mature financial systems in three ways. However, in developing economies, the story is more transformational.

Digital payments can help countries bypass older infrastructure constraints, expand merchant acceptance, and bring millions of people and small businesses into more formal economic participation. The next section examines this leapfrogging effect.

## **Chapter 5**

# **Leapfrogging in Developing Economies: Public Rails and Merchant Acceptance**

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### **Leapfrogging is real, but it is not automatic**

Digital payments have had a particularly powerful impact on developing economies. In many of these countries, the story is not simply about making existing financial systems more convenient for consumers. It involves the use of digital tools to bypass older infrastructure constraints.

This process is often referred to as leapfrogging.

The idea is simple. A country does not always need to move through every historical stage of payment development in the same order as other countries. It may not be necessary to build dense branch networks, universal card ownership, or expensive merchant-terminal infrastructure before digital payments become useful. Instead, it may move from cash-heavy systems directly to mobile wallets, QR payments, instant transfers, and public digital rails.

However, leapfrogging should not be misunderstood. It is not magic. This does not occur simply because smartphones exist or a payment app is launched. It requires trust,



regulation, low-cost access, merchant acceptance, interoperability, customer support and reliable infrastructure.

Where these pieces come together, digital payments can do more than just replace cash. They can form a new layer of economic infrastructure.

## **Why developing economies needed a different path**

Traditional banking infrastructure often grows unevenly across regions.

Large cities may have bank branches, ATMs, card terminals, and formal merchant stores. Smaller towns, rural areas, informal workers, and microenterprises may remain less connected to the Internet. For many people, the problem is not that banking does not exist. However, formal finance is often inconvenient, costly, distant, or poorly suited to daily life.

A person may technically have a bank account but rarely uses it.

A merchant may want to accept digital payments but cannot afford a card terminal.

A household may receive cash income but have no easy way to save it safely.

Workers may need to send money home but must rely on informal channels.

A government may want to distribute support but struggle with leakage or last-mile delivery issues.

Digital payments can reduce friction.

They allow users to transact through their phones. They can reduce dependence on physical branch offices. They allow merchants to accept payments through QR codes. They can create transaction records. They can help governments send funds more directly to the needy. They can help small businesses participate in the digital marketplace.

This is why digital payments often differ in developing economies. They are not only a convenient layer. They may be a developmental layer.

## **From cash-heavy systems to mobile-first payments**

In many developing economies, the move toward digital payments did not follow the classic path seen in card-heavy developed markets.

The traditional path is as follows:

**Cash → Bank branches → Cards → Card terminals →  
Online payments → Mobile payments**

However, many developing economies have moved differently.

**Cash → Mobile phones → Wallets / QR payments /  
instant transfers → Digital economy**

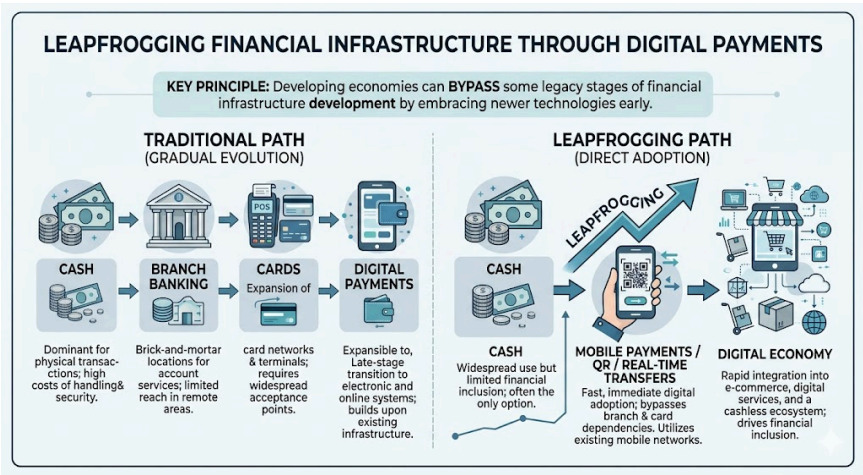
This is important because mobile phones have changed the economics of access. A branch is expensive. Card terminal networks are expensive. A mobile interface is cheaper to scale, especially when combined with digital identity, interoperable rails, agent networks, and QR-based merchant acceptance.

This does not imply that every user is automatically included. Phone ownership, data costs, digital literacy,

gender gaps, and documentation remain important. However, the mobile-first path creates a new possibility: financial participation can grow without waiting for every older infrastructure layer to mature.

This is the essence of leapfrogging.

**Figure 5.1: Leapfrogging Financial Infrastructure Through Digital Payments**



*Figure 5.1: Leapfrogging Financial Infrastructure through Digital Payments. Developing economies can move from cash-heavy systems directly toward mobile payments, QR code acceptance, and real-time digital rails without fully replicating the branch-and-card path followed by many developed economies.*

*Source note: Author-created illustration based on World Bank financial inclusion materials, GSMA mobile money reporting and BIS fast-payment research.*

## **The ecosystem behind digital payment growth**

Digital payments in developing economies depend on a broader ecosystem. No single actor can create adoption.

Consumers require a simple way to pay and receive money.

Merchants require affordable acceptance.

Banks require settlement and account infrastructure.

Fintech firms require interfaces and distribution.

Mobile network operators can provide connectivity and wallet channels.

Governments and regulators provide rules, standards, identity systems and public trust.

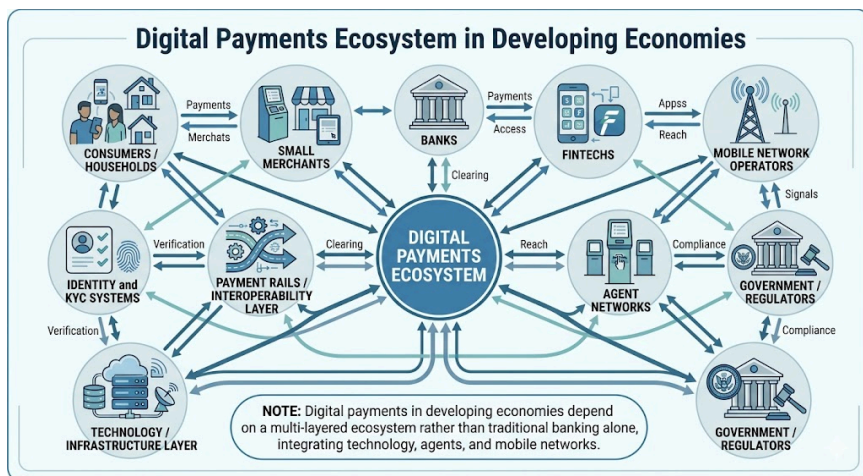
Agent networks may provide cash-in and cash-out access to customers.

Technology providers support APIs, cyber security, cloud systems, and interoperability.

Digital payments remain fragmented when these actors are disconnected. When they coordinate, adoption can grow rapidly.

This is why payment ecosystems are more important than individual apps. A good app cannot compensate for weak settlements, poor merchant acceptance, high fees, or lack of dispute support. A strong ecosystem reduces friction for everyone.

**Figure 5.2: Digital Payments Ecosystem in Developing Economies**



**Figure 5.2: Digital payment ecosystem in developing economies.** Digital payments in developing economies rely on a multilayered ecosystem involving consumers, merchants, banks, fintechs, mobile networks, regulators, agents, identity systems, and technology infrastructure.

**Source note:** Author-created illustration based on GSMA mobile money ecosystem reporting and World Bank financial inclusion data.

## Public rails and why they matter

One of the most important lessons from developing economies is the power of public or quasi-public payment systems.

A payment rail is the underlying system that allows payments to be processed. If every provider builds its own closed system, users and merchants may be fragmented across various apps and networks. This can slow adoption. It can also create dependency on a few dominant platforms such as ChatGPT.

Public or interoperable rails can partially solve this problem. They create a common foundation for banks,

fintechs, merchants, and users to connect. Private firms can still compete in terms of user experience, customer service, loyalty, analytics, and merchant tools. However, the basic ability to send and receive money is not locked inside a closed ecosystem.

This is why public infrastructure can support private innovations.

The public role does not always mean that the government runs every application. This often means that public institutions help create standards, settlement systems, interoperability rules, identity foundations, consumer protections, and reliable governance. Private actors then build services on top of them.

This balance is one of the most promising models for developing-economy payment transformation.

## **India's UPI: public infrastructure with private innovation**

India's Unified Payments Interface (UPI) is one of the clearest examples of digital payment infrastructure at scale.

The UPI facilitates real-time account-to-account payments across participating banks and applications. A user can send money to another person, pay a merchant, scan a QR code, or use an app built by a private provider, while the underlying rail remains interoperable.

The power of UPI lies in the combination of several factors.

- real-time transfers
- bank-account connectivity
- QR-based merchant acceptance

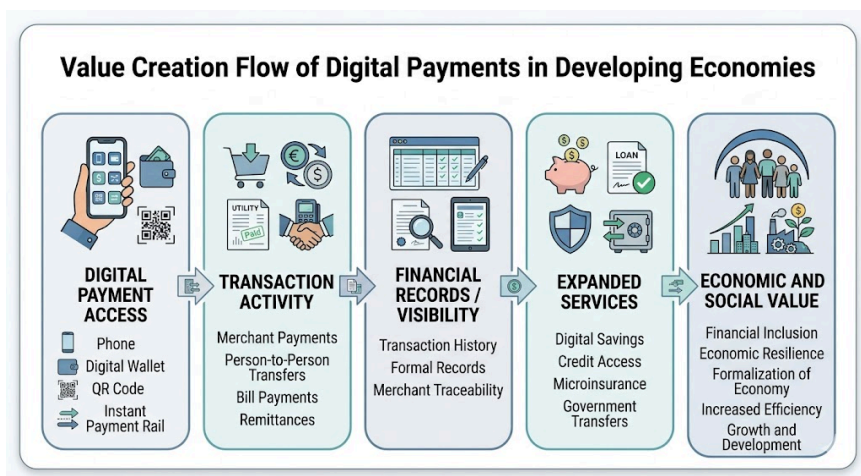
- interoperability across apps
- public digital infrastructure
- private app competition
- low-cost user experience
- large-scale adoption

This combination helped the UPI move beyond peer-to-peer transfers into everyday retail payments.

India shows that a public or quasi-public rail system can support intense private innovation. Payment apps can compete for users, but they do not need to build entirely separate payment networks from the ground up. This reduces coordination costs and helps spread adoption.

An important lesson is that UPI processed enormous transaction volumes. The deeper lesson is that interoperable infrastructure can make digital payments feel normal across households, small merchants and everyday commerce.

**Figure 5.3: Value Creation Flow of Digital Payments in Developing Economies**



*Figure 5.3 Value Creation Flow of Digital Payments in Developing Economies. Digital payment access can create a chain of value: transaction activity produces records, records support broader financial services, and broader participation contributes to inclusion, formalization, and growth.*

*Source note: Author-created conceptual model based on the World Bank, GSMA, and IMF financial inclusion research.*

## **UPI and the meaning of scale**

Scale matters because payment systems become more valuable when they are widely adopted.

A payment app that works for a small group is useful for this purpose. A payment rail that works across banks, apps, merchants, and everyday use cases becomes the infrastructure.

India's UPI demonstrates this transition well. The system evolved from a transfer mechanism to a daily payment layer. People use it to pay shops, send money to family, settle small bills, receive payments, and transact across many applications.

For small merchants, UPI is particularly important because QR-based acceptance reduces the need for expensive payment systems. Merchants can display QR codes and accept payments from customers using different apps. This lowers the barriers to digital acceptance.

For users, UPI reduces the need to carry cash for everyday transactions. For banks and fintechs, it creates a shared rail for innovation and development. The state supports broader digitization and financial visibility.



However, this does not mean that UPI is without challenges. Fraud, mistaken transfers, customer support gaps, system load, and overdependence on a shared rail all require attention. However, its scale shows how digital payments can become part of ordinary economic life.

Figure 5.4: UPI Transaction Value Growth in India

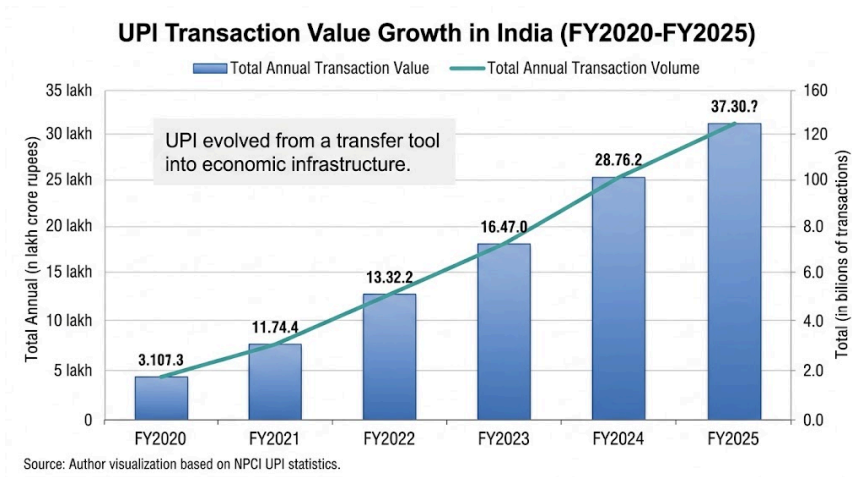
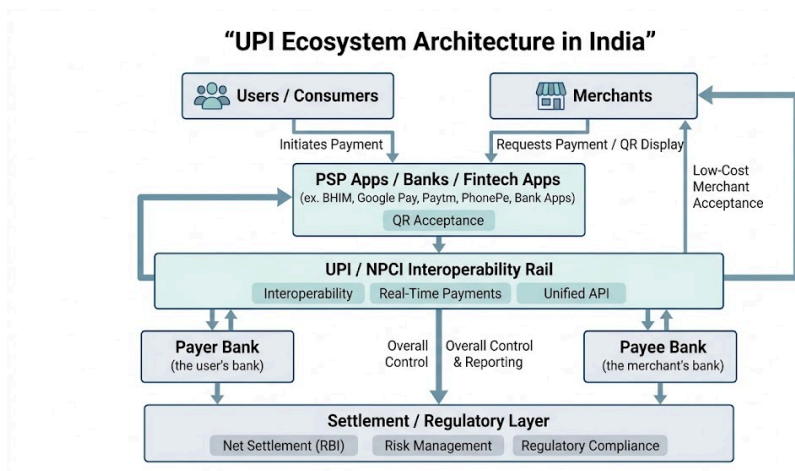


Figure 5.4: UPI Transaction Value Growth in India. The UPI’s growth reflects the transition of real-time account-to-account payments from a transfer tool into everyday economic infrastructure.

Source note: Author-created visualization based on the National Payments Corporation of India UPI statistics.

Figure 5.5: UPI Ecosystem Architecture in India



**Figure 5.5: UPI Ecosystem Architecture in India.** UPI connects users, merchants, payment apps, banks, and the NPCI interoperability rail, allowing private interfaces to operate on a shared payment platform.

**Source note:** Author-created illustration based on NPCI and Reserve Bank of India descriptions of UPI and the digital payment infrastructure.

## Brazil's Pix: central-bank-led instant payments

Brazil's Pix offers an important model.

Pix is a central bank-led instant payment system that has become deeply embedded in everyday use. Its significance lies not only in its speed but also in public design. The central bank created a payment infrastructure that could support person-to-person transfers, merchant payments, bill payments, and broader retail uses.

Pix shows that public payment infrastructure can become a practical alternative to legacy payment channels when it is easy to use, broadly accepted, and trustworthy.

The most important evidence is that Pix is not only used for large transfers. It is extensively used for small-value

everyday transactions. This means that it has entered ordinary economic behavior.

A system becomes transformative when people use it repeatedly in their normal lives, not only for occasional high-value transfers.

### **Pix and everyday retail use**

Brazil's Pix demonstrates how a public instant payment rail can reshape payment behaviors.

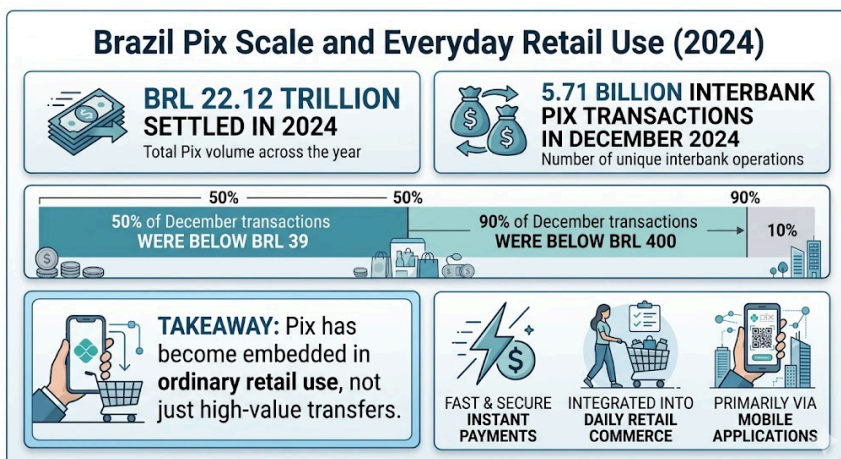
When low-value transactions dominate, it suggests that people are using the system for daily purchases, small merchant payments, personal transfers, and fulfilling routine obligations. This is important because public value comes from repeated everyday use.

A payment system used only by large institutions may be efficient, but it does not necessarily change the daily economic participation. A system used by households, merchants, and small businesses becomes part of the social fabric of the community.

Pix also highlights the importance of central bank credibility. When users and providers trust the rule-setting institution, adoption spreads faster. Public infrastructure can reduce uncertainty and create a shared foundation for the market participants.

The Brazilian case shows that public instant payments can become retail infrastructure and not just banking infrastructure.

### **Figure 5.6: Brazil Pix Scale and Everyday Retail Use**



*Figure 5.6: Brazil Pix Scale and Daily Retail Use. Pix illustrates how a central bank-led instant payment infrastructure can become embedded in daily retail behavior through high transaction volumes and broad low-value usage.*

**Source note:** Author-created visualization based on Banco Central do Brasil Instant Payments System (SPI) Annual Report 2024.

## Why small merchants matter

Small merchants are central to the success of digital payment systems in developing economies.

Consumers may adopt a payment app, but if small merchants do not accept it, digital payments remain limited to larger merchants. Daily commerce occurs in shops, markets, stalls, transportation services, repair services, food vendors, and local businesses. Merchant acceptance determines whether digital payments become a habit.

For small merchants, digital payments can create important benefits.

- less need to handle cash

- faster or clearer settlement
- ability to accept remote payments
- better business records
- improved customer convenience
- possible creditworthiness through transaction history
- easier integration into digital marketplaces

However, the risks are also real.

Merchants may face fees, fraud, settlement uncertainty, platform dependence, tax visibility and customer disputes. Some may worry that digital records will expose them to new obligations without sufficient benefits.

Therefore, merchant digitization requires careful design. Low-cost acceptance, transparent rules, simple onboarding, and reliable settlements are essential.

Digital payments become inclusive only when both users and merchants can participate on equitable terms.

## **Digital inflows as a gateway to broader inclusion**

A common mistake is to think of digital payments only as outgoing payments, that is, people buying goods or sending money.

However, receiving money digitally can be equally important.

When wages, government transfers, pensions, remittances, or business payments arrive digitally, users have a reason to keep and use their accounts or wallets. This can encourage savings, bill payments, transfers, and future financial activities.

Therefore, digital inflows can become a gateway to broader inclusion.

A person who receives money digitally may begin to trust their account. Merchants who receive digital payments may begin to see value in records. A government that sends transfers digitally may reduce leakage and improve the delivery. Lenders may later use transaction histories to evaluate creditworthiness.

This is why payment systems matter beyond the payment itself. They can create the first repeated interactions between people and formal financial services.

## **Women, workers, and control over money**

Digital payments can also affect household and labor dynamics of the economy.

For women, migrant workers, informal earners, and small entrepreneurs, the direct receipt of money can increase control. Digital transfers may be more private, portable, and secure than cash handed through intermediaries.

This can support autonomy in the learning process. It can also create transaction records that help with savings, credits, or business visibility.

However, digital payments do not automatically empower women.

A woman may have a wallet but not full control of her phone. A worker may receive money digitally but may face fees or pressure to cash out. Migrants may use remittance channels but still incur high costs.

However, the design of digital payments can influence control. Direct payments, privacy, low fees, and accessible

interfaces can help users manage their money more independently.

Inclusion is not only about access to resources. It is also about control.

## **Public transfers and state capacity**

Governments in developing economies often support digital payments because they improve public delivery systems in these countries.

Digital rails can help distribute welfare payments, pensions, subsidies, student support, emergency relief, tax refunds, and public wage payments. Digital transfers can reduce physical handling, improve audit trails and lower delivery costs.

This can increase the state's capacity. A government that can move money directly and reliably has a stronger public policy tool.

However, public transfers must be designed carefully to avoid such problems. If beneficiaries face account access problems, biometric failures, poor connectivity, agent shortages, or confusing grievance systems, digital delivery can lead to exclusion.

A digital transfer is successful only when the intended recipient can receive and use the money.

This is especially important in low-income and rural settings, where the final step of access may be the most difficult.

## **Formalization and the visibility trade-off**

Digital payments can increase the visibility of economic activities.

This can be beneficial for small businesses. Transaction records may support bookkeeping, access to credit and insurance, and participation in larger supply chains. For governments, visibility may support tax administration, policy design, and anti-fraud initiatives.

However, visibility also raises concerns.

Informal workers and small merchants may fear new compliance burdens, taxation, surveillance or loss of flexibility. Users may worry that every payment is traceable. Platforms may use transaction data for commercial advantages.

Therefore, formalization is not automatically positive for every actor. It depends on whether visibility leads to fair opportunities or only new burdens.

A well-designed digital payment system should help small participants gradually grow into formality, not punish them abruptly for becoming visible.

## **The risks of shallow inclusion**

Not all digital inclusion is profound.

- A person may have an account but not use it for various reasons.
- Merchants may only reluctantly accept digital payments.
- A user may receive money digitally but immediately cash out.



- A household may have access but may lack confidence.
- Rural users may depend on agents who are unreliable or expensive.
- A consumer may be included in the payment system but is exposed to fraud without recourse.

This is a shallow inclusion.

Deep inclusion means that users can transact repeatedly, safely, affordably, and confidently. This means that merchants can accept payments without harming their margins. This means that users can resolve problems. This means that digital payments are connected to broader financial participation, not just one-time registration.

Therefore, developing economies should measure more than account numbers and transaction volumes. They should measure the quality of usage, merchant breadth, user trust, complaint resolution, fraud rates, and affordability.

## **The importance of digital literacy and trust**

Digital payment adoption depends on the trust of users.

Users must trust that the money will arrive. They must trust the legitimacy of the app. They must trust that mistakes can be corrected. They must understand how to avoid such scams. They must feel confident in using the system repeatedly.

Therefore, digital literacy is not a minor issue. It is central to the quality of infrastructure.

A poorly understood system creates anxiety and risks. Users may send money to the wrong recipient, respond to

scams, share passwords, misunderstand fees, or avoid useful services because they fear making mistakes.

Education, clear interfaces, local language support, and visible resource mechanisms are essential.

Trust is built not only through technology but also through repeated successful use.

## **What developing economies teach the world**

Developing economies have become laboratories for payment innovation.

The findings indicate that the growth of digital payments does not necessarily need to follow the card-centric trajectory observed in developed markets. They demonstrate that a mobile-first design approach can enhance accessibility.

Furthermore, they illustrate that public infrastructure can facilitate private sector innovation. The acceptance of QR codes is shown to enable small merchants to participate in digital commerce.

Additionally, digital inflows are highlighted as a means to connect individuals to a wider range of financial services.

However, they also show that inclusion is fragile.

Connectivity gaps, fraud, weak grievance systems, gender barriers, literacy gaps, and merchant economics can limit the promise of digital payment systems.

It's fascinating how digital payment systems are evolving differently from the traditional card-centric models seen in developed countries. By prioritizing mobile-first designs, these systems are broadening access to financial services. Public infrastructure is proving to be a solid foundation for private sector innovation.

The adoption of QR codes is enabling small businesses to participate in the digital economy. Moreover, digital payment inflows are effectively linking individuals to a wider range of financial services.

**Table 5.1: Digital Payment Value by Country Context**

| <b>Context</b>             | <b>Primary Role</b>      | <b>Typical Rails</b>                              | <b>Main Gain / Main Risk</b>   |
|----------------------------|--------------------------|---|--|
| Developed economies        | Optimization             | Cards, wallets, fast account-to-account payments  | Gains include faster checkout, better records, and omnichannel commerce. Risk: Concentration, merchant fees, and resilience gaps.  |
| Developing economies       | Access plus optimization | Fast public rails, QR acceptance, wallets         | Gain: Leapfrogging, merchant inclusion, lower friction. Risks include fraud, literacy gaps, and uneven connectivity.               |
| Low-infrastructure regions | First practical access   | Mobile money, assisted onboarding, agent networks | Gains: Safer transfers, remittances, and economic visibility. Risks: shared devices, cash-out dependence, and exclusion by design. |

**Key Insight:**

Leapfrogging is not simply skipping older technology. It is about building payment infrastructure that matches local realities: mobile access, small merchants, public rails, low-cost acceptance, and daily trust.

**Chapter takeaway**

In developing economies, digital payments often do more than just optimize existing financial systems. They can help build new structures.

They can reduce dependence on branches, cards, and expensive merchant hardware systems. They can connect users and small merchants through mobile phones, QR codes, instant payment rails and public infrastructure. They can support financial inclusion, public transfers, small business records, and broader economic participation.

However, leapfrogging is not automatic. It depends on design.

The strongest systems combine public railways, private innovation, low-cost merchant acceptance, digital literacy, consumer protection, and reliable governance.

Developing economies show that digital payments become transformative not when they are merely digital but when they become useful, trusted, and affordable in ordinary life.

## **Transition to Chapter 6**

Developing economies illustrate how the integration of public rail systems and the acceptance of QR codes can significantly enhance payment inclusion. In contexts characterized by limited infrastructure, the narrative shifts towards the periphery of formal financial systems.

In such environments, digital payments may transcend mere convenience or merchant efficiency, potentially serving as the initial viable method for individuals to store value, receive remittances, manage financial risk, and engage in economic activities. Chapter 6 explores the dynamics of mobile money, remittances, and financial access in these low-infrastructure settings.

## Chapter 6

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### Access at the Edge: Mobile Money, Remittances, and Low-Infrastructure Settings

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#### When digital payments mean first access

In low-infrastructure settings, digital payments often mean something deeper than mere convenience.

For many users, the issue is not whether payments can be made faster than before. The issue is whether safe, affordable, and reliable payment methods are available. A rural worker may need to send money to their family. A small trader may need to receive payments from a buyer in another town. Migrant households may depend on remittances. Farmers may need to receive funds after selling their produce. A woman may want more direct control over her income. Displaced persons may require emergency support.

In these situations, digital payments can become the first point of entry into financial life.

This is why the language used for developed economies is often too specific. In a mature banking system, digital payments may improve checkout speed and online

convenience. In low-infrastructure settings, they may help users move beyond unsafe cash handling, costly travel, informal intermediaries and weak financial visibility.

Therefore, digital payments at the edge are not only about technology. They are about access, dignity, resilience and practical participation.

### **The meaning of low infrastructure**

Low-infrastructure settings are not identical. Some are rural areas with weak branch banking systems. Some are informal urban settlements. Some regions have limited connectivity. These include migrant communities, displaced populations, and households without stable identification. Some markets have women with less access to phones or formal accounts than men.

What these settings often share is a constraint.

- ☐ limited bank branches
- ☐ expensive travel to financial access points
- ☐ weak mobile or internet coverage
- ☐ shared phone use
- ☐ limited formal identity documents
- ☐ low literacy or low digital confidence
- ☐ high reliance on cash
- ☐ dependence on informal agents
- ☐ limited consumer protection

☐ high sensitivity to small fees

A payment system designed for an ideal smartphone user may not function well under these conditions.

Therefore, the low-infrastructure payment design must begin with real user constraints. The best systems are not necessarily the most advanced systems. They remain usable when the network is weak, the device is basic, the user is uncertain, and the financial margin for error is small.

### **Mobile money as first-entry finance**

Mobile money is one of the most important payment innovations in low-infrastructure settings.

Unlike mobile wallets in highly banked economies, mobile money does not assume that the user already has a bank account or card. Instead, it allows users to store value, send money, receive money, pay bills, and cash in or cash out through agents.

This makes mobile money more than just a payment product. It can operate as a first-entry financial infrastructure.

A person may use mobile money before opening a bank account, for example. A household may receive remittances through a phone before using formal savings products, for example. A small seller may accept mobile money before using a point of sale terminal. Workers may receive wages through a wallet before entering the banking system.

The importance of mobile money is that it starts from what people already have: often a phone, a SIM, a local agent, and a need to move money safely.



This is different from asking people to adapt immediately to branch-led, document-heavy, and card-based systems.

## Why agents matter

Mobile money systems often depend on agent networks to function.

An agent may be a shopkeeper, kiosk operator, mobile money outlet, or a local service provider. Agents help users convert cash into digital value and vice versa. They may also support registration, balance checks, bill payments, and basic troubleshooting processes.

Agents are important because low-infrastructure settings are rarely fully digitized. Many users still earn, spend, and store their value in cash. The agent connects the cash and digital worlds.

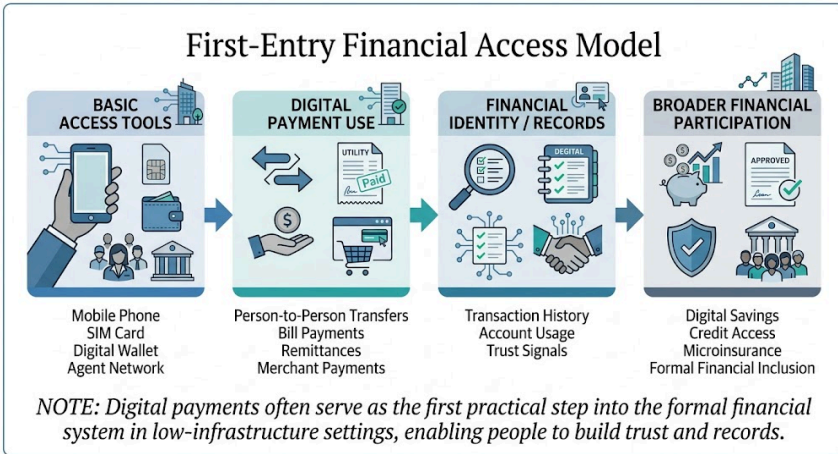
This makes the agent network a critical component of the payment infrastructure.

If agents are nearby, liquid, trustworthy, and affordable, mobile money becomes more useful. The system becomes weaker if the agents are distant, unreliable, expensive, or poorly supervised.

Agent liquidity is particularly important. Users may receive money digitally but still need cash for local purchases. If the agent cannot provide cash-out, the value of the system declines. Similarly, if users cannot easily deposit cash, they may not be able to participate.

Therefore, the agent is not a temporary workaround. In many settings, agents are the human face of digital finance.

**Figure 6.1: First-Entry Financial Access Model**



*Figure 6.1 First-Entry Financial Access Model. In low-infrastructure settings, digital payments often act as the first practical step toward broader financial participation by connecting basic access tools, payment usage, transaction records, and financial services.*

*Source note: Author-created illustration based on World Bank Global Findex materials and GSMA mobile money reports.*

## Remittances as household infrastructure

Remittances are among the most important use cases for digital payments in low-infrastructure countries.

For many households, money sent by a family member working in another city or country is not an occasional support. This is part of daily survival. Remittances may be used to pay for food, school fees, medicine, rent, farm inputs, debt repayment, or emergency needs.

Digital remittance channels can reduce travel, improve speed, lower uncertainty, and create better records of transactions. A person who previously had to travel to a cash pickup point may now receive money through a phone.

Families may receive urgent support more quickly. The sender can track the transaction more easily.

Even small cost reductions are significant. For low-income households, a few percentage points in fees can mean more money for their basic needs.

This is why remittance pricing is not only a technical issue. This is a household welfare issue.

### **Domestic transfers and risk sharing**

Digital payments also help households to share risks within a country.

A family member in a city may send money to their relatives in a village. Workers may support their parents. A group may contribute to the medical expenses. A friend may send emergency funds to the victim. A buyer can pay a rural seller without traveling.

These domestic transfers can help strengthen informal safety nets.

In cash-based systems, sending money often requires travel, trusted intermediaries, bus drivers, informal couriers or in-person visits. Although these methods may be effective, they can be slow, risky, or costly.

Digital transfers reduce this distance. They provide faster and more traceable support. They can help households to respond to shocks.

This resilience function is one reason mobile money has been important in countries such as Kenya. The ability to receive help quickly can change how households manage their emergencies.

## Kenya and the welfare effect of mobile money

Kenya's M-PESA is one of the most widely studied mobile money services.

Its importance lies not only in its adoption but also in the way it has changed household behavior. Mobile money has made it easier for people to send and receive funds across distances. This helps households manage shocks and improves access to informal support networks.

Research by Suri and Jack found that access to mobile money in Kenya had measurable welfare effects, including increased consumption and reductions in extreme poverty, with especially important effects for female-headed households.

The lesson is that not every mobile money system will produce the same result. Local conditions are important. Agent density, pricing, trust, regulation, and social networks shape the outcomes.

However, Kenya shows that payment access can affect more than just payment convenience. This can change household resilience.

When money can move quickly and safely across distances, families can respond differently to crises, opportunities, and needs.

## Women and control over money

Digital payments can affect women's financial participation, but the effects depend on the design and context.

In some households, direct digital receipt of money can improve privacy and control of the money flow. Wages, transfers, remittances, or business payments that arrive in a

woman's account or wallet may be easier to manage than cash handled through intermediaries.

This can support autonomy in the learning process. It can also create transaction records that help with savings, credits, or business visibility.

However, digital payments do not automatically empower women.

- ☐ A woman may not own a phone.
- ☐ A spouse or relative may control the SIM card.
- ☐ A digital account may be registered under someone else's name.
- ☐ Social norms may limit the independent use of these devices.
- ☐ Low literacy or fear of mistakes may reduce the confidence of the user.
- ☐ The agents may be distant or unsafe.
- ☐ Fees may discourage the use of these services.

This implies that gender-sensitive payment design is important.

Systems should consider phone access, privacy, agent safety, language, digital literacy, grievance channels, and control over users' credentials. Without these, digital payments may reproduce existing inequalities rather than reducing them.

## **Humanitarian and emergency payments**

Digital payments are increasingly important in humanitarian and emergency situations.

When governments or aid organizations need to deliver support quickly, digital transfers can be faster and more easily traceable than physical cash distribution. They can reduce handling risks and allow recipients to choose how to spend their funds.

This is especially useful during disasters, displacement, pandemics, and local economic shocks.

However, digital humanitarian payments must be carefully designed. If recipients lack phones, identity documents, connectivity, agent access, or knowledge of how to use the system, digital delivery can exclude people most in need.

Therefore, emergency payment systems must balance speed and accessibility.

A digital aid transfer is only successful if the intended recipient can access and use the money.

### **The cash-out problem**

One of the most important challenges in low-infrastructure digital payments is their cash-out dependence.

A user may receive money digitally but still needs cash because local merchants do not accept digital payments. In this case, the payment system is only partially digital. The user must still convert the value into cash.

Cash-out dependence incurs costs and risks.

- ☐ Users may pay a withdrawal fee.
- ☐ Agents may also lack liquidity.
- ☐ Users may travel to access cash, for example.
- ☐ Cash may be stolen after it is withdrawn.
- ☐ The agent pricing may be unclear.

Women and vulnerable users may face safety concerns. This does not mean that mobile money has failed. This means that the surrounding acceptance ecosystem is still incomplete.

As more merchants accept digital payments, users may need to cash out less frequently. However, until acceptance is broad, cash-in and cash-out remain essential.

A strong payment system must support both digital value and cash conversion during the transition period.

### **Shared phones and identity challenges**

Many digital payment systems assume one person, one phone, one account, and one identity for each user.

In low-infrastructure settings, the reality may be more complicated.

A household may share a single phone. A woman may use her spouse's device. A worker may change their SIM card. Users may have inconsistent identity documents. Migrants may not have locally accepted proof of identity. A person may forget PINs or depend on someone else to navigate the menus.

These realities affect privacy, security, and user control.

If a phone is shared, payment notifications may not be private enough. If the SIM is controlled by someone else, the account control may be weak. If identity documents are limited, onboarding may be difficult. If credentials are lost, account recovery may be difficult.

This demonstrates why inclusion requires more than access to a device. This requires a design that reflects how people live.

## Digital literacy and confidence

Digital literacy is a core aspect of payment inclusion.

Users must understand how to send money, confirm recipients, protect their PINs, identify scams, check balances, and seek help. Without this confidence, adoption may remain low.

The fear of making mistakes can be a serious barrier. For low-income users, sending money to the wrong person or losing funds to fraud can be devastating. The margin of error was small.

Good systems reduce anxiety. They use clear language, confirmation screens, recognizable recipient names, simple receipts, local-language support, and accessible customer service.

Educational campaigns can help, but design should not depend entirely on user training. The best systems make safe behaviors easier.

## Merchant acceptance at the edge

For digital payments to be useful in low-infrastructure settings, local merchants must accept them.

If users can receive money digitally but cannot spend it digitally, the system is incomplete. They will continue to cash out frequently.

Merchant acceptance depends on cost, trust, ease of use, settlement reliability and customer demand. A small merchant may accept digital payments if the process is simple, the fees are low, and the funds are usable quickly.



Agent networks may help with early adoption, but long-term inclusion requires broader acceptance among local shops, transportation providers, service providers, and informal sellers.

Therefore, payments and commerce must develop together. Financial access is stronger when users can both receive and spend money digitally.

## **The dignity dimension**

Digital payments can also affect dignity.

Standing in a long line to receive cash, depending on intermediaries, hiding money physically, or traveling far to send funds can be costly and stressful for the elderly. A reliable digital transfer can reduce this burden.

Simultaneously, digital systems can create new forms of dependency. A user may depend on an agent, platform, phone, or rule that they do not understand. If the support fails, the user may feel powerless.

Dignity in digital payments means that users can participate without confusion, fear, or humiliation. They can understand the system. They can also correct mistakes. They can access this support. They can choose how to spend their money.

This is why the user experience is not superficial. This is part of the inclusion criteria.

## **When inclusion becomes surveillance**

There is also a risk that inclusion will become surveillance.

Digital payments make users visible. Visibility can help create financial history, improve service delivery, and reduce

fraud. However, it can also expose users to monitoring, commercial targeting, or institutional control.

This trade-off can be particularly sensitive for low-income users. They may gain access but lose their privacy. They may become visible to lenders, tax authorities, platforms, or government systems without fully understanding these implications.

This does not imply that digital inclusion should be rejected. This means that inclusion should come with data protection, transparency, user rights, and proportional governance.

A person should not have to surrender excessive privacy to participate in basic economic life.

## **The role of regulation**

Regulation is essential for low-infrastructure payment systems.

Users require protection from fraud, unclear fees, agent misconduct, system failures, and abusive data use. Agents require supervision. Providers require capital, liquidity, cybersecurity, and consumer protection standards. Interoperability may require public support. Pricing may require more transparency.

Regulators must balance innovation and safety issues. Overly strict rules may limit access. Weak rules can expose vulnerable users to harm and abuse.

Good regulation focuses on proportional risks. It allows useful services to grow while ensuring that users have basic protection, clear information, and recourse to the law.

In low-infrastructure settings, trust is tenuous. Regulation helps turn trust from personal hope into a system feature.

## Why low-infrastructure settings teach everyone

Low-infrastructure settings provide lessons that apply everywhere.

They showed that payment systems must function under imperfect conditions. They remind us that users are not always digitally confident. They show why cash interoperability is still important. They show why customer support and agent networks are not secondary issues. They show why small fees can be large barriers to participation. They show that resilience is not just a technical issue.

Many payment systems are designed for the most profitable or easiest-to-use systems. Low-infrastructure settings force designers to ask more difficult questions.

- ☐ Can the system function with weak connectivity?
- ☐ Can it work for low-literacy users?
- ☐ Can it work with basic mobile phones?
- ☐ Can it function when agents are required?
- ☐ Can it work when users cannot afford to make mistakes?
- ☐ Can it function without exploiting data?

If the answer is yes, the system is stronger for all.

### Fact Snapshot

Mobile money has become a major component of the global payment infrastructure. This shows that digital financial access can grow even when traditional banking infrastructure is limited. However, registered accounts alone do not prove deep inclusion. Real inclusion depends on active use, agent reliability, affordability, confidence, and resources.

## Chapter takeaway

In low-infrastructure settings, digital payments are often the first financial infrastructure.

They can help users store value, receive remittances, send domestic transfers, manage shocks, and build transaction records. Mobile money and agent networks are especially important because they connect digital systems to cash-based realities of the poor.

But access is fragile. Shared phones, weak connectivity, cash-out dependence, limited literacy, agent reliability, gender gaps, fraud, and weak recourse can limit inclusion.

The strongest payment systems at the edge are not the most futuristic systems. They remain usable when conditions are imperfect, and the user has very little room for error.

## Transition to Chapter 7

Mobile money and remittances illustrate how digital payments provide initial access to formal finance. Beyond access, digital payments benefit households, firms, and governments through time savings, better records, safer transfers, public delivery, and economic transparency. The next chapter explores how digital payment value is created and distributed.

## Chapter 7

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### How Value Is Created for Households, Firms, and Governments

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#### Value should be measured beyond transaction counts

Digital payment systems are often judged based on transaction volume and value. These numbers matter. They show adoption, scale, and system activities. However, they do not fully explain whether a payment system creates meaningful value.

A system may process millions of transactions and still fail to improve the daily lives of ordinary users. It may move large values and remain useful only to a narrow group. It may appear successful in statistics while leaving merchants burdened by fees, users exposed to fraud, or vulnerable groups excluded.

The real question is not simply

How many payments were made?

The better question is:

What changed because these payments became digital? Digital payments create value by saving time, reducing risk, improving records, expanding access, supporting business activity, strengthening public delivery, and facilitating economic participation. This value is created differently for different actors.

Households gain convenience, safety, and access to these services.

Firms gain efficiency, records, and customer reach through digitalization.

Governments gain better delivery rails and economic visibility through this.

A wider economy gains lower friction, better coordination, and stronger participation.

This chapter explains how these forms of value are created and why they are not always distributed evenly.

## **For households: time, convenience, and control**

For households, the most visible value of digital payment is convenience.

People can pay their bills without traveling. They can send money instantly. They can directly receive wages, transfers, or remittances. They can shop online. They can also track payments. They can avoid carrying large amounts of cash in this manner.

These everyday improvements are significant because payments are repeated activities. A small reduction in effort becomes significant when it is repeated across weeks, months, and years.

Convenience is sometimes dismissed as a shallow benefit, but it can be important in financial life. A person who does

not need to travel to pay a bill saves time and transportation costs. A worker who receives wages digitally may avoid waiting in line or carrying cash. Families that receive money instantly during emergencies may manage risks better.

Digital payments can also increase consumer control. Users can view their balances, receive alerts, check transaction histories, and verify receipts. This creates a clearer relationship with money than cash-only systems often allow.

However, the control depends on the design. If users do not understand fees, cannot read transaction messages, or cannot resolve mistakes, digital payments may reduce their control rather than increase it.

## **For households: safety and resilience**

Digital payments can reduce the risks associated with cash.

Cash can be lost, stolen, damaged, or physically taken away. This risk is real for wage earners, small traders, and households that store value at home. Digital payments can reduce the need to carry or store large amounts of cash.

They can also support household resilience. When money can move quickly across distances, families can respond more quickly to emergencies. A relative can send support after an illness, job loss, crop failure, or sudden expense. Migrants can send remittances. Governments can distribute relief.

This ability to receive money quickly can change how households manage economic shocks.

However, digital payments introduce new forms of risk. Users may face scams, mistaken transfers, account

lockouts, password losses, or poor customer support. Cash theft may be immediately visible. Digital fraud may be confusing and difficult to resolve.

Therefore, safety is not guaranteed. Digital payment systems create household value only when they combine convenience and protection.

### **For households: inclusion and financial pathways**

Digital payments can also create value by connecting users to a broader range of financial services.

A person who receives money digitally may begin to use an account more actively. Transaction history may help build trust in providers. Repeated use may support savings, credit assessments, insurance, or access to government services.

This is especially important for people who were previously outside formal finance.

For example, a worker receiving wages digitally may begin saving small amounts of money. A small vendor receiving digital payments may create a business record of the transaction. A remittance recipient may begin using a wallet for bill payments or transfers. Government-benefit recipients may gain a more reliable financial access point.

Payments often become the first repeated interaction with formal financing. This is why they are important. People may not begin financial inclusion by applying for credits or insurance. They often begin by receiving or sending money to their families.

Digital payments create a doorway to the future. Whether users walk through that doorway into broader financial



participation depends on affordability, trust, literacy, product design, and consumer protection issues.

### **For firms: lower cash handling and smoother operations**

For firms, one of the most immediate benefits of digital payment is reduced cash handling.

Cash requires counting, storing, transporting, securing, and reconciling. These activities consume time and pose risks. Digital payments can reduce this burden.

Merchants can receive payments directly into their accounts or wallets. Businesses can match transactions with sales records. Retailers can reduce end-of-day cash counting. Companies can automate invoicing and settlements. Online sellers can accept payments from customers without meeting them.

For small businesses, these operational improvements may be modest but are meaningful. For larger businesses, they can become central to their efficiency.

Digital payments also improve the consistency of the process. Cash payments depend on physical handling and manual recording processes. Digital payments create automatic records that can be used for accounting, inventory management, taxes, and customer service.

The operational value is one reason businesses adopt digital payments, even when fees exist. The payment cost may be offset by time savings, reduced error rates, and improved sales.

## **For firms: better records and business visibility**

Digital payments create business records.

This can be transformative for small firms. Many small merchants operate with limited formal documentation requirements. Sales may be tracked informally or not tracked at all. This makes it difficult to analyze performance, apply for credit, manage inventories, or prove income.

Digital transactions can create records of business activities.

- Merchants can observe daily sales patterns.

- Shops can identify repeat customers.

- The service provider can track incoming payments.

- Lenders may use transaction history to assess cash flow.

- Businesses can reconcile payments with orders.

This improves the visibility.

Visibility can help firms grow, but it can also create tensions. Some small merchants may worry that digital records will increase tax exposure or compliance burdens. Others may fear platform dependence or the loss of bargaining power.

Therefore, the value of records depends on whether they create opportunities or only new pressure.

Digital payments should help small businesses become more capable rather than simply more visible.

## **For firms: customer reach and digital commerce**

Digital payments also expand customer reach.

A cash-only merchant can sell mainly to customers who are physically present and carrying cash with them. A digitally enabled merchant can receive remote payments, sell through online channels, participate in delivery platforms,

and accept payments from customers using different instruments.

This is important for small businesses.

- ☐ Local sellers may accept QR payments.
- ☐ Home-based entrepreneurs may receive wallet transfers.
- ☐ A small retailer may sell products through social media.
- ☐ A service provider may collect payments before the delivery.
- ☐ Rural producers may receive payments from distant buyers.

Digital payments reduce the distance between buyers and sellers.

They also support the trust in remote commerce. Customers may be more willing to buy if payment confirmation is immediate. A merchant may be more willing to deliver goods if the funds are confirmed.

This is one reason why digital payments support broader digital economy participation. They are not only a payment method. They are access tools for digital markets.

### **For governments: public delivery and administrative efficiency**

Governments create and distribute large amounts of money.

They pay pensions, salaries, subsidies, tax refunds, student support, social benefits, disaster relief, and public procurement invoices. In cash-heavy systems, these flows can be costly, slow, and challenging to audit.

Digital payments can improve public service delivery.

Funds can be sent directly to recipients. Records can be maintained in this manner. Leakage may be reduced. The delivery time can be improved. Emergency support can be expedited. Administrative costs may decrease.

However, this does not mean that digital government payments always work smoothly. Beneficiaries may face onboarding problems, identity mismatches, connectivity issues, agent shortages, and account access failures. Digital delivery can exclude people if the last mile is poorly designed.

However, when designed well, digital payment rails become a powerful tool for public administration.

A government that can move money accurately, quickly, and transparently has a stronger capacity to implement policies.

### **For governments: visibility and formalization**

Digital payments also increase economic visibility.

Cash-heavy economies are difficult to measure. Informal transactions leave limited records behind. This can make tax administration, policy design, fraud prevention, and economic planning more difficult.

Digital payments create activity traces. These traces can help governments understand economic flows, design better policies, reduce leakage, and improve accountability.

However, visibility is not automatically good for everyone.

Small merchants may fear sudden tax pressures. Informal workers may worry about being scrutinized. Citizens may be concerned about surveillance. Payment data can become politically sensitive if the governance is weak.

Therefore, formalization should be gradual, fair, and linked to benefits. If digital visibility helps small businesses access credit, insurance, or public support, it may be welcomed. If it only increases compliance burdens, adoption may be resisted.

The best digital payment systems connect visibility and opportunity.

### **For the wider economy: lower friction and higher coordination**

At the economy-wide level, digital payments reduce transaction frictions.

When money moves faster and more reliably, markets function better. Buyers and sellers can coordinate more easily. Firms can manage their cash flows. Workers can receive wages from the platform. Households can receive this support. Governments can distribute funds. Platforms can connect users and service providers.

Payment systems are often invisible when they function well; however, they are central to economic coordination.

This is why payment infrastructure is important. A slow or unreliable payment system increases friction in the economy. A fast, trusted, and interoperable system can reduce this time.

Lower payment friction can support productivity, but only when the system is broadly applicable. If digital payments serve only urban elites or large firms, economy-wide gains are limited. If they reach households, small merchants, public services, and cross-border flows, the impact is broader.

## The digital payment value stack

The digital payment value can be understood as a stack.

The first layer is access to the data. Users and merchants require access to the system.

The second layer is the transaction capability. Money must be moved safely and reliably.

The third layer is the records and visibility. Transactions create useful information.

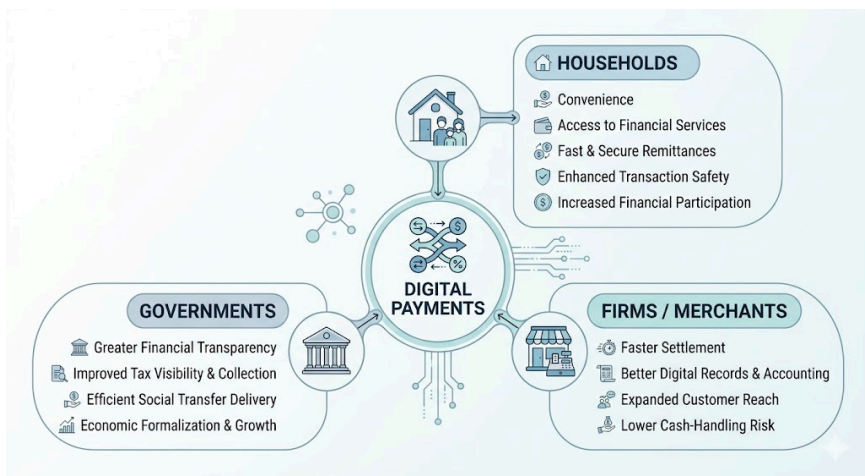
The fourth layer is the service. Payments are connected to savings, credit, insurance, remittances, public transfers, and business tools.

The fifth layer is the economic value. The system supports inclusion, efficiency, resilience, formalization and growth.

A payment system that only reaches the first two layers may still be useful. However, it becomes transformative when it supports upper layers.

The strongest systems do not merely digitize transactions. They convert transactions into pathways for broader participation.

**Figure 7.1: How Digital Payment Value Is Created**



*Figure 7.1: Creation of Digital Payment Value Digital payments create value for households, firms, and governments by improving access, transaction efficiency, record keeping, service delivery, and wider economic participation.*

*Source note: Author-created illustration based on the chapter's synthesis of household, firm, and government value creation through digital payment.*

## Value is not evenly distributed

Digital payments create value, but this value is not always shared equally.

Consumers may gain convenience while merchants pay fees.

Platforms may gain data while users lose their privacy.

Governments may gain visibility, while informal workers face new scrutiny.

Banks may gain access to transaction records, while customers face more profiling.

Large firms may automate reconciliations, whereas small firms struggle with onboarding.

This does not imply that digital payments are harmful. This means that their benefits and costs must be carefully analyzed.

A mature view asks:

- ☐ Who gains?
- ☐ Who pays?
- ☐ Who controls the data?
- ☐ Who bears fraud losses?
- ☐ Who will have access to the new services?
- ☐ Who becomes more dependent on the other?
- ☐ Who is excluded?

The value of digital payments depends on governance. Without fair rules, the system may create efficiency while shifting the risk to weaker actors.

## The risk of measuring only adoption

Adoption metrics can be misleading.

A high number of registered accounts does not indicate active use.

A high transaction volume does not imply broad inclusion.

A large total value may reflect a large number of users rather than ordinary households.

A growing wallet ecosystem may have weak consumer protection.

A digital transfer program may fail if recipients cannot access funds.

Therefore, payment systems should be evaluated using richer metrics.

Useful measures include the following:



- ☐ active usage
- ☐ low-value transaction frequency
- ☐ merchant acceptance breadth
- ☐ rural and low-income participation
- ☐ gender gaps
- ☐ cost to users and merchants
- ☐ fraud rates
- ☐ complaint resolution quality
- ☐ system uptime
- ☐ cash-out dependence
- ☐ user trust
- ☐ accessibility

A payment system that performs well on these indicators is more likely to create real public value.

## **Transaction records and credit access**

One of the most important potential benefits of digital payment is credit access.

In many economies, small businesses and low-income users lack formal credit history. Banks may consider them risky because there is little reliable information about income, sales, or repayment capacity.

Digital payment records can help reduce this information gap.

Merchants with steady digital receipts may be able to demonstrate cash flow. Workers receiving regular digital wages may show income consistency. Households with repeated account activity may become more visible to financial providers.

This can support credit scoring and lending.

But there are risks. Transaction data may be incomplete, misleading, or unfairly used. Algorithms may penalize the irregular income patterns common among informal workers. Users may not understand how their data affect credit decisions.

Payment data can support inclusion only when used responsibly. Data-based finance requires transparency, consent, fairness, and recourse.

## Digital payments and resilience

Digital payments can improve resilience in various ways.

- ☐ Households can quickly receive emergency funds.
- ☐ Firms can continue to receive payments remotely.
- ☐ Governments can distribute relief more efficiently.
- ☐ Migrants can support families across distances.
- ☐ Small merchants can reduce their dependence on cash storage.

However, digital payments also raise new resilience concerns.

If the system fails, users may be unable to complete transactions. If fraud increases, trust may decline. If accounts are frozen, households may lose their access. If platforms dominate, users may have few alternatives to choose from.

Therefore, resilience has two sides.

Digital payments can make households and institutions more resilient to certain shocks, but they also make societies dependent on digital infrastructure.

The goal is not only to digitize the data. The goal is to digitize with redundancy, protection, and fallback.

## **Digital payments and trust**

Trust is the foundation of payment value.

- ☐ Users must trust that the money will arrive.
- ☐ Merchants must trust that payment confirmation means value.
- ☐ Governments must trust that transfers reach their intended recipients.
- ☐ Banks must trust the transaction messages.
- ☐ Fintech firms must trust the rails they build.
- ☐ Regulators must trust that risks are managed properly.

Trust is created through repeated successful transactions, clear rules, reliable settlements, understandable interfaces, visible support, and fair dispute resolution.

A payment system can be technologically advanced and still fail if people do not trust it enough to use it.

Trust is not built solely on speed. It is built on reliability, fairness, recoverability, and transparency.

## **Who captures the value?**

Digital payments create new value, but different actors capture different parts.

- ☐ Consumers capture convenience and sometimes lower costs of using the service.
- ☐ Merchants capture sales and records but may pay a fee.
- ☐ Banks capture deposits, data, and customer relationships (CRs).
- ☐ Fintechs capture interface control and transaction engagement.
- ☐ Governments capture visibility and delivery efficiencies.
- ☐ These platforms capture embedded commerce and behavioral data.

This distribution is important because it shapes incentives.

If consumers benefit but merchants bear too much cost, merchant adoption may slow down. If platforms capture too much data, privacy concerns increase. If governments gain visibility without protecting their citizens, trust may decline. If fintechs grow irresponsibly, fraud and instability may increase.

A sustainable digital payment system must distribute value sufficiently to ensure the participation of all key actors.

## **When digital payments create public value**

Digital payments create public value when they do more than just move money efficiently.

They create public value when:

- ☐ expand meaningful access
- ☐ lower transaction costs

- ☐ support small merchants
- ☐ improve public delivery
- ☐ reduce leakage
- ☐ strengthen household resilience
- ☐ enable safe remittances
- ☐ preserve privacy and choice
- ☐ support competition
- ☐ remain usable during stress

Public value is not the same as private profit or transaction growth.

A payment platform can be profitable without being inclusive. A rail may be high-volume without being resilient. A wallet may be popular while weakening privacy issues. A digital transfer program may appear efficient when excluding those who cannot access it.

Public value requires design choices that consider the entire ecosystem.

## **The danger of hidden costs**

The value of digital payments should be balanced against these hidden costs.

These may include:

- ☐ user data extraction
- ☐ merchant fee pressure
- ☐ fraud exposure

- ☐ consumer overspending
- ☐ platform dependence
- ☐ exclusion of non-digital users
- ☐ loss of cash fallback
- ☐ weak dispute resolution
- ☐ cyber vulnerability
- ☐ surveillance risk

Some costs appear only after scaling. Early adoption may appear to be purely beneficial. Subsequently, societies may discover concentration, privacy loss, or resilience gaps.

Therefore, value creation must be studied alongside governance.

A good payment system does not only create value. It also manages the costs of creating value.

### **Key Insight**

Digital payments create the most value when they move beyond transactions. Payments become records, records become service pathways, and service pathways can support inclusion, resilience, and growth.

## **Chapter takeaway**

Digital payments create value in various ways.

- ☐ Households can save time, improve safety, support remittances, and open pathways to broader financial services.

- ☐ Firms can reduce cash handling, improve records, expand customer reach, and support digital commerce.
- ☐ Governments can improve public delivery, strengthen visibility, and support more efficient administration.
- ☐ For the wider economy, they can reduce friction and improve coordination.

However, the value is not automatic and is not evenly distributed.

A payment system should not be judged solely on transaction volume. It should be judged based on whether it creates meaningful, fair, and resilient value for the people and institutions that depend on it.

The strongest digital payment systems turn transactions into trust, records into opportunities, and convenience into broader economic participation.

## Transition to Chapter 8

Digital payments create value for households, firms, governments, and the economy. However, the same systems also create hidden costs. Fraud can move faster. The data can be more revealing. Platforms can gain power through this process. Non-digital users were excluded. The next section examines the risks associated with digital convenience.

# Chapter 8

## The Hidden Costs: Fraud, Privacy, Exclusion, and Digital Risks

### The darker side of convenience

Digital payments create real value. They save time, reduce cash handling, support remote commerce, improve records, and expand access to services. However, the same qualities that make digital payments powerful also create hidden costs.

A faster payment system can accelerate fraud.

A more data-rich system can compromise privacy.

A more convenient system can encourage overspending.

A more platform-based system can increase this dependency.

A more digital system can exclude people who cannot use it with confidence.

This does not imply that digital payments are bad. This means that they are not neutral. They reshape both risk and value.

Every payment system involves tradeoffs. Cash carries theft risk and weak records. Cards incur fees and dispute



complexity. Digital wallets carry data and platform-related risks. Instant payments are fast but carry fraud risks. Mobile money carries agent and cash-out risk.

Therefore, a mature view of digital payments must not only ask what the system makes easier but also what new vulnerabilities it creates.

## **Fraud now travels at the speed of the rail**

Fraud is one of the most serious risks associated with digital payments.

Digital payment systems are designed to reduce friction in the payment process. Users can send money quickly, merchants can receive funds faster, and services can confirm transactions instantly. However, fraudsters also benefit from speed.

When payments are instant or near-instant, the window for stopping suspicious transactions becomes smaller. A victim may authorize a payment under false pretenses, and the money may move before the fraud is detected.

This is especially important for scams where the user is manipulated into willingly sending money. These are often referred to as authorized push payment scams. The user may think they are paying a legitimate business, helping a relative, responding to a bank alert, or transferring money to a safe account. In reality, they are sending money to fraudsters.

This type of fraud is difficult to detect because the system may see a properly authenticated transaction. The user enters the password, approves the transaction, or confirms the transfer. The problem is not only unauthorized access. It is deception.

Therefore, digital payment fraud is not only a technical issue. It is behavioral, social, and institutional in nature.

## Common fraud patterns

Digital payment fraud can take many forms.

Impersonation fraud occurs when a scammer pretends to be a bank employee, government official, delivery agent, friend, relative or merchant.

Fake merchant fraud occurs when a user pays for goods or services that are not delivered.

Phishing tricks users into sharing their passwords, PINs, one-time codes, or account information.

Account takeover occurs when fraudsters gain control of a user's account or devices.

Mule accounts are used to receive and transfer stolen funds.

Fake investment or loan offers exploit users looking for financial opportunities.

QR code fraud can occur when fake or tampered QR codes direct payments to the wrong accounts.

Social engineering manipulates trust, urgency, fear and confusion.

These fraud types are not unique to digital payments, but digital rails can amplify their speed and reach.

The fraud problem worsens when users lack digital literacy, customer support is weak, dispute rules are unclear, or responsibility is shifted entirely to the victim.

## The design tension between speed and safety

Digital payment systems face a difficult design problem: users want speed, but safety often requires friction.

A payment system with too many warnings, confirmations, and delays is frustrating. Users may abandon it. Merchants may dislike slow checkouts. Platforms may lose their conversion.

However, a system with insufficient friction can become dangerous. Fraudsters exploit instant movement, weak confirmation, poor user education and unclear liability.

The goal is not to slow down every payment. The goal is to make the friction intelligent.

Low-risk and low-value transactions may remain simple. Higher-risk transactions may require more stringent checks. Unusual transfers may trigger these warnings. New recipients may require additional confirmation. Large payments may require delays or additional verification.

A good safety design is proportional. It does not punish ordinary use but recognizes the risk.

## **Fraud recourse and user trust**

Users are more willing to adopt digital payments when they know what will happen if something goes wrong.

- ☐ If a user sends money to the wrong account, can it be recovered
- ☐ If a user is scammed, who investigates the case?
- ☐ If a payment fails, how quickly is the money returned?
- ☐ If a merchant does not deliver goods, is there any dispute support?
- ☐ If an account is frozen, how does the user regain access to it?

These questions shape the trust.

In cash transactions, losses are often immediate and apparent. In digital transactions, losses may involve banks, apps, intermediaries, fraud teams, customer service channels, and legal rules. This can be confusing.

If users feel abandoned after a fraud event, their trust declines. If the support is slow or unclear, people may revert to cash or informal methods.

Therefore, fraud protection is not only a back-end control. This is part of the user experience.

A safe digital payment ecosystem requires prevention, detection, response, and recourse measures.

## **Privacy and the shift from anonymous to visible money**

Cash provides a natural degree of privacy to its users. Most small cash transactions do not automatically create detailed digital records of them.

Digital payments are different from cash payments. They generate data by design.

Digital payments may reveal the following:

- ☐ who paid
- ☐ who received
- ☐ how much was paid
- ☐ when the payment happened
- ☐ where it happened
- ☐ what channel was used
- ☐ which device was involved
- ☐ what merchant category was involved
- ☐ how often similar transactions occur

Over time, these records can reveal the patterns of life.

They may show where someone shops, how they travel, what medicines they buy, what organizations they support, how often they send money to relatives, whether they are under financial stress, and how their income changes.

This data can be useful for future research. It supports fraud detection, budgeting, lending, merchant analytics, public transfers and financial inclusion.

However, it also creates exposure.

When money becomes data, privacy must be designed to protect it. It no longer exists by default in the new version.

## **Payment data and power**

Payment data can create power for institutions that collect and analyze them.

Banks may use this to understand customer behavior.

Fintech companies may use this information to personalize their services.

Merchants may use it for loyalty and targeting purposes.

Platforms may use this to strengthen ecosystem control.

Governments may use it for policies, taxation, or monitoring.

Lenders may use this information for credit decisions.

Some of these uses are beneficial to society. Others may be harmful or intrusive in nature.

The problem is not that payment data exist. The problem is that users often do not understand how data is collected, combined, shared, or monetized.

A person may think that they are simply paying for groceries. Transactions may also feed analytics, risk models, loyalty profiles, advertising systems, or credit assessments.

This creates an information imbalance in the market. Institutions learn more from users than users learn from institutions.

Good payment governance must address these imbalances.

## **Data minimization and responsible use**

A trustworthy payment system should collect the data needed to operate safely but should not treat every data point as something to be exploited.

This is the principle of data minimization.

Payment providers require data for legitimate reasons, including processing, settlement, fraud prevention, compliance, receipts, and dispute resolution. However, they should not collect, retain, or share more data than necessary without clear justification.

Important governance questions include the following:

- ☐ Who owns or controls the payment data?
- ☐ Can data be sold or shared?
- ☐ Can it be combined with other types of behavioral data?
- ☐ How long was it retained?
- ☐ Can users access or correct this?
- ☐ Can users meaningfully consent to this?
- ☐ Can data be used to exclude or manipulate the users?

Digital payment systems become more trusted when users believe that their data are handled with restraint.

Privacy is not an enemy of innovation. This is part of a sustainable trust.

## Digital exclusion

Digital payments can include or exclude people.

Exclusion occurs when a system assumes that all users have the same capabilities and resources. Many digital payment systems assume that users have smartphones, stable internet, formal identity, literacy, confidence with apps, and access to customer support services.

Not everyone does.

- ☐ Some users rely on basic phones only.
- ☐ Some share devices.
- ☐ Some of these have weak connectivity.
- ☐ Some patients cannot read complex instructions.
- ☐ Some of them lack formal documents.
- ☐ Some are elderly.
- ☐ Some have disabilities.
- ☐ Some fear making mistakes.
- ☐ Some cannot afford transaction fees or data costs.
- ☐ Some live far from agents or bank branches.

If these realities are ignored, digital payments can make participation more difficult.

A society that removes cash too quickly may exclude people who are not ready or able to use digital alternatives to cash. A government that digitizes benefits without support may make access more difficult for vulnerable recipients.

Merchants that refuse cash may unintentionally exclude customers.

Digital inclusion is not achieved by merely launching an app. This is achieved when real users can participate safely and confidently.

## Exclusion by design

Exclusion often occurs through design choices.

The sign-up process may require documents that many users do not possess.

An app may only work on smartphones.

Payment confirmation may be written in a language that the user cannot read.

Screens may be difficult for visually impaired users.

Support processes may require long wait times or digital forms.

Fraud warnings may be too technical to understand.

A transfer process may make it easy to send money to the wrong people.

These may seem like minor design issues, but they shape who can use the system.

An inclusive payment design should consider the following:

- ☐ low-literacy interfaces
- ☐ local languages
- ☐ disability access
- ☐ assisted onboarding
- ☐ simple error messages
- ☐ visible receipts
- ☐ confirmation of payee



- ☐ low-data options
- ☐ offline or weak-network use
- ☐ accessible customer support
- ☐ cash-in and cash-out access

Inclusion is not an abstract policy objective. It is built into the everyday design details.

## Merchant burden and margin pressure

Digital payments can benefit merchants but can also impose burdens.

Merchants may gain faster sales, better records, reduced cash handling, and access to remote customers. However, merchants may also face the following challenges:

- ☐ transaction fees
- ☐ settlement delays
- ☐ device or software costs
- ☐ chargebacks or disputes
- ☐ fraud risk
- ☐ platform dependence
- ☐ account freezes
- ☐ tax visibility
- ☐ reconciliation complexity
- ☐ pressure to accept multiple payment methods

Large merchants can negotiate fees, invest in systems, and manage disputes. Small merchants may not have this capability.

For a small shop, street vendor, or informal service provider, a small fee can be significant. Delayed settlement can affect working capital. Disputes can be difficult to manage. Platform rule changes can disrupt businesses.

This means that digital payment adoption should be evaluated from both the merchant and consumer sides.

A payment system that is convenient for consumers but costly or risky for small merchants is not fully inclusive of all stakeholders.

## Platform dependence

Digital payments increasingly operate through platforms.

A platform may control a wallet, marketplace, app store, delivery system, ride-hailing service, or merchant interface. When payments are embedded inside platforms, users and merchants may depend on the platform not only for payment but also for access to customers and services.

This can create powerful efficiency. Platforms reduce search, enable trust, organize payments, and simplify the delivery of services.

However, platform dependence also poses risks.

- ☐ A merchant may be locked into an ecosystem.
- ☐ Users may have limited choices.
- ☐ However, fees may increase after adoption.
- ☐ The platform may control the data.
- ☐ Rules may change without negotiations.
- ☐ Dispute processes may favor platforms.
- ☐ Competitors may struggle to enter the market.

This is why interoperability is important. Systems that allow users and merchants to transact across providers reduce their dependence on closed ecosystems.

Closed platforms may also be convenient. Open and interoperable systems are often better for public values.

## Behavioral risks and invisible spending

Digital payments can change the way people experience spending.

Cash is tangible. A person sees money leaving their hands. Digital payments can feel more abstract than cash payments. Contactless taps, in-app purchases, stored credentials, automatic renewals, and one-click checkouts reduce the moment of awareness.

This can be useful. This makes commerce easier. However, it can also encourage overspending or reduce financial awareness.

Subscriptions are a good example of this. A user may sign up easily and forget about recurring charges. Small automatic payments can be accumulated. In-app purchases may feel less real than cash transactions.

Some digital tools help users manage their spending through alerts, dashboards, limits, and budgeting features. Others are designed to reduce friction and increase spending.

The behavioral design of payments is important. Systems should make payments easy without making users unaware.

## Cybersecurity and operational outages

Digital payments depend on a complex infrastructure.

They require electricity, telecommunications networks, cloud systems, bank servers, payment processors, applications, devices, APIs, identity systems, and cybersecurity controls. If a critical part fails, payments can be disrupted.

An outage may prevent people from purchasing food, fuel, medicine, or transportation. Cyberattacks can undermine trust. A cloud failure can simultaneously affect many providers. Telecommunications problems may stop mobile payments. Bank outages may block access to accounts.

As digital payments become more central, operational failures become more serious.

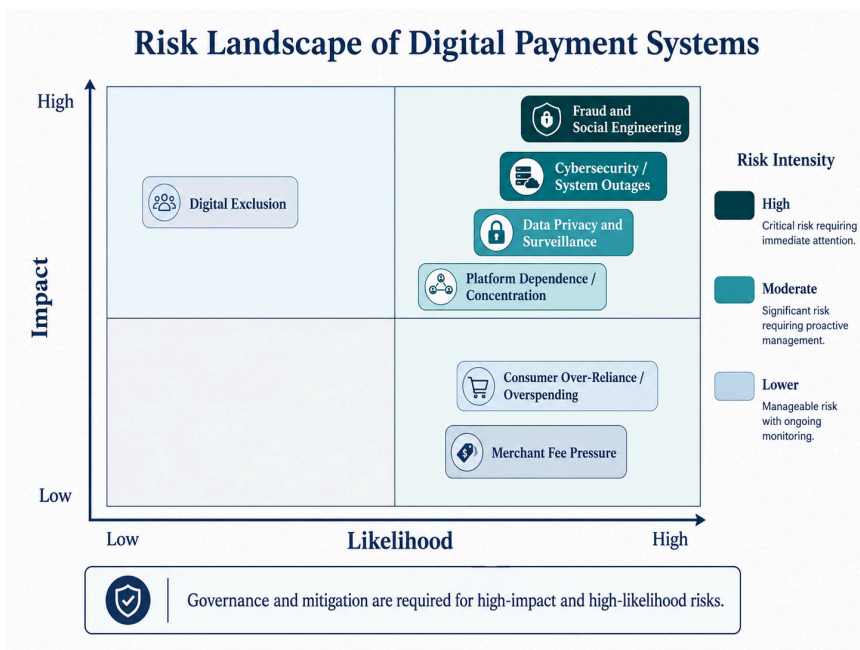
Therefore, resilience must be designed into payment systems.

Resilience may include:

- ☐ backup systems
- ☐ multiple payment rails
- ☐ offline or low-connectivity options
- ☐ incident response plans
- ☐ cybersecurity testing
- ☐ telecommunications coordination
- ☐ disaster recovery
- ☐ clear public communication
- ☐ continued access to cash

A payment system that works only under perfect conditions does not have a strong infrastructure. This is a fragile convenience.

**Figure 8.1: Risk Landscape of Digital Payment Systems**



*Figure 8.1 Digital payment risks vary by likelihood and impact. The most serious risks require governance responses that combine technical safeguards, consumer protection, privacy rules and resilience planning.*

*Source note: Author-created risk framework based on the chapter's synthesis of digital payment risk and governance responses.*

## Cash as protection against digital fragility

Cash can protect against certain digital risks.

It does not solve every problem, and cash has its own risks. However, it can function when digital systems fail. It can serve users who are not digitally included in the digital world. It can preserve the privacy of ordinary transactions. This can help households budget.

This is why cash should not be dismissed as outdated simply because digital payments are increasing.

In a resilient payment ecosystem, cash may play a smaller role in routine commerce but a larger role as a fallback infrastructure.

The goal should not be to force cash out before digital systems become inclusive and resilient. The goal should be to allow digital payments to expand while preserving reasonable alternatives to them.

Payment modernization should increase choice, not remove it prematurely.

## Regulatory gaps

Digital payments often evolve more rapidly than regulations.

New products may emerge before the liability rules are clear. Fraud patterns may change before consumer protection systems adapt. Data use may expand before privacy rules are implemented. Non-bank providers may become systemically important before oversight frameworks mature.

This creates gaps.

- ☐ Who is responsible when fraud occurs?
- ☐ What happens when a wallet provider fails to provide a service?
- ☐ How should payment data be protected?
- ☐ Can nonbank providers access payment rails?
- ☐ How should fees be disclosed?
- ☐ How should instant payments handle erroneous transfers?
- ☐ What resilience standards should be applied to payment providers?

Regulation should not stop innovation, but it must keep pace with the importance of infrastructure.

Once digital payments become essential to daily life, weak regulations become a public risk.

## **Trust can be lost faster than it is built**

Payment trust requires time to develop. It can be lost quickly.

A major fraud wave, repeated outages, poor customer support, hidden fees, and data misuse can damage confidence. Once users lose trust, they may reduce their usage, return to cash, or avoid digital systems altogether.

This is especially true for first-time users and vulnerable groups. A person who experiences a serious loss may decide that digital payments are unsafe.

Therefore, payment providers and regulators should consider trust a long-term asset.

Trust is built through:

- ☐ reliable transactions
- ☐ transparent fees
- ☐ strong fraud controls
- ☐ clear receipts
- ☐ accessible customer support
- ☐ fair dispute processes
- ☐ privacy protection
- ☐ inclusive design
- ☐ operational resilience

Digital payments cannot become a durable infrastructure without trust.

# Risk does not cancel value

It is important to maintain balance. The risks described in this chapter do not negate the value of digital payments.

Cash also has risks. Informal transfers may be unsafe. Manual records may be weak. Physical money can be stolen, for example. Cash-heavy public delivery systems can leak funds. Lack of digital access can exclude people from using modern services.

The conclusion is not that digital payments should be avoided. The correct conclusion is that they should be governed well.

A mature payment ecosystem recognizes both the benefits and risks. It does not treat innovation as automatically good or regulation as automatically bad.

The challenge is to design digital payment systems that are fast but not reckless, data-rich but not invasive, convenient but not manipulative, inclusive but not shallow, and efficient but not fragile.

**Table 8.1: Digital Payment Risks and Governance Responses**

| Risk Area                     | Why It Matters                               | Governance Response  |
|-------------------------------|--|--|
| Fraud and social engineering  | Instant payments can move scam funds quickly | Scam warnings, recipient confirmation, fraud monitoring, dispute support |
| Data privacy and surveillance | Payment records reveal sensitive behavior    | Data minimization, purpose limits, privacy protections                   |



|                         |   |   |
|-------------------------|---|---|
| Digital exclusion       | Some users lack devices, literacy, connectivity, or documents   | Assisted access, low-data design, cash coexistence, accessible interfaces |
| Merchant burden         | Small merchants may face fees, disputes, or platform dependence | Fee transparency, fair settlement, merchant support                       |
| Platform concentration  | Closed ecosystems can reduce competition and user choice        | Interoperability, open access, competition oversight                      |
| System outages          | Digital dependence can disrupt daily commerce                   | Redundancy, backup rails, incident response, cash fallback                |
| Behavioral overspending | Invisible payments can reduce spending awareness                | Alerts, spending controls, clear subscription management                  |

### Key Insight

Digital payments should not be judged solely based on speed and convenience. They should also be judged based on how well they protect users, preserve privacy, support merchants, include vulnerable groups, and remain available during stress.

## Chapter takeaway

Digital payments create hidden costs and visible benefits. Fraud can move faster. Privacy can weaken. Small merchants may face new burdens. Users can overspend. Platforms can gain power through this process. Digitally excluded groups can be left behind in this process. Outages and cyberattacks can disrupt the daily lives of people. These risks do not imply that digital payments are undesirable. This means that payment systems must be designed and

governed as infrastructure. A trustworthy digital payment system requires fraud protection, privacy safeguards, accessible design, fair merchant economics, operational resilience, dispute resolution, and fallback options. The future of payments should not only be faster. It should be safer, fairer, more inclusive, and resilient.

## Transition to Chapter 9

The risks of digital payments do not appear in the same way everywhere. They depend on the country's context, infrastructure, regulation, market structure, and user behavior. The next chapter turns to country snapshots—India, Brazil, Kenya, Sweden, China, and the United States—to show how different payment models create different kinds of value and different kinds of risk.

# Chapter 9

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## Country Case Snapshots: India, Brazil, Kenya, Sweden, China, and the United States

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### Why country cases matter

Digital payments do not develop uniformly across the globe. The technology may look similar on the surface, but the story behind its adoption differs from country to country.

A person scanning a QR code in India, using Pix in Brazil, receiving mobile money in Kenya, paying through a super-app in China, using a card-linked wallet in the United States, or living in a cash-light society such as Sweden may be participating in digital payments. However, each case reflects a different infrastructure path.

- ☐ Some countries have built digital payments on public railways.
- ☐ Some have grown through private platforms.
- ☐ Some expanded access is provided through mobile money.
- ☐ Some mature card systems have been optimized.
- ☐ Some became nearly cash-light and had to rethink their resilience.

This chapter uses six country snapshots to show why digital payment systems must be understood in their context. The goal was not to rank the countries. The goal is to understand the different models of payment transformation.

The six cases are:

- ☐ India: interoperable public infrastructure through UPI
- ☐ Brazil: central-bank-led instant payments through Pix
- ☐ Kenya: mobile money and first-entry financial access
- ☐ Sweden: cash-light maturity and resilience concerns
- ☐ China: platform-based mobile payments
- ☐ United States: card-centric digital transition

Together, these cases show that there is no single path to digital payment success in developing countries.

### **India: scale through interoperable public infrastructure**

India's digital payment story is strongly associated with the Unified Payments Interface (UPI).

UPI is important because it is not merely a payment app. It is an interoperable, real-time payment rail. It allows users to send and receive money across participating banks and applications in the country. A user may use one app while the recipient uses a different app. Merchants may display a QR code and receive payments from many different apps. The underlying rail connects to the ecosystem.

This is the central strength of UPI: it separates the shared infrastructure from the competitive one.

Banks, fintech firms, and apps can compete with each other for users. However, they do not need to build completely separate payment networks from scratch. This reduces fragmentation and allows digital payments to be scaled across users, merchants, and institutions.

India's case is especially important because the UPI moved beyond peer-to-peer transfers. It has become a part of everyday retail payments. People use it to pay small shops, street vendors, transportation providers, service workers, online merchants, friends, and family.

This kind of repeated everyday use is what turns a payment system into an infrastructure.

### What India teaches

India offers three major lessons.

First, interoperability is important. A payment system becomes more valuable when users, banks, apps, and merchants can connect with providers.

Second, low-cost merchant acceptance is important. QR-based acceptance allows small merchants to participate without expensive card terminals.

Third, public infrastructure supports private innovation. UPI shows that public or quasi-public rails can create a foundation for private firms to compete in terms of experience, features, and distribution.

The Indian case also carries a warning. Large-scale digital payments require strong fraud control, customer support, dispute resolution, cybersecurity, and system resilience. As the transaction volume increases, so does the importance of trust.

Therefore, India represents a powerful model, but not a risk-free one.

*Digital payment infrastructure becomes transformative when it is interoperable, low-cost, widely accepted, and useful for everyday life.*

## **Brazil: Pix as public instant-payment infrastructure**

Brazil's Pix is another major example of a digital payment infrastructure at scale.

Pix was developed under the leadership of Banco Central do Brasil. Its purpose was to create a fast, low-cost, and widely accessible instant payment system. It supports person-to-person payments, merchant payments, bill payments, and other use cases.

Pix is important because it shows how a central bank can play an active role not only as a regulator but also as an infrastructure builder.

The strength of Pix lies in its simplicity and scope. Users can instantly send money. Merchants can receive payments quickly and easily. The system was operated continuously. It is used not only for large transfers but also for small everyday payments.

The last point is critical. A payment system becomes socially important when it enters ordinary retail life.

Brazil's Pix did not remain a technical banking system. This has become a daily payment habit.

## **What Brazil teaches**

Brazil teaches that public instant payment infrastructure can become a practical retail payment option when it is trusted, user-friendly, and widely available.

Pix also shows that central banks can shape market behavior through the design of infrastructure. By creating a public instant payment rail, Brazil has changed the competitive landscape of payments.

The Brazilian model highlights several design lessons.

- ☐ Public institutions can reduce coordination barriers.
- ☐ Instant payments can become mainstream if they support everyday use cases.
- ☐ Low-value transactions are important evidence of real adoption.
- ☐ Central bank credibility can support user and provider trust.
- ☐ Payment infrastructure can reshape competition with existing channels.

However, Pix also raises important governance questions. As usage increases, system resilience becomes increasingly important. Therefore, fraud controls must evolve. Consumer protection must keep up with these changes. Market participants may become highly dependent on railways.

Brazil's lesson is not simply that instant payments work; public instant payment systems can become economic infrastructure when they move from bank transfers into everyday life.

### **Kenya: mobile money and first-entry finance**

Kenya's digital payment story differs from those of India and Brazil.

The central example is mobile money, especially M-PESA. Kenya's importance lies in showing that digital payments can expand before traditional banking infrastructure reaches all.

Mobile money in Kenya did not succeed by copying card-based systems, for example. It succeeded by matching the local realities.

Many users had mobile phones before they had easy access to banks. Many people need to send money across distances. Many depend on informal support networks. Agent networks help users convert cash into digital value and vice versa.

This has made mobile money practical.

For many households and small businesses, mobile money has become a way to store value, send support, receive payments, pay bills, and manage risk. This created a financial interface where formal banking was limited or inconvenient.

Kenya's case shows that payment access can be the foundation for wider financial participation.

### **What Kenya teaches**

Kenya teaches that digital payments can become the first-entry financial infrastructure.

The most important lessons are as follows:

- ☐ Payment design must fit local conditions.
- ☐ agent networks matter, where cash remains important
- ☐ Mobile phones can support financial access before bank branches expand.
- ☐ Domestic transfers and remittances are central use cases.



☐ Payment systems can strengthen household resilience.

Kenya also shows that inclusion is not only about opening accounts. This is about usable access. People must be able to send, receive, store, withdraw, and trust money under real conditions.

However, mobile money also poses risks. Users may depend heavily on these agents. Cash-out fees may be important. Agent liquidity may be unevenly distributed. Fraud and mistaken transfers can harm vulnerable user groups. Mobile money may create access without fully connecting users to savings, credit, insurance, or long-term financial security.

**Digital payments are most inclusive when they start from real user needs rather than from imported assumptions.**

### **Sweden: cash-light maturity and resilience**

Sweden is often described as one of the world's most cash-light economies.

Digital payments are widely accepted in India. Many consumers rarely use cash in their daily lives. Cards, mobile payments, and bank-linked digital systems are deeply embedded in the commerce.

At first glance, Sweden may appear to be the future of payments. It shows how far digitalization can go in a high-trust, high-income, institutionally mature society.

However, Sweden's story is more nuanced.

The decline of cash has created policy questions regarding resilience and inclusion. If digital payments dominate too strongly, what happens during outages, cyber incidents, power failures, or national emergencies? What happens to

elderly users, people with disabilities, rural residents, and those who are less comfortable with digital systems?

Sweden shows that a highly digital payment ecosystem can be efficient and still requires fallback planning.

### What Sweden teaches

Sweden teaches us that becoming cash-light is not the same as becoming risk-free.

Its main lessons are:

- ☐ Digital maturity creates new resilience responsibilities.
- ☐ Cash may decline in daily use but remains important as fallback infrastructure.
- ☐ Public authorities must consider crisis readiness.
- ☐ Inclusion remains relevant even when most people are digitally capable.
- ☐ Efficiency should not eliminate redundancy.

Sweden is important because it challenges the simplistic cashless narrative. This shows that the future of payments is not only about replacing cash. It involves designing systems that remain usable under stress.

**A payment system can be highly digital and still require non-digital fallback options.**

### China: payments as platform behavior

China's digital payment system is strongly shaped by platform ecosystems.

Mobile payments have become deeply integrated into everyday services such as messaging, shopping, food delivery, transportation, entertainment, and local commerce. QR codes have become widely used. Payments have become embedded in high-frequency digital environments.

This model is powerful because payments are not separated from daily digital behavior. Users do not consider payment a stand-alone financial act. It is part of messaging, shopping, social interaction, mobility, and service consumption.

This integration helped digital payments scale quickly.

China shows that when payments are embedded into platforms people use every day, adoption can become extremely fast and widespread.

However, platform-based success raises concerns.

If a few large platforms control payment interfaces, they can gain enormous influence over data, merchants, users, and market access. Convenience may lead to dependence. Payment data may become part of a wider behavioral profile. Small merchants may have limited bargaining abilities.

Therefore, China shows both the strengths and risks of platform-led payment transformation.

## What China teaches

China shows that payment adoption can accelerate when payments are embedded in high-frequency digital ecosystems.

Its key lessons are:

- ☐ payments scale faster when they are part of daily platform behavior;

- ☐ QR codes can support widespread merchant acceptance.
- ☐ Integrated platforms can dramatically reduce friction.
- ☐ User convenience can coexist with platform concentration.
- ☐ Data governance becomes critical when payments and social behaviors are linked.

China's model is not simply based on mobile payments. It involves the fusion of payments, platforms, identity, commerce, and data.

**Platform ecosystems can make digital payments extremely convenient; however, they also concentrate power and data.**

### **The United States: card-centric digital transition**

The United States represents a different path to that of China.

Its payment system has long been shaped by strong card network systems. Credit and debit cards have become deeply embedded in consumer behavior, merchant acceptance, rewards programs, dispute rules, and financial institutions.

Because card infrastructure was already strong, many digital wallets in the United States were developed as interfaces layered on top of existing cards. A user may tap a phone, but the transaction may still be processed through a card network.

This is an important example of path dependence theory.

New payment technologies do not instantly replace old systems. They are often built on top of them. The result is a

layered ecosystem in which cash, cards, bank transfers, digital wallets, payment apps, online checkout systems, and newer instant payment rails coexist.

The United States shows that a mature legacy system can be both an asset and a constraint to the government.

It provides reliability, familiarity, and consumer protection benefits. However, it can also slow the shift toward alternative rails and preserve merchant-fee debates.

### **What the United States teaches**

The United States teaches that payment evolution is shaped by the existing infrastructure.

Its main lessons are:

- ☐ Strong legacy systems influence future adoption.
- ☐ Digital wallets may improve the interface without changing the underlying rail.
- ☐ cards remain powerful when acceptance, rewards, and dispute rules are mature.
- ☐ Payment changes are often layered rather than sudden.
- ☐ merchant fees, and competition remain central policy debates.

The U.S. case also reminds us that cash does not automatically disappear. Even in a highly digital economy, cash may remain useful for some users, small transactions, privacy, budgeting, and as a fallback.

**When legacy infrastructure is strong, digital transformation often arrives as layers rather than as a replacement.**

## Comparing the six cases

The six cases show different paths to digital payment transformation in the banking sector.

- ☐ India has an interoperable public infrastructure.
- ☐ Brazil has central bank-led instant payments.
- ☐ Kenya shows mobile money and agent-supported access to financial services.
- ☐ Sweden has cash-light maturity and resilience concerns.
- ☐ China shows platform-led, embedded payments.
- ☐ The United States has shown a card-centric evolution and layered change.

These models differ because countries begin from different positions.

- ☐ Some have strong banks.
- ☐ Some have weak-branched networks.
- ☐ Some of these have powerful platforms.
- ☐ Some countries have active central banks.
- ☐ Some people have a high level of trust in digital systems.
- ☐ Some countries have large informal economies.
- ☐ Some countries have strong card systems.
- ☐ Some have urgent inclusion requirements.

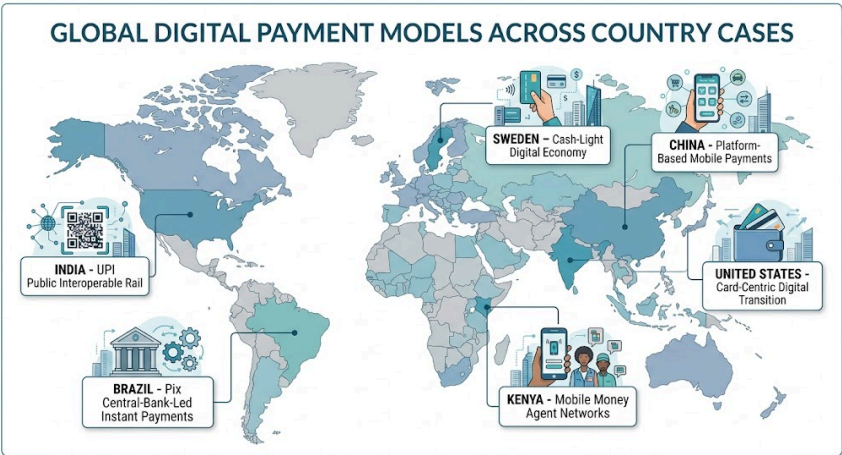
Therefore, digital payment success cannot be defined by a universal model.

**Table 9.1: Country Case Snapshots**

| Country | Signature Model | Why It Matters | Key Lesson |
|---------|-----------------|----------------|------------|
|---------|-----------------|----------------|------------|

|               |   |   |   |
|---------------|---|---|---|
| India         | UPI and interoperable public rail         | Mass real-time payments and QR merchant acceptance                  | Public rails can support private innovation                     |
| Brazil        | Pix and central-bank-led instant payments | Public instant payments became everyday retail infrastructure       | Central banks can shape payment behavior through infrastructure |
| Kenya         | Mobile money and agent networks           | Mobile-led access before deep banking penetration                   | Payment access can support household resilience                 |
| Sweden        | Cash-light digital ecosystem              | Mature digital use with resilience concerns                         | Digital success still needs fallback design                     |
| China         | Platform-based mobile payments            | Payments embedded in super-app and platform behavior                | Convenience can coexist with concentration                      |
| United States | Card-centric digital transition           | Strong legacy card system shapes digital wallets and payment habits | Payment evolution is path-dependent                             |

**Figure 9.1: Global Digital Payment Models Across Country Cases**



*Figure 9.1: Global Digital Payment Models Across Country Cases. Different countries illustrate different digital payment pathways: public rails, central bank-led instant payments, mobile money, cash-light ecosystems, platform-based payments, and card-centric transitions.*

*Source note: Author-created comparative illustration based on the six-country case snapshots discussed in this chapter.*

## **Shared success factors**

Despite their differences, successful digital payment systems share several common features.

First, they reduce the friction. Users and merchants must find the system easier than alternative systems.

Second, they support the use of everyday cases. A system becomes an infrastructure when it works for routine payments: small retail, transfers, bills, wages, transportation, and remittances.

Third, they build trust through their reliability. Users must believe that money will arrive and that problems can be resolved.

Fourth, they achieve a broad acceptance. A payment method is useful only when users can pay for where they actually spend.

Fifth, they are supported by the government. The scale creates responsibility. Fraud, privacy, disputes, resilience, and competition must be addressed.

These factors are more important than technology alone.

## **Shared risks**

The cases also revealed common risks.

India and Brazil show that mass instant-payment adoption requires strong fraud control and user support.



Kenya shows that inclusion can remain fragile when users depend on agents, cash-out points, and mobile access to services.

Sweden shows that high digital adoption can create resilience issues.

China shows that platform convenience can concentrate data and market power.

The United States shows that legacy systems can preserve fees and slow down structural change.

No model is perfect. Each creates different trade-offs for the user.

Therefore, payment system design must be judged by context, not by copying another country's model.

### **What the cases reveal about infrastructure**

These country cases confirm the central argument of this book: that digital payments are economic infrastructure.

They shape how people shop, save, send, receive, work, trade, and interact with institutions and each other. They affect not only consumer convenience but also market access, public delivery, data visibility, competition, and resilience.

A payment system becomes an infrastructure when people organize their daily lives around it.

This has already occurred in different ways across these countries:

- ☐ UPI in India as an interoperable payment infrastructure

- ☐ Pix in Brazil as a public instant-payment infrastructure
- ☐ Mobile money in Kenya as access infrastructure
- ☐ cash-light systems in Sweden as a mature digital infrastructure
- ☐ platform payments in China as an embedded commerce infrastructure
- ☐ card-linked digital systems in the United States as a layered payment infrastructure.

The diversity of these models is the most important lesson learned.

There is no single global future for payments. Multiple futures are shaped by local institutions, user needs, regulations, technology, and trust.

### **Key Insight**

The same digital payment idea can have different meanings in different countries. In one place, it may be convenient. In contrast, it may be an inclusion. In other cases, it may be public infrastructure. Alternatively, platform control may be used. The context determines the meaning.

## **Chapter takeaway**

Country cases show that digital payment transformation does not follow a universal path.

- ☐ India demonstrates the power of interoperable public railways.

- ☐ Brazil shows how central bank-led instant payments can become retail infrastructure.
- ☐ Kenya proves that mobile money can support first-entry financial access in developing countries.
- ☐ Sweden shows that digital maturity requires resilience planning.
- ☐ China illustrates the power and risks associated with platform-based payments.
- ☐ The United States shows how legacy card systems shape the digital transition.

The common lesson is that digital payments succeed when they become useful, trusted, affordable, and widely accepted in daily life.

However, each model carries risks. Infrastructure must be governed properly. Speed must be balanced with safety. Inclusion must be real, not symbolic. Data must be protected. Resilience must be designed to be effective.

Digital payment success is not about becoming cashless; it is about building systems that people, merchants, firms, and governments can rely on.

## Transition to Chapter 10

The country cases show how digital payments have evolved through various pathways. However, the next phase is already emerging. Payments are becoming more embedded, real-time, cross-border, data-driven, and connected to broader financial services. Chapter 10 examines the future roadmap: embedded finance, cross-border rails, resilience, artificial intelligence, and the next generation of payment infrastructure.

## Chapter 10

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### The Next Phase: Embedded Finance, Cross-Border Rails, and Resilience

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#### The next phase is not just faster payment

The next phase of digital payments will not be defined only by their speed.

Speed is already becoming the norm. In many countries, users increasingly assume that money should move instantly or nearly instantly. In many contexts, payments that take days now feel outdated.

However, speed alone is no longer sufficient.

The next phase will be shaped by deeper questions.

How will payments become embedded in daily services?

How will domestic payment systems connect across national borders?

How will fraud control keep pace with real-time movement?

How will the payment data be governed?

How will systems remain resilient during outages and cyber incidents?

How will inclusion be protected as payments become increasingly digital?

How will public infrastructure and private platforms share this responsibility?

These questions show that digital payments are moving from transaction innovation to infrastructure design.

The future of payments is not simply about moving money more quickly. It involves building payment systems that are trusted, inclusive, interoperable, resilient, and governable.

## **From payment method to invisible infrastructure**

In the early stages of digital payments, the focus was often on the payment method itself: card, wallet, application, QR code, bank transfer, or mobile money.

The next phase was different. Payments are increasingly disappearing from the background of services.

A user may not think about payment when ordering food, booking a ride, subscribing to software, paying a toll, using a mobility service, or buying inside an app. Payment is simply part of the experience.

This has led to the rise of invisible payments.

Invisible payments can be convenient. It reduces friction and makes services feel more seamless. However, it also changes the user's relationship with money. When payments become less visible, people may lose awareness of how often they are paying, which services are charging them, and what permissions they have granted.

This creates design responsibilities. Invisible payments should not imply invisible consent.

Users require clear receipts, easy cancellation, spending alerts, and control over recurring payments. Convenience should not come at the expense of transparency.

## Embedded finance and the merging of payments with services

Embedded finance means financial services are built directly into non-financial experiences.

Payments are often the first layer of embedded financing. Once a platform controls the payment moment, it can add credit, insurance, savings, loyalty, subscription management, working capital, or merchant tools to the payment.

- ☐ A marketplace may offer seller loans to sellers.
- ☐ Ride-sharing platforms may offer driver payouts.
- ☐ A retail app may offer installment payment options.
- ☐ Payroll platforms may offer earned wage access.
- ☐ A small-business tool may offer invoicing and credit services.

Food delivery platforms may offer merchant analytics. This is powerful because finance appears exactly where the user needs it to be. However, it also poses risks.

Users may not clearly understand when they use a regulated financial service. Merchants may become dependent on platforms for both customers and finances. Data collected through payments can be used to offer credit or pricing decisions. Platform rules may shape access to financial opportunities.

Therefore, embedded finance makes payment governance more important.

When finance becomes embedded, responsibility can become more difficult to discern.

## **The future of merchant payments**

Merchant payments will continue to evolve in the future.

In developed economies, the focus will likely be on smoother checkouts, better software integration, fraud reduction, and omnichannel commerce. Merchants will want payment systems that connect easily to accounting, inventory, loyalty, tax, and customer management tools.

In developing economies, the focus will remain on low-cost acceptance, QR payments, faster settlements, merchant onboarding, and the transition from cash-heavy businesses to digital records.

In low-infrastructure settings, merchant payments depend on whether local businesses can accept digital value without losing flexibility. If users must constantly cash out because merchants do not accept digital payments, the system is incomplete.

Therefore, the next phase of merchant payments will be shaped by two goals:

1. make acceptance easier and cheaper.
2. turn payment records into useful business tools.

The best merchant payment systems do not only collect money. They will help businesses manage their finances.

## **Cross-border payments: the unfinished frontier**

Domestic digital payments have improved more rapidly than cross-border payments.

In many countries, a person can instantly send money to someone in the same country. However, sending money across borders is often slower, more expensive, and less transparent.

This is important because cross-border payments are not only a business issue. They affect migrant workers, families, students, freelancers, exporters, travelers, and small businesses.

For many households, the most important payment is not a retail purchase. It is a remittance from family members abroad.

Therefore, the future of digital payments will be judged partly by whether cross-border payments become cheaper, faster, and more reliable.

A world of instant domestic payments but expensive international transfers is still an incomplete digital payment system.

## **Why cross-border payments remain difficult**

Cross-border payments are difficult because they cross multiple systems simultaneously.

They may involve:

- ☐ different currencies
- ☐ different banks
- ☐ different legal systems
- ☐ different compliance rules



- ☐ foreign exchange conversion
- ☐ sanctions screening
- ☐ correspondent banking chains
- ☐ settlement timing differences
- ☐ data and messaging standards
- ☐ consumer-protection gaps

Each layer adds to the friction.

These frictions may be manageable for large corporate transactions. For small remittances, these can be costly and frustrating.

A migrant sending a small amount of money home may care about four things: cost, speed, certainty, and trust. If the fees are unclear, the exchange rates are poor, or the delivery is delayed, the household receiving the money suffers.

This is why cross-border payment reform is also a financial inclusion issue in China.

## **Interlinking fast payment systems**

One promising direction is the interlinking of domestic fast-payment systems.

If two countries each have a strong real-time payment rail, they may be able to connect. This could allow users to send low-value cross-border payments more quickly and at a lower cost.

However, interlinking is not simple.

Technical compatibility is only one aspect of this process. Countries must also address legal rules, compliance requirements, foreign exchange, settlement arrangements, consumer protection, data sharing, fraud responsibility, and dispute resolution.

A cross-border payment system must answer the following difficult questions:

- ☐ Which country's rules apply to this situation?
- ☐ Who handles fraud complaints?
- ☐ How is the currency converted?
- ☐ When is the payment finalized?
- ☐ Who bears the settlement risk?
- ☐ What data are moved across borders?
- ☐ How are the users protected?

The future of cross-border payments depends as much on governance coordination as it does on technology.

## **Digital identity and trust infrastructure**

Digital identity will become increasingly important in the next phase of payment.

A payment system needs to know who is paying, who is being paid, and whether the transaction is legitimate. As payments become more remote, real-time, and cross-border, identity becomes increasingly important.

A digital identity can improve onboarding, reduce fraud, simplify compliance, and support access. This can help users prove their identity without repeatedly submitting documents. This can help merchants and institutions reduce uncertainty.

However, identity systems also pose risks.

If identity is too strict, people without documentation may be excluded. If identity is too centralized, the privacy risks increase. If identity is poorly secured, fraud can become more damaging. If payment identity is linked too broadly with other data, surveillance concerns will grow.

The future requires secure, inclusive, and privacy-conscious identity systems.

A good payment identity should support trust without turning every transaction into excessive monitoring.

## Artificial intelligence in payments

Artificial intelligence will play a larger role in digital payments.

The most obvious use of this technology is in fraud detection. AI systems can identify unusual patterns, detect suspicious behaviors, monitor transaction networks, and flag possible scams. They can help payment providers respond faster than manual systems.

AI may also support customer service, dispute triage, transaction categorization, credit assessment, merchant analytics and personalization.

However, AI in payments must be handled carefully.

Payment decisions affect real people's lives. A false fraud flag can block a user from accessing their money. A biased model can unfairly limit services. An automated support system can frustrate users who require urgent assistance. A credit model based on payment data can reinforce inequality if not well governed.

Therefore, AI should support payment trust and not replace accountability.

Users need explanations, appeal, correction, and human support when automated systems make harmful decisions.

In payments, automation without recourse is dangerous.

## **Fraud in the real-time era**

Fraud will become one of the defining challenges in the next payment era.

As payment systems become faster, scammers will adapt to them. Real-time payment systems reduce the time available for detecting and reversing suspicious transactions. Social engineering may become increasingly sophisticated. Fraudsters may exploit QR codes, fake apps, impersonation, deepfakes, malware, mule accounts and cross-border flows.

This means that fraud control must become more intelligent and user-centered.

Future fraud systems may require the following:

- ☐ confirmation of payee
- ☐ real-time risk scoring
- ☐ transaction limits
- ☐ scam warnings
- ☐ delayed execution for high-risk transfers
- ☐ shared fraud intelligence

- ☐ stronger account-opening controls
- ☐ mule-account detection
- ☐ user education
- ☐ clearer liability rules

However, fraud prevention must also avoid making payments unusable.

The best systems will use smart friction: simple payments will stay simple, risky payments will receive extra checks.

## **Data governance as payment governance**

The next phase of payments will be shaped by data governance.

As payments become embedded, real-time, and platform-based, transaction data become more valuable. Payment data may be linked to identity, location, shopping behavior, credit models, social graphs, loyalty systems, and public services.

This creates opportunities and risks.

The opportunities include better fraud control, more useful financial tools, improved public delivery, and more personalized services.

The risks include surveillance, manipulation, exclusion, over-profiling, and data concentration.

Therefore, payment governance must include the following:

- ☐ data minimization

- ☐ purpose limitation
- ☐ user consent
- ☐ retention limits
- ☐ transparency
- ☐ cybersecurity
- ☐ restrictions on harmful data sharing
- ☐ accountability for automated decisions
- ☐ privacy-by-design principles

In the subsequent phase, the establishment of trust will be contingent not only upon the receipt of financial resources but also on the responsible management of data.

## **Resilience and fallback design**

As digital payments become more important, resilience becomes more important.

Payment systems must continue to function during stressful situations. Stress may arise from cyberattacks, power failures, telecommunications outages, cloud disruptions, natural disasters, bank failures, conflicts, or technical errors.

A resilient payment system does not assume perfect conditions for its operation.

It includes redundancy, backup rails, incident response, offline options, public communication plans, and fallback instruments, such as cash.

This is especially important in highly digital societies such as Japan. The more people depend on digital payments, the more serious the outages become.

The future payment system must be designed to degrade. If one channel fails, another should be available. If mobile data fail, some offline or alternative processes should exist. If an app fails, users should have another way to pay for parking.

An efficiency without redundancy is fragile.

## Central bank digital currencies and public money

Central bank digital currencies (CBDCs) are often discussed as part of the future of payments.

A CBDC is a digital form of central bank currency. In theory, this could support digital payments with public backing. Some countries are studying or testing CBDCs for retail payments, wholesale settlements, cross-border transfers, and financial inclusion.

The future of the CBDCs remains uncertain. In some markets, strong and fast payment systems may reduce the need for retail CBDCs. In addition, CBDCs may be explored for resilience, inclusion, or monetary sovereignty.

The key question is not whether CBDCs are fashionable. The key question is what problems they solve.

- ☐ Do they improve access?
- ☐ Do they reduce cost?
- ☐ Do they increase resilience?
- ☐ Do they protect privacy?
- ☐ Do they improve cross-border payment?

- ☐ Do they compete with or complement the existing rails?

CBDCs should be judged by their practical public value, not by novelty.

## Public infrastructure and private interfaces

The next phase will likely involve continued tension between public infrastructure and private interfaces.

Public infrastructure can provide interoperability, trust, low-cost access, and resilience. Private firms can provide user-friendly designs, innovations, customer support, loyalty programs, and merchant tools.

The strongest model may often be a hybrid one: public or interoperable rails combined with competitive, private services.

This model can reduce fragmentation while preserving innovation.

However, this requires careful governance. Public rail systems must remain reliable and inclusive. Private interfaces must be held accountable. Access rules must be fair and equitable. Data usage must be controlled. Fraud responsibility must be clearly defined.

The question is not whether the data is public or private. The question is which functions are best handled as shared infrastructure and which are best left for competitive innovation.

## Inclusion in the next phase

Inclusion must remain the central focus.



As payments become more advanced, they may become more difficult for some users to navigate. Embedded finance, digital identity, AI fraud systems, subscription payments, cross-border applications, and biometric authentication may create new barriers.

Therefore, the next phase must avoid designing only for ideal users.

Payment systems should work for people with basic phones, weak connectivity, low literacy, disabilities, limited documentation, shared devices, and low tolerance for financial errors.

Inclusion in the future will require the following:

- ☐ simple interfaces
- ☐ assisted onboarding
- ☐ low-cost access
- ☐ local languages
- ☐ accessibility standards
- ☐ cash-in and cash-out options where needed
- ☐ customer support
- ☐ fraud education
- ☐ clear dispute resolution
- ☐ cash or fallback alternatives

A payment future that excludes vulnerable users is not progress at all. This is a selective modernization.

## The strategic importance of payments

Payments have become a strategic layer of the economy.

They influence commerce, public policy, financial inclusion, platform power, data governance, consumer behavior, and economic resilience. They shape who can sell, subscribe, receive support, remit, and build a transaction history.

This strategic importance means that payment debates will become more political.

Countries will ask who controls the payment rails. Regulators will ask how the data are used. Merchants will ask who sets the fees. Consumers ask who protects them from fraud. Governments will ask how payments support the state's capacity. Central banks will question how public money should function in a digital economy.

Digital payments are no longer a narrow banking topic. They are part of the national infrastructure, economic policy, and social design.

## What to watch next

Several developments are expected to shape the next phase of digital payments.

First, domestic real-time payments will continue to grow. More countries will build or improve their fast payment systems.

Second, cross-border interlinking is becoming increasingly important. Users expect international payments to be as smooth as domestic payments.

Third, fraud control will become more sophisticated. Scam prevention, mule-account detection, and confirmation tools will become central to this process.

Fourth, payment data governance will become a major policy concern. Users and regulators will ask how transaction data are used.

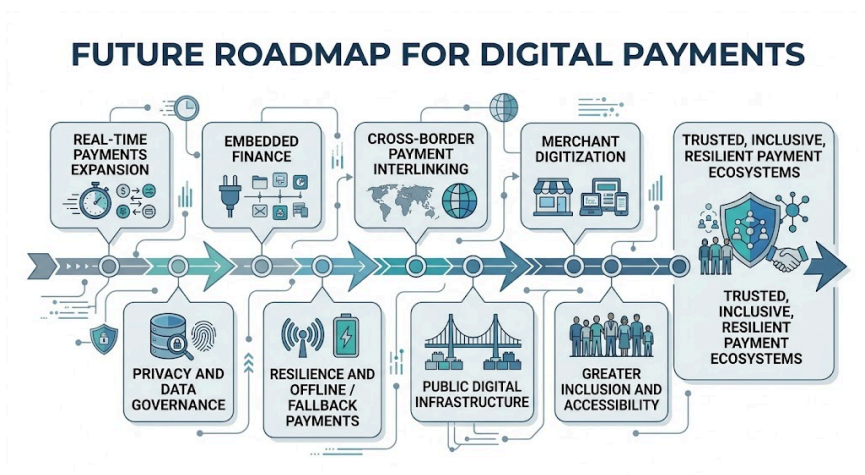
Fifth, embedded finance will continue to grow in the future. Payments will become more integrated into platforms, commerce, payrolls, and public services.

Sixth, resilience will become a public priority in the future. Outages and cyber risks will force countries to rethink their redundancy.

Seventh, inclusion gaps remain. Digital payment growth does not automatically serve everyone.

Therefore, the next phase will be defined not by one technology but by how societies combine speed, trust, data, governance, and resilience.

### **Figure 10.1: Future Roadmap for Digital Payments**



*Figure 10.1 Future Roadmap for Digital Payments. The next phase of digital payments will be shaped by real-time rails, embedded finance, cross-border interlinking, fraud control, data governance, resilience and inclusion.*

*Source note: Author-created roadmap based on the chapter's synthesis of emerging digital payment trends and policy priorities.*

### Key Insight

The next phase of payments is not simply about making transactions faster. It is about making payment systems more embedded, interoperable, resilient, secure, and accountable.

### Chapter takeaway

The future of digital payments will not be defined by speed alone.

Payments will become more embedded, real-time, data-rich, cross-border, and connected to broader financial services. This creates enormous opportunities. It can improve

commerce, inclusion, public delivery, remittances and business efficiency.

However, it also creates new responsibilities.

The next generation of payment systems must protect users from fraud, govern data responsibly, support cross-border usability, preserve resilience, and include people who do not fit the ideal digital user profile.

The strongest payment futures will combine public infrastructure with private innovation, speed with recourse, data with restraint and convenience with resilience.

The future of payments is not simply cashless. It is trustworthy, inclusive, interoperable, and resilient.

## **Transition to Chapter 11**

The future roadmap shows that cross-border payments are one of the largest unfinished challenges in the digital economy. Domestic payment systems have improved rapidly, but international transfers remain costly, slow, and fragmented in many corridors. Chapter 11 examines cross-border payments and remittances as one of the most important remaining problems in the global digital payment economy.

# Chapter 11

## Cross-Border Payments, Remittances, and the Unfinished Global Problem

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### **The border is where payment friction still hides**

Domestic payment systems have improved dramatically in several countries. A person can instantly send money to a friend, pay a merchant by scanning a QR code, settle a bill through a mobile app, or receive funds into a wallet within seconds.

However, the experience changes when money crosses borders.

A payment that feels simple within a country can become slower, more expensive, and less transparent when it moves internationally. The sender may not know the exact exchange rate. The fee may be unclear. The delivery time may vary. Receiving households may need to travel to collect funds. The transfer may pass through several intermediaries before it reaches its destination.

This is one of the clearest unfinished problems in the global payments system.

The world has made major progress in domestic digital payment systems. Cross-border payments have improved but not at the same pace. The gap between domestic speed and international friction remains significant.

This is important because cross-border payments are not niche issues. They affect migrant workers, students, families, freelancers, exporters, travelers, small businesses, charities, and global platforms alike. For millions of households, remittances are not optional but a necessity. They are part of the survival process.

Therefore, a credible digital payment future must solve for borders, not only for storefronts.

## **Why cross-border payments are difficult**

Cross-border payments are difficult because they cross multiple systems simultaneously.

Domestic payments usually operate within one currency, legal system, regulatory environment, identity framework, and settlement infrastructure. International payments cross all these boundaries.

Cross-border payments may involve:

- ☐ different currencies
- ☐ foreign exchange conversion
- ☐ sending and receiving banks
- ☐ payment service providers
- ☐ correspondent banking relationships

- ☐ sanctions screening
- ☐ anti-money-laundering checks
- ☐ different consumer-protection rules
- ☐ different data-sharing requirements
- ☐ settlement timing differences
- ☐ messaging standards
- ☐ local cash-out or payout networks

Each layer can add costs, delays, uncertainties, or risks.

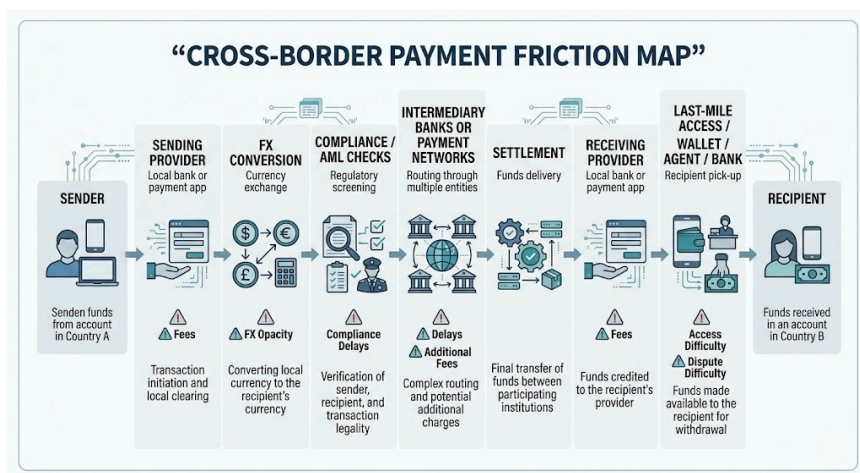
For large corporations, these frictions may be manageable because they have banking relationships, treasury teams, and negotiation powers. For ordinary households and small businesses, these costs are much more burdensome.

A migrant sending a small amount of money home cares about four things: cost, speed, certainty, and trust. If the fee is high, the exchange rate is poor, or the payment arrives late, the household receives less support than expected.

Therefore, cross-border payment inefficiency is not just a technical weakness. This poses a social and economic burden.

### **Figure 11.1: Cross-Border Payment Friction Map**





*Figure 11.1: Cross-Border Payment Friction Map — Cross-border payments face multiple layers of friction, including currency conversion, compliance, intermediaries, settlement delays, foreign exchange opacity, and last-mile access challenges.*

*Source note: Author-created illustration based on World Bank remittance materials, BIS cross-border payment research, and the chapter's synthesis of common cross-border payment friction.*

## Remittances are deeply human payments

Cross-border payments are often discussed in terms of banking infrastructure. However, remittances are deeply human.

Remittances may be used to pay for a child's school fees.

It may support food and rent expenses.

It may cover medical expenses as well.

It may help families recover after a flood, illness, or job loss.

It may help parents, spouses, children, or siblings stay financially connected across distances.

For migrant workers, remittances are often an expression of responsibility and care for their families. For receiving households, remittances can be a lifeline.

This is why remittance costs are significant. A small percentage fee may look modest in financial reports, but for a low-income household, it can mean the difference between paying a bill and delaying it.

The social importance of remittances makes cross-border payment reform a significant development issue.

When remittances become cheaper, faster, and more transparent, more money reaches the households. When they remain expensive and opaque, the cost is borne by some of the people least able to absorb it.

## **The cost problem**

The cost of sending money internationally has declined in many corridors, but it remains high in some.

Costs may include:

- ☐ visible transfer fees
- ☐ foreign exchange margins
- ☐ receiving fees
- ☐ cash-out fees
- ☐ bank charges
- ☐ intermediary fees
- ☐ poor exchange-rate transparency
- ☐ travel cost to send or receive money

The advertised fee is often not the full cost of the service. Exchange rate margins can conceal a significant portion of the price. A service may advertise a low fee but offer a worse exchange rate than its competitors. Users may struggle to compare the options.

This creates transparency problems.

For remittance users, the most important price is not only the fee. It is the total amount the recipient receives after all charges and conversion effects are applied.

A good cross-border payment system should clearly show users the following:

- ☐ How much will be paid?
- ☐ What exchange rate is being used?
- ☐ What fees apply?
- ☐ When will the recipient receive money?
- ☐ How will the recipient access it?
- ☐ What happens if something goes wrong?

Transparency is a part of trust.

## **The speed problem**

Speed is another major challenge in this field.

Domestic fast payments have increased expectations. If a person can send money instantly within one country, they naturally wonder why an international transfer takes more time.

Some delays were caused by compliance checks. Some are caused by settlement arrangements. Some are caused by intermediary banks. Some are caused by local payout processes. Some are caused by operating hours, time zones, and batch processing.

For users, the reason may not be important. They simply experienced uncertainty.

This uncertainty is most important when money is urgently required. Remittances for medical treatment, emergency travel, school deadlines, or food support cannot always wait.

Faster cross-border payments would not only improve convenience. This would improve household resilience.

## **The certainty problem**

Cross-border payments can fail in many ways.

The recipient's name may not match the original.

The bank may reject the transfer.

Compliance checks may delay processing.

The sender may enter incorrect information.

The receiving institution may have limited operating hours.

However, a payout agent may lack cash.

A wallet or bank may be temporarily unavailable.

When this occurs, users require clear information and support.

Uncertainty is one of the most frustrating aspects of cross-border payments. The sender may not know whether the money is delayed, rejected, under review, or already available. Recipients may not know where to collect funds or when they will arrive.

Certainty implies more than speed. This implies predictable delivery, clear status tracking, and reliable recourse.

A slower payment with a clear status may create less anxiety than a faster payment with poor communication.

## **The access problem**

Cross-border payments depend on both the sending and receiving sides.

A migrant worker may send money through a digital channel, but the receiving household may need to access funds through a bank, mobile wallet, agent, cash pickup point, or a merchant network.

If the receiving area has limited infrastructure, payments remain difficult.

The recipient may need to travel.

Agents may lack cash.

However, wallets may not be widely accepted locally.

The bank branch may be far away from the customer.

The recipient may not have formal identification.

The recipient may not understand the digital interfaces.

This means that international payment reform must include last-mile access.

A cross-border payment is only successful when the recipient can use the money.

## **Digital remittances and their promise**

Digital remittance channels can improve this experience.

They allow senders to initiate transfers from a phone instead of visiting a physical agent. They can reduce travel time. They can provide better tracking. They can sometimes reduce costs. They can link funds directly to bank accounts, wallets or mobile money systems.

Digital remittances also create such records. These records can help households track incoming funds and support broader financial use.

However, digital remittances are not automatically low-cost or inclusive.

Users may still face exchange rate margins, cash-out fees, poor customer support, limited payout options, or platform lock-in. However, some corridors remain expensive. Some recipients remain dependent on cash pickups. Some users may lack digital literacy.

Digital remittances are a major improvement, but they are not a complete solution unless they are affordable, transparent, accessible, and trustworthy.

## **Mobile money and remittance access**

Mobile money has been especially important for remittances in certain markets.

If a recipient can receive funds directly into a mobile wallet, the payment may be faster and more convenient. The recipient may not need to travel to a bank branch to receive the funds. Funds may be used for transfers, bill payments, merchant payments, or cash-out through such agents.

This can be particularly valuable in rural or low-infrastructure settings.

However, the quality of the mobile money ecosystem is important. If agents are unreliable, fees are unclear, or merchant acceptance is limited, recipients may still face friction.

An ideal remittance experience connects cross-border transfers with domestic usability. Money should not only

arrive digitally. It should be usable digitally or convertible into cash, conveniently and safely.

## **Small businesses and cross-border payments**

Cross-border payments are also important for small businesses.

A small exporter may need to receive payments from international buyers. Freelancers may work for clients abroad. Digital creators may receive income from global platforms. A small supplier may pay for imported input. A family business can sell online across borders.

For these businesses, slow or costly cross-border payments reduce their competitiveness.

Large firms often have better banking access, foreign exchange arrangements, and payment methods. Small firms may face high fees, unclear pricing, compliance friction and limited support.

If cross-border payments become faster and cheaper, small firms can participate more easily in global commerce.

This is why cross-border payment reform is not only about migrant remittances. It also concerns small-business inclusion in the global digital economy.

## **Why domestic success is not enough**

India's UPI, Brazil's Pix, and other domestic fast payment systems show how quickly digital payments can improve within national borders. However, domestic success does not automatically solve international payments.

A domestic payment rail may be fast, low-cost, and widely used in the country. However, once money crosses into

another country, the payment must interact with another legal system, currency, compliance framework, and settlement environment.

Therefore, the next frontier is interconnection.

If domestic fast payment systems can connect safely and efficiently, cross-border payments could become more like domestic payments: faster, clearer, and cheaper.

However, this is difficult because the problem is not only technical. It is institutional.

Countries must agree on standards, risk management, settlement, consumer protection, foreign exchange, data sharing, and liabilities.

Cross-border payments require cooperation from multiple parties.

## **Interlinking fast payment systems**

Interlinking fast payment systems is one of the most promising directions for cross-border reforms.

The idea is to connect domestic instant payment systems so that users can send money across borders more directly and conveniently. Instead of relying on long chains of correspondent banks, payments can move through linked rails.

This could improve speed and reduce costs, especially for low-value payments.

However, interlinking requires careful design.

It must address:

- ☐ technical messaging standards
- ☐ foreign exchange conversion



- ☐ settlement finality
- ☐ compliance screening
- ☐ data protection
- ☐ fraud monitoring
- ☐ customer support
- ☐ dispute resolution
- ☐ operational resilience
- ☐ legal jurisdiction
- ☐ participation rules

If these issues are not resolved, interlinking may pose new risks.

Cross-border instant payments are useful only if users are protected and institutions understand their responsibilities.

## **Foreign exchange transparency**

Foreign exchange is one of the most important components of cross-border payment costs.

A user may focus on the transfer fee, but the exchange rate can be equally important. If a provider offers a poor exchange rate, the recipient receives less money.

Therefore, transparent pricing is essential.

Users should be able to compare providers based on the final amount received and not only the stated fee.

A fair cross-border payment experience should be as follows:

- ☐ exchange rate used
- ☐ margin compared with market rate
- ☐ sender fee
- ☐ recipient fee
- ☐ expected delivery time
- ☐ final amount received
- ☐ refund or dispute process

Without this transparency, competition is weaker because users cannot easily compare the true costs.

## **Compliance and inclusion**

Cross-border payments must comply with anti-money laundering rules, sanctions requirements, fraud controls, and consumer protection standards.

These rules are important. They help prevent crime, terrorism financing, fraud and abuse.

However, compliance can also create exclusion if it is too rigid or poorly designed.

Migrants, refugees, informal workers, and low-income users may lack conventional documentation. Small businesses may struggle with compliance with paperwork. Transfers may be delayed or rejected without a clear explanation.

The challenge is to ensure compliance without making legitimate low-value payments unnecessarily difficult.

Risk-based approaches are important. A small remittance should not always face the same burden as a complex, high-risk transaction. Proportional regulation can improve access while preserving the safety of the public.

## **The role of public institutions**

Public institutions play an important role in improving cross-border payments.

Central banks, regulators, international organizations, and payment authorities can support standards, interoperability, transparency, consumer protection, and settlement arrangements.

Private providers can innovate user experience and distribution, but cross-border payment reform often requires public coordination.

This is because no single private provider can solve all institutional issues alone. Cross-border payments involve multiple countries, currencies, rules, and infrastructure.

Public institutions can help create conditions for competition and trust.

## **The role of competition**

Competition can lower prices and improve the quality of services.

If users have multiple reliable options, providers must compete on cost, speed, transparency, and customer experiences. Digital providers can challenge older, high-cost channels.

However, competition works only when users can compare options. Hidden fees and opaque exchange rates weaken the competition.

Interoperability is also important. If users are locked into a platform or payout network, competition remains limited.

A better cross-border payment market requires transparency, accessibility, and portability.

## **Consumer protection in cross-border payments**

Consumer protection is more difficult across borders because the responsibility is spread across multiple institutions and jurisdictions.

If something goes wrong, the sender may contact one provider, while the recipient deals with another. Payments may pass through several intermediaries. However, the rules may differ between countries.

This makes dispute resolution difficult for the parties involved.

A strong cross-border payment system should provide:

- ☐ clear receipts
- ☐ transaction tracking
- ☐ transparent fees
- ☐ clear delivery expectations
- ☐ accessible support
- ☐ complaint escalation
- ☐ refund rules
- ☐ fraud reporting

- ☐ liability clarity

Users should not require expert knowledge to resolve ordinary payment problems.

Consumer protection should be included with the payment.

## **Cross-border payments and financial inclusion**

Cross-border payments are central to financial inclusion because many excluded or underserved users live across economic borders.

- ☐ Migrants send money home.
- ☐ Families depend on international support to survive.
- ☐ Small businesses sell products across borders.
- ☐ Students receive funds from abroad to support their studies.
- ☐ Workers participate in the global labor market.
- ☐ Freelancers earn money through international platforms.

If cross-border payments are expensive or unreliable, users face barriers to participation.

Therefore, improving cross-border payments can support household welfare, small-business growth, and global economic inclusion.

The inclusion agenda should not stop at domestic access to the Internet. It must include international money movements.

## **What better cross-border payments would look like**

A better cross-border payment system has several features. This would be transparent. Users will know the full cost

before sending. It would be faster. Funds would arrive in minutes or hours, not days, wherever possible. This is predictable. Users will receive clear status updates.

It would be affordable. Low-value transfers are not penalized by high fixed costs. It would be accessible. Recipients can receive funds through accounts, wallets, agents, or other usable channels. It would be safe. Fraud controls and compliance systems would protect users without unnecessarily blocking legitimate payments.

This would be interoperable. Domestic payment systems would be more effectively connected across borders. This would be accountable. Users would have recourse if something went wrong. This is the direction in which cross-border payments must move.

## **Why this problem remains unfinished**

Cross-border payments remain unfinished because they are not only a technological problem.

This is a coordination problem.

This poses a regulatory challenge.

They are foreign exchange problems.

This is a trust problem.

They are consumer protection problems.

They are a last-mile access problem for the user.

This is a governance problem.

This is why progress is slower than that of domestic payment innovation. A domestic payment system can be improved by a single country. A cross-border system requires cooperation across borders.

However, the importance of the problem makes it worth solving.

As migration, digital work, online commerce, and global platforms expand, cross-border payments will become increasingly central to economic life.

**Table 11.1: Cross-Border Payment Frictions and Design Responses**

| Friction                           | Why It Matters  | Design Response   |
|------------------------------------|---|---|
| High fees                          | Reduces money received by families and small businesses | Transparent pricing, competition, low-cost digital channels |
| Poor foreign-exchange transparency | Hidden exchange-rate margins increase true cost         | Show final amount received and exchange-rate margin         |
| Slow delivery                      | Weakens household resilience and business confidence    | Faster settlement, linked rails, improved processing        |
| Compliance delays                  | Can block or delay legitimate transfers                 | Proportional risk-based controls                            |
| Weak last-mile access              | Recipients may struggle to receive or use funds         | Wallets, accounts, agents, cash-out networks                |
| Poor dispute handling              | Users lack support when payments fail                   | Clear tracking, complaint channels, liability rules         |
| Fragmented systems                 | Domestic rails do not connect well internationally      | Interlinking fast payment systems and common standards      |

### **Key Insight**

A country can have excellent domestic digital payments and still participate in a fragmented global payment system. The next stage of payment progress requires solving cross-border costs, speed, transparency, and recourse.

## **Chapter takeaway**

Cross-border payments remain one of the most important unfinished problems in the digital payment economy today.

Domestic payments have become faster and more convenient in many countries; however, international payments often remain costly, slow, opaque, and difficult to resolve when problems arise.

Remittances demonstrate why this is important. For many households, cross-border transfers are not luxurious services. They support food, rent, education, healthcare, and resilience.

The future of digital payments will be incomplete unless international low-value payments are made more affordable, transparent, accessible, and trustworthy.

A truly inclusive payment system must work across apps and banks, as well as across borders.

## **Transition to Chapter 12**

Cross-border payments show why payment systems cannot be evaluated solely by speed or technology. Rules, liability, transparency, access, and consumer protection are equally important. Chapter 12 focuses on regulation, consumer protection, and the politics of payment design.



## Chapter 12

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### Regulation, Consumer Protection, and the Politics of Payment Design

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#### **Payment systems are not only technical systems**

Payment systems are often described in technical terms such as rails, wallets, APIs, settlement, authentication, tokenization, clearing, and interoperability. These details matter. However, this is not the whole story.

Once a payment system becomes part of everyday economic life, it becomes more than just a technology. It becomes a public-interest infrastructure.

This is because payment systems decide who can participate, how money moves, what records are created, who controls access, who pays fees, how fraud is handled, and what happens when the system fails.

A payment system may appear to be a neutral tool, but its design choices distribute power.

- ☐ If the fees are high, small merchants may suffer.
- ☐ If the identity rules are strict, undocumented users may be excluded.
- ☐ If data rules are weak, users may lose their privacy.
- ☐ If fraud liability is unclear, victims may be abandoned by the authorities.
- ☐ If access is restricted, competition may weaken.
- ☐ If fallback options disappear, resilience may also decline.

Therefore, regulation is not merely a constraint on payment innovation. Good regulation is part of what makes payment systems trustworthy.

## Why payment design is political

Payment design is political because it affects the interests of various stakeholders.

- ☐ Consumers desire convenience, safety, privacy, and recourse.
- ☐ Merchants desire low fees, fast settlements, and predictable rules.
- ☐ Banks require stable deposits, customer relationships, and risk control.
- ☐ Fintechs want access to rails, data, scale and innovation space.
- ☐ Governments seek formalization, public delivery, resilience, and oversight.
- ☐ Regulators seek safety, competition, inclusion, and systemic stability.

These goals often overlap but can also conflict.

- ☐ A system that is excellent for consumers may be costly for the merchants.
- ☐ A system that improves state visibility may reduce privacy issues.
- ☐ A system that supports open access may increase operational risks.
- ☐ A system that maximizes speed may increase fraud loss.
- ☐ A system that reduces fees may weaken certain business models.
- ☐ A system that strongly protects users may increase provider compliance costs.

Payment regulation is the art of balancing these tensions.

A perfect solution is rarely available. However, there are better and worse trade-offs.

## **Consumer protection as trust infrastructure**

Consumer protection is sometimes considered a compliance requirement. Digital payments are more than that. This is a trusted infrastructure.

Users are more likely to adopt digital payment methods when they believe that the system will protect them. They need to know that mistakes can be corrected, fraud can be reported, fees are clear, and support is available to them.

This is particularly important for new users. A person using digital payments for the first time may be anxious about sending money to the wrong recipient, losing access to their account, or being scammed. If the system provides clear guidance and fair recourse, trust increases. If the user feels abandoned after a problem, trust collapses.

Consumer protection should cover the full payment journey.

- ☐ onboarding
- ☐ fee disclosure
- ☐ authentication
- ☐ transaction confirmation
- ☐ receipts
- ☐ error correction
- ☐ fraud reporting
- ☐ dispute resolution
- ☐ refunds where appropriate
- ☐ account recovery
- ☐ complaint escalation
- ☐ data protection

A payment system is not trustworthy merely because it processes transactions correctly most of the time. It becomes trustworthy when it handles failures fairly.

### **The importance of clear fees**

Fees are one of the most important consumer protection issues.

Digital payments may appear free to users, but costs may appear elsewhere. Merchants may pay fees. Users may face withdrawal charges. Cross-border payments may include foreign exchange margins. Wallets may charge for specific

services. Small merchants may face settlement or device costs issues.

Unclear fees weaken this trust.

Users and merchants should know:

- ☐ What is the payment cost?
- ☐ Who pays the fee?
- ☐ When is the fee charged?
- ☐ Is the exchange rate fair?
- ☐ Are there any withdrawal or cash-out charges?
- ☐ Are there any subscription or service charges?
- ☐ Can fees change later?

Transparent pricing helps users make informed decisions. It also improves competition because providers must compete on real costs rather than hidden charges.

Even small fees can matter for low-income users and small merchants. A payment system that is technically accessible but economically expensive may not be inclusive.

## **Fraud liability and responsibility**

Fraud is one of the most difficult regulatory challenges in digital payments.

When money is stolen through unauthorized access, responsibility may be easier to define. However, when users are manipulated into authorizing payments, the responsibility becomes more complex.

- ☐ Should the user bear the loss because they approved the payment?
- ☐ Should the bank bear some responsibility because it failed to detect the risk?

- ☐ Should the payment app be responsible for issuing weak warnings?
- ☐ Should the receiving institution be responsible for the mule accounts?
- ☐ Should liability depend on the transaction type, warning quality, or user behavior?

There is no simple, universal answer to this question. However, unclear liability is dangerous.

If users believe that they have no protection, they may avoid digital payments. If providers bear unlimited liability, they may restrict access or increase the costs. If fraudsters can exploit the gaps between institutions, scams will grow.

Good regulation should clarify responsibilities across the ecosystem. It should also encourage prevention, not just compensation after harm occurs.

Useful tools include:

- ☐ confirmation of payee
- ☐ scam warnings
- ☐ transaction monitoring
- ☐ mule-account detection
- ☐ risk-based limits
- ☐ suspicious-transfer delays
- ☐ customer education
- ☐ rapid reporting channels

☐ shared fraud intelligence

☐ clear liability rules

Fraud governance must match the payment speed. Instant payment requires instant vigilance.

## **Dispute resolution and recourse**

A digital payment system must provide a clear recourse when things go wrong.

Disputes may involve failed payments, duplicate charges, unauthorized transfers, scams, incorrect recipients, merchant non-delivery, account lockouts, delayed refunds, or unclear fees.

If users cannot resolve problems, their confidence declines.

A good dispute process should include the following:

☐ easy to find

☐ simple to understand

☐ available in local languages

☐ accessible to low-literacy users

☐ time-bound

☐ transparent

☐ fair

☐ documented

☐ escalatable

Dispute design is crucial for vulnerable users. A complicated digital complaint form may not be sufficient. Some users require human support, assisted channels, or local help.

Recourse is part of inclusion. A person is not truly included in a digital payment system if they can use it only when everything goes perfectly well.

## **Data governance and privacy**

Digital payments create detailed records of transactions. This makes data governance a central issue in payment regulation.

Payment data can reveal sensitive patterns such as income timing, purchases, travel, medical spending, religious giving, political donations, debt stress, family support, and merchant relationships.

This data has value. It can assist with fraud detection, budgeting, credit assessment, financial planning, and public policy. However, it can also be misused.

Payment regulations should address the following:

- ☐ what data is collected
- ☐ why it is collected
- ☐ how long it is stored
- ☐ who can access it
- ☐ whether it can be shared
- ☐ whether it can be sold
- ☐ whether it can be combined with other data



- ☐ how users are informed
- ☐ how users can correct errors
- ☐ how automated decisions are governed

A strong digital payment system should practice data restraint. It should collect what is needed for safety, settlement, compliance, and service quality but avoid unnecessary extraction.

Privacy is not an obstacle to trust. This is one of its foundations.

## Interoperability and competition

Interoperability is a regulatory issue as well as a technical one.

If payment systems are closed, users and merchants may be locked into different ecosystems. Merchants may require multiple QR codes. A user may require several apps. Smaller providers may struggle to compete with larger ones. Dominant platforms may control the access.

Interoperability can reduce these problems. This allows different providers to connect through shared rails, standards, or rules. It supports competition at the service layer while preserving the common payment functionality.

However, interoperability must be carefully designed. Open access can increase innovation, but it may also increase risks if weak providers connect to critical infrastructure without proper controls.

Good regulation should balance openness and safety.

This may involve:

- ☐ fair access rules
- ☐ technical standards
- ☐ licensing requirements
- ☐ risk-based supervision
- ☐ cybersecurity requirements
- ☐ consumer-protection obligations
- ☐ dispute rules
- ☐ settlement safeguards

A payment system becomes a public infrastructure when it allows broad participation without sacrificing trust.

### **Public rails and private innovation**

Many successful digital payment ecosystems combine public infrastructure and private innovation.

Public or central bank-supported rails can provide interoperability, reliability, and trust. Private firms can provide user-friendly applications, merchant tools, customer service, analytics, and innovative services.

This hybrid model can be powerful.

- ☐ The public layer reduces the fragmentation.
- ☐ The private layer improves the user experience.
- ☐ The regulatory layer protects the users.
- ☐ The market layer encourages innovation.

However, this balance is delicate.

- ☐ If public systems are too rigid, innovation may slow down.
- ☐ If private systems completely dominate, fees and data power may concentrate.
- ☐ If regulations are weak, fraud and exclusion may increase.
- ☐ If access rules are unclear, competition may be affected.

The best payment ecosystems define which functions should be shared infrastructure and which should be competitive.

Core settlement, interoperability, and basic access often have public interest characteristics. Front-end design, merchant services, loyalty, analytics, and customer experience may be better served through competition.

The key is to align public values with private creativity.

## **Resilience as a regulatory responsibility**

Resilience should not be left to chance.

As digital payments become essential, outages become public issues. If people cannot pay for food, fuel, transportation, medicine, or basic services, payment failure becomes more than an inconvenience.

Payment resilience includes the following:

- ☐ technical redundancy
- ☐ backup systems
- ☐ cyber preparedness
- ☐ telecommunications coordination

- ☐ cloud risk management
- ☐ incident response
- ☐ settlement continuity
- ☐ public communication
- ☐ cash availability
- ☐ offline or alternative payment options

Regulators should require critical payment providers to develop contingency plans for potential failures. Systems should be tested not only for normal operation but also for stress.

A resilient payment ecosystem should degrade in a graceful manner. If one channel fails, another should be available.

The more digital a society becomes, the more seriously it must consider fallback design.

### **Cash access and public preparedness**

Cash access remains a part of the regulatory debate in many countries.

Even when cash use declines sharply, cash remains important for resilience, inclusion, privacy, and emergency preparedness. The question is not whether cash should dominate daily payment. The question is whether societies should preserve sufficient cash access to protect users when digital systems fail or exclude them.

Cash access may require the following:

- ☐ ATM availability

- ☐ cash distribution planning
- ☐ merchant acceptance rules in some contexts
- ☐ emergency cash arrangements
- ☐ protection for vulnerable users
- ☐ public communication about fallback options

A cash-light society may still require cash for public preparedness.

Regulations should avoid both extremes. This should not prevent the growth of digital payments. However, it should not be assumed that every user can safely depend only on digital payments.

### **Inclusion as a measurable obligation**

Inclusion should not be left to the marketing language.

Providers may claim to support inclusion because their apps are available to everyone. However, availability is not the same as usability.

Regulators and policymakers should ask more difficult questions:

- ☐ Can low-income users afford the system?
- ☐ Can rural users access it?
- ☐ Can elderly users understand this?
- ☐ Can disabled users use it?
- ☐ Can migrants or undocumented users board?
- ☐ Can small merchants affordably accept payments?
- ☐ Can users obtain assistance when something goes wrong?

- ☐ Can people use the system with a weak connectivity?
- ☐ Are women and marginalized groups actually using these services?

Inclusion should be measured through real usage, complaint data, access gaps, affordability and user outcomes.

A payment system is inclusive only when people can use it safely, repeatedly, and confidently.

## The politics of identity

Digital identity is increasingly associated with digital payments.

Identity can reduce fraud, simplify onboarding, support compliance, and improve access to services. However, it can also exclude users who lack documents or create privacy risks when payment identity is linked too broadly across systems.

Identity design raises important policy issues.

- ☐ What documents are required?
- ☐ Can simplified accounts support low-risk users?
- ☐ How are migrants and informal workers included?
- ☐ How is biometric failure managed?
- ☐ Can users recover their accounts?
- ☐ How is identity data protected?
- ☐ Can identity systems be used for surveillance purposes?

A strict identity system may be safe but also exclusionary. A weak identity system may be inclusive but is vulnerable to fraud. Good regulation must balance both aspects.

The proportional identity rules are important. Low-risk, low-value accounts may require simpler requirements. Higher-risk services may require more robust verification.

Payment inclusion often depends on identity's flexibility.

## **The politics of merchant fees**

Merchant fees are also a political issue.

Payment providers require sustainable revenue. Merchants require affordable acceptance. Consumers want convenient payment options. Governments may want to adopt digital technologies. These interests may conflict with each other.

If the fees are too high, small merchants may resist digital payments. If fees are too low, providers may reduce their investment or shift costs elsewhere. If fees are hidden, users and merchants cannot make informed decisions.

The regulation of fees is a complex issue. Although it has the potential to enhance affordability, it may also influence market incentives. The primary objective should be to ensure transparent and equitable pricing, particularly for low-value transactions and small-scale merchants.

Merchant economics must be considered in payment regulations. A payment system cannot be considered broadly successful if small merchants participate only under pressure or at an unsustainable cost.

## **Regulating non-bank payment providers**

Non-bank providers play an increasingly important role in digital payment systems.

Fintech firms, mobile money operators, wallet providers, payment aggregators, processors, and platforms often

deliver user-facing experiences. They can improve innovation and reach more people. However, they can also create new risks.

Regulators must decide how to supervise these systems.

Important questions include the following:

- ☐ Should they directly access payment rails?
- ☐ What capital or safeguarding rules should be applied?
- ☐ How should customer funds be protected
- ☐ What are the required cybersecurity standards?
- ☐ What happens if a provider fails to comply?
- ☐ How should complaints be handled?
- ☐ How should the data be governed?
- ☐ What are the reporting obligations?

Regulating non-banks too harshly may slow down innovation. Regulating them too lightly may expose users and systems to harm.

The appropriate approach is proportionate regulation based on function and risk.

If a non-bank performs infrastructure-like functions, it should carry out infrastructure-like responsibilities.

### **Consumer education is necessary but not enough**

Many payment policies emphasize consumer education. Education is important. Users should understand scams, fees, PIN protection, transaction confirmation, and complaints channels.

However, education alone is insufficient.



A system should not depend entirely on users to avoid every mistake. Fraudsters are professionals. Interfaces can be confusing for users. People act under pressure. Low-literacy users may struggle with this. Older users may be targeted for this purpose. Emergencies reduce careful decision making.

A good design should make safe behavior easy.

Consumer education should be combined with the following:

- ☐ clear interface design
- ☐ recipient confirmation
- ☐ scam warnings
- ☐ transaction limits
- ☐ fraud detection
- ☐ dispute pathways
- ☐ liability rules
- ☐ support channels

Responsibility should be shared among users, providers, regulators, and the ecosystem.

### **Regulation should support innovation with accountability**

The purpose of regulation should not be to freeze payment innovations. Digital payments have created enormous value in the economy. Telemedicine has improved convenience,

expanded access, supported public delivery, and enabled new business models.

However, innovation without accountability can be harmful.

A balanced regulatory approach should allow new providers and models to grow while ensuring that users are protected, data are governed, and systems remain resilient.

This means that regulation should be

- ☐ technology-aware
- ☐ risk-based
- ☐ proportionate
- ☐ competition-friendly
- ☐ consumer-centered
- ☐ privacy-conscious
- ☐ resilience-oriented
- ☐ adaptable

Good regulation does not ask whether digital payment should grow. They are already growing. It asks how they should grow themselves.

## **A practical regulatory framework**

A practical framework for payment regulation should include the following eight pillars:

First, access and participation: fair rules for who can join the payment systems.

Second, consumer protection: clear fees, dispute resolution, fraud recourse, and consumer support.

Third, data governance: privacy, minimization, purpose limitations, and transparency.

Fourth, competition: interoperability, open access where appropriate, and prevention of harmful concentrations.

Fifth, resilience: backup systems, cyber preparedness, outage planning, and fallback options are required.

Sixth, merchant fairness: transparent fees, timely settlement, and protection from unfair platform dependence are required.

Seventh, inclusion of accessible design, affordability, assisted access, and real usage metrics.

Eighth, accountability: clear responsibility across banks, fintechs, platforms, regulators and public institutions.

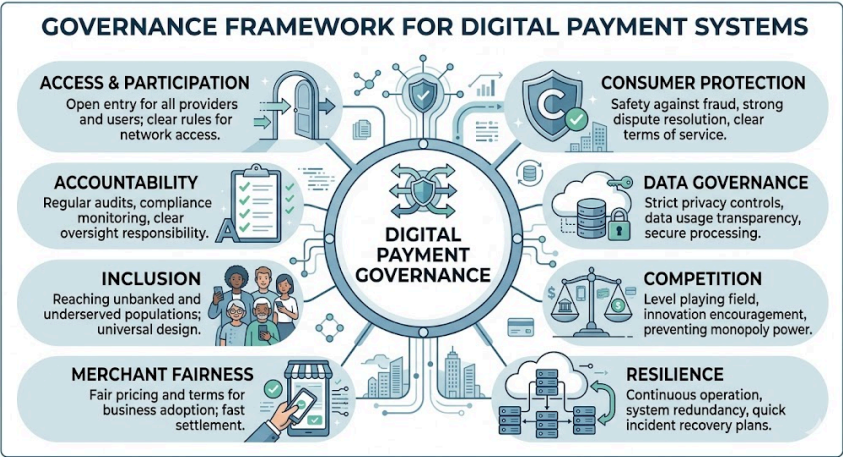
These pillars transform regulations from a compliance checklist into an infrastructure-quality framework.

**Table 12.1: Regulatory Pillars for Digital Payment Infrastructure**

| Regulatory Pillar        | Core Question                       | Practical Focus  |
|--------------------------|-------------------------------------|--|
| Access and participation | Who can join the payment ecosystem? | Licensing, fair access, non-bank participation, interoperability     |
| Consumer protection      | What happens when users are harmed? | Fee disclosure, fraud recourse, dispute resolution, account recovery |

|                   |  |   |
|-------------------|--|---|
| Data governance   | How is the payment data used?                | Privacy, minimization, consent, retention, data sharing limits        |
| Competition       | Does the system prevent the lock-in?         | Open standards, portability, anti-concentration rules                 |
| Resilience        | Can the system operate under stress?         | Cybersecurity, redundancy, incident response, fallback options        |
| Merchant fairness | Can merchants participate in sustainability? | Transparent fees, timely settlement, dispute rules                    |
| Inclusion         | Can vulnerable users access the system?      | Accessibility, low-cost access, assisted onboarding, cash coexistence |
| Accountability    | Who is responsible for the failures?         | Clear liability, supervision, reporting, escalation channels          |

**Figure 12.1: Governance Framework for Digital Payment Systems**



*Figure 12.1 Governance Framework for Digital Payment Systems. Effective digital payment governance balances innovation, inclusion,*

*consumer protection, competition, and privacy, resilience, and accountability.*

*Source note: Author-created governance framework based on the chapter's synthesis of digital payment regulation, consumer protection, and infrastructure accountability.*

### **Key Insight**

A digital payment system attains the status of public-interest infrastructure when it becomes essential to individuals' everyday activities. At this stage, elements such as consumer protection, data governance, competition, resilience, and inclusion are not peripheral issues; instead, they are integral to the system framework.

## **Chapter takeaway**

Digital payment systems are not only technical systems. These are governance systems.

They determine who can participate, what it costs, how data is used, who bears the risk, how users are protected, how merchants are treated, and how societies prepare for failure.

Good regulations do not oppose innovation. This makes innovation trustworthy.

The architecture of payment systems is a battleground where power dynamics are sculpted. As these systems weave themselves into the fabric of our daily economic activities, regulation emerges as the guardian, ensuring that this intricate dance remains balanced and fair.

Payment systems are inherently political because they influence who holds power. As these systems now play a

crucial role in our daily economic activities, regulation becomes essential.

## Transition to Chapter 13

Regulations create guardrails for trustworthy digital payments. However, practical responsibility does not rest with regulators alone. Banks, fintechs, merchants, governments, and development institutions shape whether payment systems become inclusive, resilient, and useful. The final chapter turns these ideas into practical lessons for actors building and using digital payment systems.

# Chapter 13

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## Practical Lessons for Banks, Fintechs, Merchants, and Policymakers

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### From analysis to action

Digital payments are now a part of the everyday economic infrastructure. They influence how people receive money, how merchants sell, how firms operate, how governments deliver support, and how financial systems create and maintain records.

This implies that the future of digital payments cannot be shaped by a single group.

- ☐ Banks provide trust, accounts, compliance, settlement, and financial depth services.
- ☐ Fintech firms provide speed, user experience, product innovation, and distribution services.
- ☐ Merchants determine whether digital payments are part of daily commerce.
- ☐ Governments and regulators define the rules, infrastructure, and public safeguards.
- ☐ Development institutions help ensure that inclusion is real and not symbolic.
- ☐ Consumers ultimately decide whether a system is useful enough to become a habit.

The practical lesson is that digital payments succeed when these actors work together to solve real problems. They fail when each actor optimizes only their own performance.

- ☐ A bank may build a secure infrastructure that users find difficult to navigate.
- ☐ A fintech company may build a beautiful app with weak resources.
- ☐ A merchant may accept payments but dislikes fees.
- ☐ Governments may digitize transfers without supporting last-mile access.
- ☐ A platform may make payments seamless while reducing the user's control.

A good payment ecosystem requires alignment of all stakeholders. It must be useful, affordable, safe, comprehensible, and resilient.

## **Lesson 1: Treat payments as infrastructure, not a side feature**

The first lesson is simple: payments should not be treated as minor operational functions.

For many years, payments have often been seen as back-office plumbing. Money was moved after the real business was done. This view is no longer sufficient.

Today, payments shape customer experience, business data, merchant relationships, fraud exposure, public delivery, financial inclusion and platform strategy. A failed payment can result in the loss of a customer. Slow settlement can hurt small merchants. A weak dispute process can damage this trust. A poor data policy can create privacy risks. Fragile railways can disrupt economic activities.

Therefore, organizations should treat payments as strategic infrastructure.

This means that payment decisions should involve product, risk, customer support, compliance, technology, and senior



leadership teams. Payment design is not only about processing payments. It is about trust.

## Lessons for banks

Banks remain central to payment systems, even when the user interface is controlled by fintechs, wallets, or platforms.

They hold accounts, manage settlements, support compliance, safeguard deposits, provide customer trust, and connect payments to broader financial services. However, banks can no longer assume that owning an account means owning a customer relationship.

In many digital ecosystems, customers interact more often with an app, wallet, or platform than with a bank branch. This changes the role of the banks.

Banks must become more responsive, API-ready, user-centered, and partnership-oriented.

## What banks should do

Banks should modernize their payment infrastructure to ensure that transactions are fast, reliable, and easy to integrate. Legacy systems may still work, but they can limit innovation if they are slow, closed, or difficult to connect to.

Banks should also improve their fraud monitoring. Digital fraud is increasingly behavioral and real-time. Banks require strong analytics, shared intelligence, and customer-facing warnings.

They should provide more serious support to small merchants. Small merchants require simple onboarding, predictable settlement, low-friction reconciliation, and clear

support. Treating them as marginal users is a mistake because small merchants are central to payment adoption.

Banks should also use payment data responsibly. Transaction records can support better services, but they should not be exploited in ways that weaken the trust.

Above all, banks should combine their traditional strength—trust—with modern expectations of speed and usability to improve customer experience.

## Banking takeaway

Banks that perceive digital payments as a strategic relationship layer are likely to maintain their significance. Conversely, banks that regard payments merely as traditional infrastructure with a modern interface risk losing customer engagement to providers that offer faster and more user-friendly services.

## Lessons for fintech firms

Fintech firms often excel in user experience. They identify friction, simplify onboarding, create better interfaces, and reach users that traditional institutions may overlook.

This is valuable. Many digital payment breakthroughs have come from firms willing to rethink the user experience.

However, fintech success brings responsibility. Once a payment product becomes widely used, it becomes a part of people's economic lives. Users rely on it to receive wages, pay merchants, send money home, and manage business activities.

At that point, a fintech company is not only offering a product. A trust system is operated.

## What fintechs should do

Fintech firms should be designed to build trust from the beginning. This means clear fees, visible receipts, strong fraud control, accessible support, and fair dispute processes.

They should avoid growth models that depend solely on subsidies or hidden costs. A payment product may grow quickly through incentives, but long-term trust requires a sustainable value.

Fintech companies should also carefully treat vulnerable users. A simple design is not only a marketing advantage. This is an inclusion requirement. Interfaces should be understandable to users with different literacy levels, languages, and financial confidence levels.

Data usage is another critical issue. Fintech companies often collect rich behavioral and transactional data. They should handle these data with restraint and transparency. Users should not feel that convenience comes at the cost of excessive surveillance by the company.

## Fintech takeaway

The best fintech payment firms will not be those that scale the fastest. They will combine speed, simplicity, protection, transparency, and long-term trust.

## Lessons for merchants

Merchants are where payment systems become real-time.

A payment method may be well designed, but it becomes valuable only when merchants accept it. Small shops, service providers, online sellers, restaurants, transportation

operators, market vendors, and large retailers shape payment adoption.

For merchants, the decision is not simply whether to accept digital payments or not. The real question is which payment method supports business goals without creating hidden burdens.

## What merchants should consider

Merchants should evaluate payment options across several dimensions.

- ☐ cost and fees
- ☐ settlement speed
- ☐ reliability
- ☐ customer preference
- ☐ fraud and chargeback risk
- ☐ ease of reconciliation
- ☐ integration with accounting or inventory systems
- ☐ dependence on a single platform
- ☐ quality of customer and merchant support
- ☐ data access and ownership

The cheapest payment option is not always the best if it reduces customer conversion or creates operational issues. The most popular option is not always the best if it increases dependency or weakens merchant bargaining power.

Small merchants should also treat digital payment records as business assets. Payment data can help track sales, understand seasonality, support bookkeeping, and possibly improve credit access.

However, merchants should be cautious about platform dependence. If a business relies entirely on one payment platform or marketplace, it may have limited control if fees rise, rules change, or accounts are restricted.

## **Merchant takeaway**

Merchants should treat payment acceptance as a business strategy, not just as a checkout decision. A good payment setup should improve customer access, cash flow, record keeping, and control.

## **Lessons for policymakers and regulators**

Policymakers shape the conditions under which digital payment systems grow.

They defined licensing rules, consumer protection, data safeguards, interoperability standards, fee policies, fraud frameworks, resilience requirements, and public infrastructure priorities.

Their challenge is to encourage innovation without allowing harm to the scale.

## **What policymakers should do**

Policymakers should measure payment success beyond the transaction volume. A high volume may indicate adoption, but it does not prove inclusion, fairness, or resilience.

Better measures include the following:

- ☐ active usage
- ☐ low-value transaction frequency
- ☐ rural and low-income adoption
- ☐ merchant acceptance breadth
- ☐ fraud complaint rates
- ☐ dispute resolution quality
- ☐ system uptime
- ☐ cost to users and merchants
- ☐ gender gaps
- ☐ accessibility
- ☐ trust levels
- ☐ cash-out dependence
- ☐ consumer understanding

Policymakers should also encourage interoperability, where appropriate. Closed systems may grow quickly, but they can also create fragmentation and dependency. Shared rails and standards can improve public values.

Consumer protection should be treated as an infrastructure. Clear fees, fraud recourse, complaint systems, and data protection are essential for trust.

Resilience should also be prioritized in policy-making. Payment systems should have backup plans, cybersecurity standards, crisis procedures, and fallback options in place.

## **Policy takeaway**

The best payment policy does not only ask how to increase digital transactions. It asks how to build payment systems that are inclusive, competitive, safe, privacy-aware and resilient.

## **Lessons for development institutions**

Development institutions often support financial inclusion, digital public infrastructure, mobile money, remittance reform, and government-to-person payment programs.

Their role is important because payment inclusion can fail if projects focus too much on deployment and too little on actual usage.

A payment system may be successfully launched but still not serve vulnerable users well.

## **What development institutions should do**

Development institutions should focus on lived experiences.

This means asking whether users can actually receive, understand, use and resolve problems with digital payments.

They should examine:

- ☐ phone ownership gaps
- ☐ gender differences
- ☐ documentation barriers

- ☐ shared device use
- ☐ agent reliability
- ☐ cash-out costs
- ☐ digital literacy
- ☐ accessibility for disabled users
- ☐ local language support
- ☐ fraud exposure
- ☐ grievance systems
- ☐ trust in providers
- ☐ actual active use

They should also avoid treating account registration as the main measure of success. An inactive account does not represent deep inclusivity.

Digital payment programs should be designed around the user with the greatest constraints, not the easiest to serve.

### **Development takeaway**

Inclusion is real only when people can use digital payments repeatedly, safely, affordably, and confidently under ordinary conditions.



## Lessons for governments using digital transfers

Governments increasingly use digital payments to distribute benefits, pensions, wages, refunds, subsidies, and emergency support to citizens.

This can improve the speed, transparency, and administrative efficiency. However, public digital transfers can also exclude people if the last mile is poorly designed.

A transfer is not successful when it leaves the government's account. It is successful when the intended recipient can access and use the funds.

### What governments should do

Governments should test the full delivery chain from the recipients' perspective.

- ☐ Can the recipient open or access their account?
- ☐ Is identity verification reliable?
- ☐ Can the recipient understand this notification?
- ☐ Is there a nearby cash-out or spending option?
- ☐ What happens if the authentication fails?
- ☐ Can the recipient complain or appeal the decision?
- ☐ Are agents liquid and trustworthy?
- ☐ Can women, elderly users, disabled users, and rural users access funds?
- ☐ Do fees reduce the value of the transfer?

Public transfers should also preserve the dignity of the recipients. Recipients should not have to navigate confusing systems, repeated failures, or humiliating support processes to access the money meant for them.

## Government transfer takeaway

Digital public payments should be judged by their successful use at the recipient level, not only by successful disbursement at the system level.

## Lesson 2: Design for the least confident user

One of the most practical rules in payment design is as follows:

Design for the user with the least time, confidence, connectivity, and tolerance for financial error.

- ☐ This user may be an elderly person.
- ☐ They may have a low literacy level.
- ☐ They may use shared phones.
- ☐ They may live in rural areas.
- ☐ They may fear scams.
- ☐ They may not understand banking terms.
- ☐ They may not have the money to lose.
- ☐ They may not know how to contact the support team.
- ☐ They may not speak the dominant language of the country.

If a payment system works for this user, it will likely work better for all users.

Designing for the least confident user does not mean making the systems simplistic. This means making them clear, forgiving, accessible, and safe.

This includes:

- ☐ simple language

- ☐ clear confirmation screens
- ☐ visible recipient names
- ☐ understandable receipts
- ☐ low-data functionality
- ☐ local language support
- ☐ assisted access
- ☐ fraud warnings
- ☐ easy account recovery
- ☐ human support
- ☐ dispute resolution
- ☐ accessible design for disabilities

The most advanced payment system is not the one with the most features. This is the one that works reliably for real users under imperfect conditions.

### **Lesson 3: Build trust before scale**

Many digital payment products chase the scale. Scale matters, but a scale without trust is fragile.

If a system grows quickly without strong fraud controls, support, privacy safeguards or dispute processes, problems will eventually surface. Once trust is damaged, recovery becomes difficult.

Payment trust is built through repeated successful usage. Users must see that the system works, money arrives, support responds, and problems are handled properly.

Trust-building features include the following:

- ☐ transparent fees
- ☐ reliable settlement
- ☐ transaction alerts
- ☐ scam warnings
- ☐ clear receipts
- ☐ fast support
- ☐ visible complaint channels
- ☐ privacy protections
- ☐ uptime reliability
- ☐ fair liability rules

Trust should not be treated as a brand slogan. It is an operating discipline.

## **Lesson 4: Measure quality, not only volume**

Payment ecosystems often celebrate the growth of transactions. However, volume alone is insufficient.

High-volume systems may still have weak consumer protection.

A fast-growing wallet may still have inactive accounts that are not used.

However, a popular payment method may still burden merchants.

A digital transfer program may still fail to protect vulnerable users.

Real-time rail may still expose users to scams.

A cash-light economy may remain fragile during outages.

Quality metrics are therefore essential.

Useful quality indicators include the following:

- ☐ transaction success rate
- ☐ uptime
- ☐ complaint resolution time
- ☐ fraud rate and fraud recovery
- ☐ merchant cost
- ☐ active usage
- ☐ accessibility
- ☐ user trust
- ☐ dispute outcomes
- ☐ low-value payment usage
- ☐ inclusion by income, gender, age, and region
- ☐ cash-out dependence
- ☐ resilience during outages

A payment system should be evaluated based on how well it supports public value, not only on how many transactions it processes.

## **Lesson 5: Keep merchant economics visible**

Digital payment discussions often focus on consumers' perspectives. However, merchants are equally important.

If merchants do not accept a payment method, consumers cannot use it in their daily lives. If acceptance is too costly, merchants may resist or pass the costs to customers.

Merchant economics should remain visible in the design of payments.

Important questions include the following:

- ☐ What is the cost of acceptance?
- ☐ How quickly are funds settled?
- ☐ Are fees transparent?
- ☐ Can small merchants onboard easily?
- ☐ Are disputes manageable
- ☐ Can merchants easily reconcile payments?
- ☐ Are merchants dependent on multiple platforms?
- ☐ Do payment records help in business growth?

A payment system that works for households but not for merchants will struggle to become a full infrastructure.

## **Lesson 6: Treat data as sensitive infrastructure**

Payment data are powerful.

It can support fraud prevention, credit access, financial planning, merchant analytics and public policy. However, it

can also expose personal behavior, commercial relationships, and household vulnerability.

Organizations should treat payment data as sensitive information.

This means:

- ☐ collect only what is necessary
- ☐ protect data strongly
- ☐ explain data use clearly
- ☐ limit unnecessary sharing
- ☐ control retention periods
- ☐ govern automated decisions
- ☐ provide correction and appeal mechanisms
- ☐ avoid exploitative profiling
- ☐ protect vulnerable users

Data trust will become a defining issue in digital payments.

Users may accept digital payments because they are convenient to use. They will remain loyal only if they believe that their information is handled responsibly.

#### Lesson 7: Preserve resilience and fallback options

A fully digital payment ecosystem can be efficient but also fragile.

Payment systems require fallback options.

These may include:

- ☐ cash access
- ☐ backup rails
- ☐ offline payment options
- ☐ manual contingency processes
- ☐ alternative authentication
- ☐ disaster recovery plans
- ☐ telecommunications coordination
- ☐ public incident communication
- ☐ redundancy across providers

Resilience should be designed prior to failure. It should not be improvised during crises.

This is especially important for essential payments, such as food, fuel, medicine, transportation, wages, benefits, and remittances.

A payment system that cannot handle stress is not a reliable infrastructure.

## **Lesson 8: Connect domestic success to cross-border usability**

Many countries are improving their domestic digital payment systems. However, cross-border payments are often costly and slow.

Banks, fintech companies, policymakers, and international institutions should treat cross-border usability as a strategic priority.



The important goals include:

- ☐ transparent pricing
- ☐ faster settlement
- ☐ better foreign-exchange disclosure
- ☐ linked fast payment systems
- ☐ clearer dispute processes
- ☐ lower remittance costs
- ☐ broader wallet and account interoperability
- ☐ better last-mile access

Domestic success is important, but global economic life requires international monetary movement.

A digital payment future that works only within national borders remains incomplete.

### **A practical checklist for payment ecosystem builders**

- ☐ A payment ecosystem is more likely to create broad value when it meets the following conditions.
- ☐ Users can onboard easily without excessive burden.
- ☐ Merchants can affordably accept payments.
- ☐ Fees are transparent.

- ☐ Transactions are reliable and sufficiently fast for use cases.
- ☐ The dispute processes are clear.
- ☐ Fraud controls are strong but not excessive.
- ☐ Data is protected and used responsibly.
- ☐ Systems are interoperable when public value requires it.
- ☐ Small merchants are not affected by hidden costs.
- ☐ Vulnerable users can access this support.
- ☐ The system remained usable under stress.
- ☐ Cash or fallback options are available where needed.
- ☐ Cross-border use cases were considered.
- ☐ Success is measured by quality and inclusion, not just volume.

This checklist can help banks, fintech firms, regulators, merchants, and development actors evaluate payment systems more realistically.

**Table 13.1: Practical Lessons by Stakeholder**

| Stakeholder | Main Priority                          | Practical Action                         |
|-------------|--|--|
| Banks       | Trust and infrastructure modernization | Improve APIs, fraud controls, settlement |

|                          |                                   |   |
|--------------------------|-----------------------------------|---|
|                          |                                   | reliability, and merchant services  |
| Fintech firms            | Usability with accountability     | Build simple interfaces, transparent fees, recourse, and responsible data practices         |
| Merchants                | Cost, control, and customer reach | Evaluate fees, settlement, reconciliation, platform dependence, and data access             |
| Policymakers             | Public value and resilience       | Measure inclusion, competition, fraud, privacy, merchant costs, and system uptime           |
| Development institutions | Real inclusion                    | Focus on active usage, agent reliability, gender gaps, accessibility, and grievance systems |
| Governments              | Effective public transfers        | Ensure recipients can actually access and use funds, not merely receive                     |

|           |                        |  |
|-----------|------------------------|--|
|           |                        | disbursement records   |
| Consumers | Safe and confident use | Understand fees, protect credentials, use trusted channels, and report fraud quickly |

Figure 13.1: Practical Digital Payment Design Checklist



*Figure 13.1 Practical Digital Payment Design Checklist. A useful payment ecosystem balances user access, merchant acceptance, transparent pricing, fraud protection, data governance, resilience, and inclusion.*

*Source note: Author-created checklist based on practical stakeholder lessons developed in this chapter.*

## Chapter takeaway

Digital payments are built by many actors, not just one.

Banks provide trust and financial depth to the economy. Fintech companies provide innovation and user experience. Merchants turn payment tools into their daily habits. Policymakers create rules and safeguards to protect the public. Development institutions promote inclusion. Governments use payment rails for public services. Consumers decide whether the system is worth trusting.

The most practical lesson is to design for actual users under real constraints.

A payment system succeeds when it is easy to use, safe to trust, affordable enough to repeat, resilient enough to depend on, and fair enough to support broad participation.

Digital payments should not merely transfer money faster. They should help people, businesses, and governments participate in the economy with greater confidence.

## Transition to Conclusion

In this chapter, we get to the heart of the book's main idea: digital payments are more than just a handy tool. They actually form systems of trust, access, governance, and economic coordination. The conclusion ties all these aspects together and revisits the big question: what kind of payment future should we be aiming to build in our societies?

# Conclusion

## Digital Payments and the New Economy

**The real question is not whether payments will become digital**

Digital payments have already changed the world.

They shape how people shop, how workers receive wages, how families send money, how merchants sell, how governments distribute support, how platforms organize commerce, and how financial institutions understand economic behavior.

The useful question is no longer whether payments will become more digital. They already have.

The deeper question is: What kind of digital payment future are we building?

That question matters because payment systems are not neutral. They organize exchange. They create records. They distribute costs. They shape access. They affect privacy. They influence competition. They determine who can participate easily and who faces barriers.

A payment system is not only about moving money. It is about how a society manages trust.

**Digital payments are economic infrastructure**

The central argument of this book is that digital payments should be understood as economic infrastructure.

They are not merely apps, cards, wallets, QR codes, or fintech conveniences. They are systems that connect people, firms, governments, banks, platforms, merchants, regulators, and data networks.

In developed economies, digital payments often optimize mature financial systems. They make commerce faster, smoother, and more integrated. They support e-commerce, subscriptions, platform services, contactless checkout, and data-rich business operations.

In developing economies, digital payments can do more than optimize. They can help countries leapfrog older infrastructure constraints. Public rails, QR acceptance, mobile-first interfaces, and real-time account-to-account transfers can bring small merchants and ordinary users into digital commerce.

In low-infrastructure settings, digital payments may provide first-entry financial access. Mobile money, agent networks, and remittances can help households store value, receive support, manage shocks, and begin building transaction histories.

These three roles - optimization, leapfrogging, and first-entry access - show why one global story is not enough. Digital payments mean different things in different places.

## **Speed is valuable, but trust is essential**

Many digital payment innovations are celebrated for speed. Real-time payments are faster than traditional transfers. Mobile wallets are faster than cash handling. QR payments are faster than manual acceptance. Embedded payments are faster than repeated checkout.



Speed matters. It saves time, improves liquidity, supports emergency transfers, and makes commerce more efficient.

But speed alone is not enough. A fast payment system can also move fraud faster. A seamless payment experience can reduce user awareness. A data-rich system can weaken privacy. A highly digital system can become fragile during outages. A widely adopted system can still exclude vulnerable users. A popular platform can still concentrate power.

Trust is therefore more important than speed.

Users must trust that money will arrive. Merchants must trust that settlement is reliable. Governments must trust that transfers reach the intended recipients. Regulators must trust that risks are managed. Societies must trust that payment systems will work during stress.

The best payment systems are not simply the fastest. They are the ones people can rely on.

## **Inclusion must be real, not symbolic**

Digital payments are often described as tools of financial inclusion. This can be true, but only under the right conditions.

A person is not included simply because an account exists. A merchant is not included simply because a QR code is available. A household is not included simply because a benefit was digitally disbursed. A rural user is not included if the nearest cash-out point is unreliable. An elderly user is not included if the app is confusing. A low-income user is not included if fees make usage costly. A fraud victim is not included if there is no recourse.

Real inclusion means safe, repeated, affordable, and confident use.

It means users can understand the system. It means merchants can afford the system. It means support exists when things go wrong. It means vulnerable users are treated as central design cases, not afterthoughts.

Digital payments can widen participation, but they can also create new barriers. Inclusion is not automatic. It is designed.

## **Cash may decline, but fallback still matters**

The rise of digital payments does not mean cash has no role.

Cash use is declining in many economies, especially for routine payments. But cash still provides qualities that digital systems do not always provide: simplicity, privacy, immediate settlement, and resilience during outages.

A modern payment system should not treat cash as the enemy. It should treat cash as one part of a broader payment ecosystem.

In highly digital societies, the role of cash may become smaller but more strategic. It may serve as fallback infrastructure. It may protect users who are not fully digital. It may help households budget. It may support transactions when systems fail.

A resilient payment future is not necessarily cashless. It is plural. It gives people reliable options.

## **Data is the new payment layer**

One of the most important changes in digital payments is that every transaction can become a data event.

This creates new opportunities. Payment data can support budgeting, fraud detection, credit access, business analytics, public delivery, and economic planning.

But it also creates new risks. Payment data can reveal personal behavior, commercial relationships, location patterns, household stress, and sensitive choices. If misused, it can support surveillance, manipulation, exclusion, or platform lock-in.

This means payment governance must include data governance.

The question is not only whether money moves safely. It is whether the data created by that movement is handled responsibly.

A trustworthy payment system must practice restraint. It should collect what is necessary, protect what is sensitive, explain how data is used, and give users meaningful safeguards.

In the digital economy, payment trust and data trust are inseparable.

## **Merchants are central to payment transformation**

Digital payment stories often focus on consumers. But merchants are equally important.

A payment system becomes useful only when people can pay where they actually spend money. Small merchants, street vendors, local shops, online sellers, service providers, and large retailers all shape adoption.

For merchants, digital payments can reduce cash handling, improve records, support remote sales, and create business visibility. But they can also bring fees, settlement delays, disputes, platform dependence, and tax concerns.

A payment system that works for consumers but burdens merchants will not create broad public value.

Merchant acceptance must be affordable, predictable, and useful. Small merchants should gain more than payment collection. They should gain better records, business tools, customer reach, and financial opportunity.

Digital payments become infrastructure only when both sides of the transaction can participate sustainably.

## **Public infrastructure and private innovation must work together**

The country cases in this book show that payment success can come through different models.

India shows the power of interoperable public rails with private app innovation. Brazil shows how a central bank can build instant payment infrastructure that reaches everyday retail use. Kenya shows how mobile money and agent networks can create access before traditional banking reaches everyone. Sweden shows the resilience questions that arise in cash-light societies. China shows the power and risk of platform-based payments. The United States shows how legacy card systems shape digital transition.

There is no single perfect model. But one pattern is clear: the strongest systems often combine shared infrastructure with competitive services.

Public or interoperable rails can reduce fragmentation and support broad access. Private firms can improve user experience, merchant tools, distribution, and innovation. Regulators can protect trust, competition, privacy, and resilience.

The challenge is balance. Too much fragmentation weakens public value. Too much concentration weakens competition. Too much control can slow innovation. Too little oversight can expose users to harm.

The future of payments will depend on how well societies balance public purpose with private creativity.

## **Cross-border payments remain unfinished**

Domestic digital payments have advanced quickly. Cross-border payments remain a major unresolved problem.

For many households, the most important payment is not a coffee purchase or an online subscription. It is a remittance from a family member abroad.

Cross-border payments are still too often costly, slow, opaque, and difficult to resolve when something goes wrong. This affects migrant workers, families, students, small exporters, freelancers, and global platform workers.

A payment future that is instant domestically but expensive internationally is incomplete.

Improving cross-border payments will require more than better apps. It will require linked rails, transparent foreign exchange, proportional compliance, consumer protection, last-mile access, and international cooperation.

The global payment problem is not solved until ordinary people can move small amounts across borders affordably, safely, and clearly.

## **Governance is part of the product**

A central lesson of this book is that governance is not external to digital payments.

Consumer protection, fraud recourse, privacy rules, interoperability, resilience planning, merchant fairness, and inclusion standards are not afterthoughts. They are part of what makes a payment system usable and trustworthy.

A payment product without governance may grow quickly. But payment infrastructure without governance becomes fragile.

Governance answers the questions that matter most: Who can participate? What does it cost? Who controls the data? Who bears fraud losses? What happens when the system fails? How are disputes resolved? How are vulnerable users protected? How is competition preserved? How does the system serve public value?

These questions define the quality of payment infrastructure.

## **The future is designed, not predetermined**

The future of digital payments is often described as inevitable. But the shape of that future is not fixed.

Societies can choose systems that are open or closed. They can prioritize speed or safety. They can protect privacy or allow unchecked data extraction. They can preserve fallback options or eliminate them too quickly. They can support small merchants or burden them. They can design

for vulnerable users or ignore them. They can treat payments as public-interest infrastructure or leave them entirely to market concentration.

These are design choices. Technology creates possibilities. Institutions decide how those possibilities become reality.

The most important payment debates in the coming years will not be only about which app, rail, wallet, or currency wins. They will be about trust, inclusion, resilience, data, competition, and public accountability.

## Final reflection

Digital payments began as a way to make exchange easier. They are now a way of organizing economic life.

They determine how money moves, how value is recorded, how users are identified, how merchants participate, how governments deliver support, and how societies handle risk.

That makes them too important to treat as simple convenience tools.

The best digital payment systems will be those that make daily life easier without making society more fragile. They will increase access without creating shallow inclusion. They will use data without exploiting users. They will support innovation without allowing unchecked concentration. They will move money quickly while preserving recourse. They will reduce friction while maintaining trust.

The future of payments should not be judged by how close it comes to eliminating cash. It should be judged by whether it helps people, businesses, and governments participate in economic life more safely, fairly, and confidently.

In the end, the question is not simply how money moves. The question is what kind of economy that movement creates.

## Conclusion takeaway

Digital payments are no longer only about paying faster. They are about building economic infrastructure.

Their promise lies in convenience, inclusion, efficiency, resilience, and broader participation. Their risks lie in fraud, exclusion, privacy loss, concentration, and fragility.

The future of payments will be strongest where digital systems are designed around trust, fairness, accessibility, and public value.

A good payment system does not merely move money. It helps society move forward.



# Appendix A

## A Practical Policy Checklist

Digital payment systems should not be evaluated only by speed, transaction volume, or app adoption. A payment system becomes valuable infrastructure when it is accessible, affordable, secure, resilient, transparent, and trusted.

This checklist is designed for policymakers, regulators, central banks, public agencies, development institutions, banks, fintech firms, and payment-system designers. It can be used to evaluate whether a digital payment ecosystem is creating broad public value rather than narrow transaction growth.

### 1. Access and inclusion

A digital payment system should be usable by different groups of people, not only by digitally confident urban users.

#### Checklist questions

- ☐ Can low-income users open and use accounts or wallets affordably?
- ☐ Can rural users access the system with weak connectivity?
- ☐ Can elderly users understand and use the system safely?
- ☐ Can people with disabilities use the interface?
- ☐ Can migrants, informal workers, or users with limited documentation participate?
- ☐ Are women and marginalized groups actually using the system?
- ☐ Are language, literacy, and accessibility barriers addressed?

- ☐ Are assisted channels available for users who cannot complete everything digitally?
- ☐ Are cash-in and cash-out options available where needed?
- ☐ Is inclusion measured by active use rather than registration alone?

### **Policy focus**

Inclusion should be measured through real usage, affordability, complaint data, gender gaps, rural access, merchant acceptance, and user confidence.

## **2. Affordability**

Digital payments cannot support inclusion if they are too expensive for ordinary users or small merchants.

### **Checklist questions**

- ☐ Are fees clear and easy to understand?
- ☐ Are low-value payments affordable?
- ☐ Are small merchants able to accept payments without high fixed costs?
- ☐ Are cash-out or withdrawal charges reasonable?
- ☐ Are foreign-exchange costs clearly disclosed for cross-border payments?
- ☐ Are there hidden charges through poor exchange rates, settlement fees, or platform charges?
- ☐ Are merchants able to compare payment providers?
- ☐ Are fee changes communicated clearly?
- ☐ Are digital payments cheaper or more efficient than the alternatives for the intended users?

### **Policy focus**

Affordability should be evaluated from both sides of the transaction: the user and the merchant.

## **3. Merchant acceptance**

Merchant acceptance determines whether digital payments become part of daily life.

### **Checklist questions**

- ☐ Can small merchants onboard easily?
- ☐ Is acceptance possible without expensive hardware?
- ☐ Are QR payments, mobile acceptance, or low-cost options available?
- ☐ Are settlement times predictable?
- ☐ Can merchants reconcile payments easily?
- ☐ Are dispute rules clear?
- ☐ Are merchant fees transparent?
- ☐ Are merchants protected from unfair platform dependence?
- ☐ Do payment records help merchants access business services, credit, or accounting tools?
- ☐ Are informal and micro-merchants included in adoption strategies?

### **Policy focus**

A payment system becomes everyday infrastructure only when it works for small merchants, not only for large retailers and online platforms.

## 4. Interoperability and competition

Interoperability prevents payment systems from becoming closed islands.

### Checklist questions

- ☐ Can users send and receive payments across banks, wallets, or apps?
- ☐ Can merchants accept payments from users of different providers?
- ☐ Are open standards available?
- ☐ Can non-bank providers participate safely?
- ☐ Are access rules fair and transparent?
- ☐ Does the system avoid excessive dependence on one platform or provider?
- ☐ Are users able to switch providers without losing basic payment access?
- ☐ Are merchants forced to maintain multiple accounts or QR codes?
- ☐ Does the payment rail support competition at the service layer?

### Policy focus

Interoperability should support competition, reduce fragmentation, and preserve public value while maintaining security and operational standards.

## 5. Consumer protection and recourse

A payment system is trustworthy only when it handles failure fairly.

### Checklist questions

- ☐ Are users given clear transaction confirmations?
- ☐ Are receipts easy to understand?

- ☐ Can users report fraud quickly?
- ☐ Are dispute channels easy to find and use?
- ☐ Are complaint processes time-bound?
- ☐ Are refunds or reversals handled clearly where applicable?
- ☐ Is there protection for mistaken transfers?
- ☐ Are liability rules clear for unauthorized and scam-related payments?
- ☐ Can users recover accounts after lost devices, forgotten credentials, or SIM changes?
- ☐ Are support channels accessible to low-literacy and vulnerable users?

### **Policy focus**

Consumer protection should cover the full payment journey: onboarding, payment, confirmation, failure, complaint, and recovery.

## **6. Fraud prevention and safety**

Fraud controls must evolve with payment speed.

### **Checklist questions**

- ☐ Does the system use risk-based monitoring?
- ☐ Are users warned before high-risk payments?
- ☐ Is recipient confirmation available?
- ☐ Are suspicious transactions flagged?
- ☐ Are transaction limits appropriate?
- ☐ Are mule accounts detected and controlled?
- ☐ Is fraud intelligence shared across providers?

- ☐ Are customers educated about common scams?
- ☐ Are instant payments balanced with safety controls?
- ☐ Are fraud losses and complaints monitored transparently?

### **Policy focus**

Fraud prevention should combine technology, user education, liability rules, and rapid response. Speed should not eliminate safety.

## **7. Data governance and privacy**

Digital payments create sensitive records. These records require strong governance.

### **Checklist questions**

- ☐ What payment data is collected?
- ☐ Why is the data collected?
- ☐ How long is it retained?
- ☐ Who can access it?
- ☐ Can it be shared with third parties?
- ☐ Can it be sold or used for profiling?
- ☐ Can users understand how their data is used?
- ☐ Can users correct errors?
- ☐ Are automated decisions explainable and contestable?
- ☐ Are data minimization and purpose limitation applied?

### **Policy focus**

Payment data should be treated as sensitive infrastructure. Trust depends on restraint, transparency, security, and accountability.

## 8. Resilience and operational continuity

As payments become digital, outages become public problems.

### Checklist questions

- ☐ Are critical systems tested under stress?
- ☐ Are backup systems available?
- ☐ Are multiple payment rails supported where possible?
- ☐ Are cyber resilience standards enforced?
- ☐ Are telecommunications dependencies understood?
- ☐ Are cloud and third-party risks monitored?
- ☐ Are incident-response plans tested?
- ☐ Are users informed clearly during outages?
- ☐ Are offline or fallback options available?
- ☐ Is cash access preserved where it supports resilience?

### Policy focus

A modern payment ecosystem should not rely on perfect conditions. It should continue functioning, or degrade safely, during disruption.

## 9. Public transfers and government payments

Digital public payments should be evaluated by recipient access, not only system disbursement.

### Checklist questions

- ☐ Can recipients actually access the funds?
- ☐ Are identity and authentication systems reliable?

- ☐ Are there backup processes when verification fails?
- ☐ Are recipients informed clearly?
- ☐ Are cash-out or spending options available nearby?
- ☐ Are fees reducing the value of benefits?
- ☐ Are women, elderly users, disabled users, and rural users able to access funds?
- ☐ Is there a grievance process?
- ☐ Are failed or delayed transfers tracked?
- ☐ Does the system preserve dignity for recipients?

#### **Policy focus**

A public transfer is successful only when the intended recipient can access and use the money safely.

## **10. Cross-border payments and remittances**

A digital payment ecosystem remains incomplete if cross-border payments are costly, slow, or opaque.

#### **Checklist questions**

- ☐ Are total costs transparent?
- ☐ Is the exchange rate clearly shown?
- ☐ Is the final amount received displayed before payment?
- ☐ Is delivery time predictable?
- ☐ Can users track the payment?
- ☐ Are complaint channels available across borders?



- ☐ Are receiving options usable in low-infrastructure settings?
- ☐ Are remittance corridors affordable?
- ☐ Are compliance requirements proportionate for low-risk transfers?
- ☐ Are domestic fast-payment systems being considered for cross-border interlinking?

#### **Policy focus**

Cross-border payment reform should focus on cost, speed, transparency, access, and recourse.

## **11. Measurement and accountability**

Payment success should be measured through quality, not only volume.

#### **Checklist questions**

- ☐ Are active users measured separately from registered users?
- ☐ Are low-value transactions tracked?
- ☐ Are rural and low-income adoption patterns monitored?
- ☐ Are merchant acceptance gaps measured?
- ☐ Are gender and age gaps measured?
- ☐ Are fraud rates tracked?
- ☐ Are complaint outcomes published or reviewed?
- ☐ Is system uptime monitored?
- ☐ Are user trust levels studied?
- ☐ Are inclusion outcomes evaluated independently?

#### **Policy focus**

High transaction volume is not enough. A high-quality payment system must be inclusive, affordable, resilient, trusted, and governable.

## 12. Final policy test

Before calling a digital payment system successful, policymakers and ecosystem builders should ask: Can ordinary people and small merchants use this system safely, affordably, repeatedly, and with confidence?

If the answer is yes, the system is moving beyond digitization toward meaningful economic infrastructure.

If the answer is no, the system may be growing in transaction volume without yet creating broad public value.

## Appendix A takeaway

A strong digital payment system is not simply fast or popular. It is usable, trusted, affordable, resilient, and fair.

The most important policy goal is not to eliminate cash or maximize transaction counts. The goal is to build payment systems that help people, merchants, firms, and governments participate in economic life with greater safety and confidence.

# Appendix B

## Glossary of Payment Terms

This glossary explains key payment terms used throughout the book. The goal is not to provide technical legal definitions, but to give readers a practical understanding of the language used in digital payments, financial inclusion, and payment infrastructure.

### Account-to-account payment

A payment that moves money directly from one account to another. These accounts may be bank accounts, regulated transaction accounts, or payment accounts. Real-time systems such as UPI and Pix are examples of account-to-account payment models.

### Acquirer

A bank or payment institution that enables merchants to accept card or digital payments. The acquirer connects the merchant to the payment network and helps process transactions.

### Agent network

A network of local agents, often shops or kiosks, that help users deposit cash, withdraw cash, register accounts, or access mobile money services. Agent networks are especially important in low-infrastructure settings where bank branches are limited.

### Application programming interface (API)

A technical interface that allows software systems to communicate with one another. In payments, APIs allow banks, fintech firms, merchants, and platforms to connect payment services with apps, websites, and back-end systems.

## **Authorization**

The process of confirming that a payment can proceed. Authorization may involve checking whether the payer has enough funds, whether the payment instrument is valid, and whether the transaction appears safe.

## **Bank transfer**

A payment made from one bank account to another. Bank transfers may be slow, same-day, or instant depending on the payment system.

## **Beneficiary**

The person or organization receiving a payment. In remittances, the beneficiary is often the family member or household receiving funds from abroad.

## **Card network**

A payment network that connects card issuers, acquiring banks, merchants, and processors. Card networks help authorize, clear, and settle card payments.

## **Cash-in**

The process of converting physical cash into digital value, usually through an agent, wallet provider, or bank.

## **Cash-out**

The process of converting digital value into physical cash. Cash-out access is especially important in places where merchants do not yet widely accept digital payments.

## **Central bank digital currency (CBDC)**

A digital form of central bank money. CBDCs may be designed for retail use by the public or for wholesale use between financial institutions. Their usefulness depends on the policy problem they are meant to solve.

## **Chargeback**

A process in card payments that allows a cardholder to dispute a transaction and request reversal under certain conditions. Chargebacks can protect consumers, but they can also create costs and risks for merchants.

## **Clearing**

The process of exchanging and confirming payment information between institutions before final settlement. Clearing determines what each party owes and what needs to be settled.

## **Contactless payment**

A payment made by tapping a card, phone, or wearable device near a payment terminal. Contactless payments are common in developed economies and are valued for speed and convenience.

## **Cross-border payment**

A payment where the sender and recipient are in different countries. Cross-border payments often involve currency conversion, compliance checks, intermediaries, and different legal systems.

## **Digital financial inclusion**

The use of digital tools to expand access to financial services. True inclusion requires active, safe, affordable, and confident use, not just account registration.

## **Digital identity**

A digital method of verifying who a person, merchant, or institution is. Digital identity can support onboarding and fraud prevention, but it must be designed carefully to avoid exclusion and privacy risks.

## **Digital payment**

Any payment initiated, processed, or completed through electronic or digital means. Examples include card payments, mobile wallets, QR

payments, account-to-account transfers, mobile money, and online payments.

## **Digital public infrastructure**

Shared digital systems that support broad public and economic activity. In payments, this may include interoperable payment rails, identity systems, data-exchange systems, and public standards that allow many providers to build services on top.

## **Digital wallet**

An app or service that allows users to store payment credentials, account links, or digital value. Some wallets are linked to cards or bank accounts, while others store value directly.

## **Embedded finance**

Financial services built into non-financial platforms or services. Examples include payments inside ride-sharing apps, merchant loans offered through marketplaces, or insurance offered at checkout.

## **Embedded payment**

A payment that happens inside a broader service experience, often with little visible friction. Examples include ride-sharing payments, subscription renewals, and in-app purchases.

## **Financial inclusion**

The ability of individuals and businesses to access and use financial services that meet their needs. In this book, inclusion means usable participation: safe, affordable, repeated, and confident use.

## **Fintech**

Short for financial technology. Fintech refers to companies, products, and systems that use technology to deliver or improve financial services.

## Foreign-exchange margin

The difference between the exchange rate offered to a customer and a benchmark or market exchange rate. In cross-border payments, foreign-exchange margins can hide part of the true cost.

## Fraud monitoring

The process of detecting suspicious payment behavior. Fraud monitoring may use rules, machine learning, transaction limits, device signals, and behavioral analysis.

## Instant payment

A payment that is processed and made available to the recipient in real time or near real time. Instant payments are often available continuously, including outside traditional banking hours.

## Interoperability

The ability of different payment providers, banks, wallets, apps, and merchants to transact with one another. Interoperability helps prevent closed systems and supports broader payment infrastructure.

## Issuer

A bank or financial institution that provides a payment card or account to a customer. In card payments, the issuer authorizes payment from the cardholder's account or credit line.

## KYC

Short for know your customer. KYC refers to processes used by financial institutions to verify customer identity and assess risk. KYC rules help prevent fraud and financial crime, but overly strict requirements can exclude vulnerable users.

## Merchant acceptance

The ability and willingness of merchants to accept a particular payment method. Merchant acceptance is essential because digital

payments become useful only when people can pay where they actually spend money.

## **Mobile money**

A digital financial service that allows users to store, send, and receive money through a mobile phone, often without requiring a traditional bank account. Mobile money commonly uses agent networks for cash-in and cash-out.

## **Mobile wallet**

A digital wallet accessed through a mobile device. It may store card credentials, connect to a bank account, or hold value directly.

## **Payment gateway**

A service that helps merchants accept online payments by securely transmitting payment information between the customer, merchant, and payment processor.

## **Payment infrastructure**

The rails, rules, institutions, data systems, interfaces, and governance mechanisms that allow payments to move safely and reliably across an economy.

## **Payment rail**

The underlying system or network that moves payment instructions and value between parties. Examples include card networks, automated clearing systems, instant payment systems, mobile money systems, and public account-to-account rails.

## **Payment service provider**

A company or institution that helps users or merchants make, receive, or process payments. Payment service providers may include fintech firms, banks, wallets, gateways, processors, or aggregators.



## **Pix**

Brazil's instant payment system developed under the leadership of Banco Central do Brasil. Pix enables fast, low-cost payments and has become widely used for everyday transactions.

## **Programmable trust**

A way of describing how digital payment systems embed trust into rules, identity checks, authentication, fraud controls, APIs, and automated settlement. It does not remove human trust, but it places more trust inside technical and institutional systems.

## **QR payment**

A payment initiated by scanning a quick response code. QR payments are important because they can lower the cost of merchant acceptance, especially for small businesses.

## **Real-time payment**

A payment that is processed immediately or almost immediately. Real-time payments are commonly used for peer-to-peer transfers, merchant payments, and bill payments.

## **Reconciliation**

The process of matching payment records with invoices, sales, orders, receipts, or accounting records. Digital payments can make reconciliation easier for businesses.

## **Remittance**

Money sent by a person, often a migrant worker, to family or others in another location or country. Remittances are important for household welfare and financial resilience.

## Settlement

The final movement of funds between institutions or accounts. A user may receive instant confirmation, but settlement arrangements determine when and how value is finally transferred.

## Stored-value wallet

A wallet that holds money directly inside the wallet account rather than only linking to a bank account or card.

## UPI

India's Unified Payments Interface. UPI is an interoperable real-time account-to-account payment system that allows users to send and receive money across participating banks and apps.

## User recourse

The ability of users to seek help, dispute a problem, recover funds where appropriate, or appeal decisions when something goes wrong in a payment process.

## Wallet provider

A company or institution that offers a digital wallet service. Wallet providers may be banks, fintech firms, telecommunications companies, technology firms, or payment companies.

## Appendix B takeaway

Digital payment language can seem technical, but the underlying questions are practical. Who can use the system? How does money move? What does it cost? Who protects the user? How is data used? What happens when things fail? Understanding these terms helps readers evaluate digital payments not only as technology, but as infrastructure for economic life.

# Appendix C

## Country Profile Notes

This appendix summarizes the country examples discussed throughout the book. These notes are not meant to provide complete country histories. They are designed to help readers compare different digital payment pathways and understand why the same technology can create different outcomes in different contexts.

### India

#### Signature model

UPI and interoperable public digital payment infrastructure

#### Why it matters

India is one of the most important examples of public or quasi-public payment infrastructure operating at large scale. The Unified Payments Interface, or UPI, allows real-time account-to-account transfers across participating banks and apps. It has become widely used for peer-to-peer transfers, merchant payments, QR payments, bill payments, and everyday commerce. India's model shows how a shared payment rail can support private app innovation. Users may interact with private payment apps, but the underlying system allows interoperability across banks and providers.

#### Core lesson

India shows that digital payments can become everyday economic infrastructure when public rails, bank connectivity, low-cost merchant acceptance, QR codes, and private app innovation work together.

#### Key strengths

- ☐ Interoperable real-time account-to-account payments
- ☐ Large-scale QR merchant acceptance

- ☐ Public infrastructure with private interfaces
- ☐ Strong everyday retail use
- ☐ Potential to support small merchants and formalization

#### **Key risks**

- ☐ Fraud and social engineering
- ☐ Customer support challenges at scale
- ☐ System dependency
- ☐ Digital literacy gaps
- ☐ Uneven protection for vulnerable users

## **Brazil**

#### **Signature model**

Pix and central-bank-led instant payments

#### **Why it matters**

Brazil's Pix shows how a central bank can shape the payment ecosystem by building or coordinating instant payment infrastructure. Pix supports person-to-person transfers, merchant payments, bill payments, and other everyday use cases. Its importance lies in how quickly it became part of ordinary payment behavior. Pix demonstrates that public instant payment systems can move beyond technical banking infrastructure and become part of daily retail life.

#### **Core lesson**

Brazil shows that central-bank-led instant payments can reshape payment behavior when the system is simple, trusted, low-cost, and useful for everyday transactions.

#### **Key strengths**

- ☐ Strong public-sector leadership
- ☐ Instant payment availability
- ☐ Broad adoption across users and merchants
- ☐ Retail and low-value use
- ☐ Competitive pressure on legacy payment channels

#### **Key risks**

- ☐ Fraud growth as instant payments scale
- ☐ User-protection challenges
- ☐ Dependence on a central infrastructure
- ☐ Need for strong resilience planning
- ☐ Ongoing governance and liability questions

## **Kenya**

### **Signature model**

Mobile money and agent-supported financial access

### **Why it matters**

Kenya is one of the most important global examples of mobile money. M-PESA and related mobile money services helped expand digital financial access in a context where traditional banking infrastructure did not fully reach all users. Kenya's experience shows that digital payments can provide first-entry finance. For many users, mobile money made it easier to send money, receive support, pay bills, store value, and manage household risk.

### **Core lesson**

Kenya shows that mobile money can support financial inclusion when it matches local needs, relies on accessible agents, and solves practical problems such as domestic transfers and remittances.

### **Key strengths**

- ☐ Strong agent network model
- ☐ Useful for domestic transfers and remittances
- ☐ Supports household resilience
- ☐ Practical for users without full bank access
- ☐ Demonstrates first-entry financial access

### **Key risks**

- ☐ Cash-out dependence
- ☐ Agent liquidity constraints
- ☐ Fees and affordability concerns
- ☐ Fraud and mistaken transfers
- ☐ Uneven transition from payment access to broader financial services

## **Sweden**

### **Signature model**

Cash-light digital payment maturity

### **Why it matters**

Sweden is often cited as one of the world's most cash-light economies. Digital payments are deeply embedded in daily commerce, and many users rely heavily on cards, mobile payments, and bank-linked digital systems. Sweden is important because it shows both the benefits and risks of advanced digital payment adoption. High digital use can

create convenience and efficiency, but it also raises questions about resilience, inclusion, and emergency preparedness.

### **Core lesson**

Sweden shows that a highly digital payment society still needs fallback planning. Cash may decline in daily use, but resilience remains important.

### **Key strengths**

- ☐ Highly developed digital payment culture
- ☐ Strong consumer familiarity with digital payments
- ☐ Efficient retail payment environment
- ☐ Advanced financial infrastructure
- ☐ High institutional trust

### **Key risks**

- ☐ Resilience concerns during outages or crises
- ☐ Exclusion of users less comfortable with digital tools
- ☐ Reduced cash access
- ☐ Dependence on digital infrastructure
- ☐ Need for public preparedness planning

## **China**

### **Signature model**

Platform-based mobile payments

### **Why it matters**

China's digital payment transformation has been strongly shaped by large platform ecosystems. Mobile payments became integrated into

messaging, shopping, food delivery, transportation, entertainment, and daily services. China shows how payments can scale quickly when they are embedded into high-frequency digital platforms. QR codes and mobile-first interfaces helped digital payments become routine in everyday commerce.

### **Core lesson**

China shows that platform ecosystems can make payments highly convenient and widely adopted, but they also concentrate data, market power, and user dependency.

### **Key strengths**

- ☐ Deep integration of payments into everyday apps
- ☐ Widespread QR payment adoption
- ☐ Strong user convenience
- ☐ Rapid merchant acceptance
- ☐ Platform-driven service innovation

### **Key risks**

- ☐ Platform concentration
- ☐ Data privacy concerns
- ☐ Dependence on dominant ecosystems
- ☐ Limited bargaining power for smaller merchants
- ☐ Governance complexity when payments, commerce, and social behavior are linked

## **United States**

### **Signature model**

Card-centric digital transition



## **Why it matters**

The United States shows a different digital payment pathway. Its payment evolution has been shaped by strong credit and debit card infrastructure. Many digital wallets and mobile payment tools operate as improved interfaces layered on top of existing card networks. This case shows how legacy systems shape future innovation. Digital transformation does not always replace older systems. It often arrives in layers.

## **Core lesson**

The United States shows that strong legacy card infrastructure can support digital convenience while also slowing deeper structural change toward alternative payment rails.

## **Key strengths**

- ☐ Mature card payment ecosystem
- ☐ Broad merchant acceptance
- ☐ Strong consumer familiarity
- ☐ Established dispute and chargeback mechanisms
- ☐ Strong e-commerce and embedded payment environment

## **Key risks**

- ☐ Merchant fee debates
- ☐ Slower shift toward account-to-account alternatives
- ☐ Fragmented payment experience
- ☐ Privacy and data concerns
- ☐ Cash and digital divide issues for some users

## Comparative summary

| Country       | Signature Model                           | Main Contribution to the Book's Argument                                      | Main Risk to Watch                           |
|---------------|---|---|--|
| India         | UPI and interoperable public rail         | Public rails can support mass digital payment adoption and private innovation | Fraud, customer support, system dependency   |
| Brazil        | Pix and central-bank-led instant payments | Central banks can build retail-scale instant payment infrastructure           | Fraud, liability, operational resilience     |
| Kenya         | Mobile money and agent networks           | Mobile money can provide first-entry financial access                         | Cash-out dependence, agent reliability, fees |
| Sweden        | Cash-light digital maturity               | Digital payment success still requires fallback planning                      | Resilience, inclusion, cash access           |
| China         | Platform-based mobile payments            | Embedded payments can scale rapidly through platforms                         | Data concentration, platform power           |
| United States | Card-centric transition                   | Legacy systems shape digital transformation                                   | Merchant fees, slower structural change      |

## Cross-country lessons

These country profiles show that digital payment transformation is context-specific. A payment model that works in one country cannot simply be copied into another without adaptation. Each country has its own institutional history, banking structure, regulatory environment, merchant base, telecommunications infrastructure, user behavior, and trust conditions.

Still, several lessons appear across cases. Digital payments become powerful when they solve everyday problems. Merchant acceptance is essential. Public infrastructure can support private innovation when designed well. Mobile money can be transformative when banking access is limited. Platform convenience must be balanced with data governance and competition. Mature digital systems still need resilience and fallback options.

## **Appendix C takeaway**

The global digital payment story is not one story. It is many stories. India, Brazil, Kenya, Sweden, China, and the United States each show a different pathway. Together, they demonstrate that digital payments become valuable infrastructure only when they fit local needs, build trust, support merchants, protect users, and remain resilient under stress.

# Appendix D

## What to Watch Next

Digital payments will continue to evolve. Some changes will be technical. Others will be regulatory, social, commercial, and geopolitical. The most important developments will not only involve new apps or faster transactions. They will involve the future design of trust, access, data, resilience, and public value.

This appendix highlights the major trends to watch in the next phase of digital payments.

### 1. Expansion of real-time payment systems

Real-time payment systems are becoming a global priority. More countries are building or upgrading instant payment rails that allow funds to move in seconds rather than days. These systems can improve household transfers, merchant payments, bill payments, government disbursements, and small-business cash flow.

#### **What to watch**

- ☐ Growth of domestic instant payment systems
- ☐ New use cases beyond peer-to-peer transfers
- ☐ Merchant adoption of real-time account-to-account payments
- ☐ Fraud controls for instant transfers
- ☐ Central-bank involvement in payment infrastructure
- ☐ Competition between card networks and instant payment rails

#### **Why it matters**

Real-time payments can improve economic efficiency, but instant speed also requires stronger fraud protection, liability rules, and customer support.

## 2. Cross-border interlinking of payment rails

Domestic payments have improved faster than international payments. The next major challenge is connecting payment systems across borders. Interlinking domestic fast-payment systems could reduce cost, increase speed, and improve transparency for remittances and small business payments.

### What to watch

- ☐ Bilateral and regional payment-linking initiatives
- ☐ Faster remittance corridors
- ☐ Foreign-exchange transparency
- ☐ Interoperability between wallets and bank accounts
- ☐ Consumer protection across jurisdictions
- ☐ Regulatory coordination between countries

### Why it matters

A payment future that is instant domestically but expensive internationally remains incomplete. Cross-border reform is essential for migrant workers, families, freelancers, small exporters, and global digital commerce.

## 3. Embedded finance

Payments are increasingly becoming part of broader services. Once a platform controls the payment moment, it can add credit, insurance, savings, loyalty, working-capital tools, and subscription management.

### What to watch

- ☐ Credit offered inside merchant platforms
- ☐ Payroll-linked financial services
- ☐ Buy-now-pay-later models
- ☐ Insurance at checkout
- ☐ Small-business lending based on payment records
- ☐ Financial products inside non-financial apps

#### **Why it matters**

Embedded finance can make financial services more convenient, but it can also blur responsibility. Users may not always understand when they are using a regulated financial product or how their payment data is being used.

## **4. Artificial intelligence in payment risk and personalization**

Artificial intelligence will play a larger role in fraud detection, transaction monitoring, customer service, dispute handling, and credit assessment.

#### **What to watch**

- ☐ AI-based fraud detection
- ☐ Mule-account detection
- ☐ Scam warning systems
- ☐ Automated dispute triage
- ☐ AI-driven credit decisions based on payment data
- ☐ Bias, false positives, and explainability concerns

#### **Why it matters**

AI can strengthen payment safety, but automated decisions can also harm users if they block legitimate payments, misclassify risk, or offer no clear appeal process.

## 5. Privacy and payment data governance

Payment data is becoming one of the most valuable outputs of digital payment systems. It can reveal spending patterns, income cycles, merchant relationships, travel behavior, and household needs.

### What to watch

- ☐ Payment data sharing rules
- ☐ Consent frameworks
- ☐ Data minimization standards
- ☐ Restrictions on profiling and resale
- ☐ Data use in credit scoring
- ☐ Privacy-preserving payment technologies
- ☐ Regulatory action on platform data power

### Why it matters

Trust in digital payments will depend not only on whether money arrives, but also on whether payment data is handled responsibly.

## 6. Fraud and social engineering

Fraud will remain one of the most important challenges in digital payments. As payments become faster and more digital, scams will become more sophisticated.

### What to watch

- ☐ Authorized push payment scams
- ☐ Real-time scam warnings

- ☐ Confirmation-of-payee tools
- ☐ Fraud liability frameworks
- ☐ Cross-institution fraud intelligence sharing
- ☐ Consumer education campaigns
- ☐ Recovery processes for scam victims

### **Why it matters**

Fraud can damage trust quickly. A payment system that is fast but unsafe will struggle to remain trusted infrastructure.

## **7. Offline and fallback payment design**

As payment systems become more digital, resilience becomes more important. Outages, cyberattacks, power failures, telecommunications disruptions, and cloud failures can interrupt payment access.

### **What to watch**

- ☐ Offline payment capability
- ☐ Cash access policies
- ☐ Backup payment rails
- ☐ Emergency payment procedures
- ☐ Cyber resilience standards
- ☐ Telecommunications and cloud dependency
- ☐ Public communication during outages

### **Why it matters**

A highly digital society must still be able to transact under stress. Payment resilience is a public-interest issue.



## 8. Merchant digitization beyond acceptance

The next stage of merchant digitization will go beyond accepting payments. Payment records may become the foundation for bookkeeping, inventory tools, tax support, credit access, loyalty, and working-capital products.

### What to watch

- ☐ Payment-linked accounting tools
- ☐ Digital receipts and reconciliation
- ☐ Small merchant credit based on cash flow
- ☐ QR payment integration with business software
- ☐ Merchant data ownership
- ☐ Platform dependence for small businesses

### Why it matters

Digital payments create the most business value when they help merchants manage and grow their businesses, not simply collect money.

## 9. Digital public infrastructure

Digital public infrastructure will remain a major theme. Payment rails, identity systems, consent frameworks, and data-exchange layers can support broad digital participation.

### What to watch

- ☐ Public fast-payment rails
- ☐ Government-backed interoperability standards
- ☐ Digital identity and payment integration
- ☐ Open finance and consent systems

- ☐ Public-private payment partnerships
- ☐ Inclusion safeguards in public infrastructure

### **Why it matters**

Shared infrastructure can reduce fragmentation and support innovation, but it must be governed carefully to protect privacy, competition, resilience, and user rights.

## **10. Central bank digital currencies**

Central bank digital currencies will continue to be explored. Some countries may use them for wholesale settlement, while others may study retail use cases.

### **What to watch**

- ☐ Retail CBDC pilots
- ☐ Wholesale CBDC settlement projects
- ☐ Privacy design choices
- ☐ Offline CBDC functionality
- ☐ Interaction with commercial banks
- ☐ Competition with existing fast-payment systems
- ☐ Cross-border CBDC experiments

### **Why it matters**

CBDCs may support public money in a digital economy, but they must offer clear public value. In some countries, improved fast-payment systems may solve many of the same problems.

## **11. Regulation of non-bank payment providers**

Non-bank payment providers are becoming more important. Fintech firms, wallets, payment aggregators, processors, mobile money

providers, and platforms may perform functions once handled mainly by banks.

### **What to watch**

- ☐ Licensing for payment service providers
- ☐ Safeguarding of customer funds
- ☐ Cybersecurity requirements
- ☐ Direct access to payment rails
- ☐ Operational resilience standards
- ☐ Consumer-protection obligations
- ☐ Supervision of large platforms

### **Why it matters**

If non-bank providers perform infrastructure-like functions, they should carry infrastructure-like responsibilities.

## **12. Inclusion gaps in a more digital economy**

Digital payment growth does not automatically include everyone. Vulnerable users may still face barriers related to phone ownership, documentation, literacy, disability, gender, age, geography, or connectivity.

### **What to watch**

- ☐ Gender gaps in digital payment use
- ☐ Rural access and weak connectivity
- ☐ Elderly and disabled user inclusion
- ☐ Shared-phone households
- ☐ Low-literacy interface design

- ☐ Cash-in and cash-out availability
- ☐ Complaint access for vulnerable users

#### **Why it matters**

A payment future that works only for digitally confident users is not inclusive. Real inclusion requires safe and repeated use by people under real constraints.

### **13. Payment competition and platform power**

Digital payments can increase competition, but they can also concentrate power. Large platforms may control user interfaces, merchant access, payment data, and customer relationships.

#### **What to watch**

- ☐ Dominance of large wallets or platforms
- ☐ Merchant dependence on marketplaces
- ☐ App store control over payments
- ☐ Data portability
- ☐ Interoperability requirements
- ☐ Competition policy in payment markets
- ☐ Open banking and open finance rules

#### **Why it matters**

Convenience should not come at the cost of excessive dependency or market concentration.

### **14. The changing role of cash**

Cash use may continue to decline in many economies, but cash will not disappear everywhere. It may become less important for routine

payments while remaining important for fallback, privacy, budgeting, and inclusion.

**What to watch**

- ☐ Cash access policies
- ☐ ATM availability
- ☐ Merchant cash acceptance debates
- ☐ Cash use by vulnerable groups
- ☐ Emergency cash planning
- ☐ Public attitudes toward cash and privacy

**Why it matters**

A modern payment ecosystem should expand digital options without removing alternatives before users and institutions are ready.

## 15. New measures of payment success

The next phase should move beyond transaction volume as the main success metric. A system can be high-volume but still weak on inclusion, trust, privacy, or resilience.

**What to watch**

- ☐ Active usage instead of registration counts
- ☐ Low-value transaction patterns
- ☐ Merchant acceptance breadth
- ☐ Fraud rates and recovery outcomes
- ☐ Complaint resolution time
- ☐ System uptime

- ☐ User trust surveys
- ☐ Inclusion by income, gender, age, and geography
- ☐ Cost to users and merchants
- ☐ Cross-border transparency

### **Why it matters**

Better measurement leads to better policy. Payment infrastructure should be judged by quality, not only scale.

## **Appendix D takeaway**

The future of digital payments will be shaped by more than technology. It will be shaped by governance, trust, data rights, competition, resilience, and inclusion. The most important developments to watch are not simply the newest apps or fastest rails. They are the choices societies make about who can participate, who controls data, how users are protected, how merchants are treated, how systems survive disruption, and whether digital payments create broad public value.

# Appendix E

## Annotated Further Reading

This appendix suggests further reading for readers who want to go deeper into digital payments, financial inclusion, mobile money, real-time payment systems, remittances, regulation, and payment resilience.

The list is intentionally practical. It includes institutional reports, policy documents, and research-oriented sources that are useful for understanding digital payments as economic infrastructure.

### 1. Digital payments and financial inclusion

#### **World Bank - Global Findex Database**

The Global Findex Database is one of the most important sources for understanding financial inclusion worldwide. It tracks account ownership, digital payment use, saving, borrowing, and financial resilience across countries. It helps readers understand who is included in formal finance, who remains excluded, and how digital payments are changing access patterns.

#### **World Bank - Payment Aspects of Financial Inclusion**

This work explains how payment systems can support financial inclusion when they are accessible, affordable, safe, and interoperable. It connects payment infrastructure directly to inclusion policy and shows why payments are often the first step into broader financial participation.

#### **CGAP - Digital Financial Services and Financial Inclusion**

CGAP publishes practical research on digital financial services, low-income users, agent networks, consumer protection, and inclusion. It is especially helpful for readers interested in real-world design challenges for low-income and underserved users.

## 2. Mobile money and low-infrastructure settings

### **GSMA - State of the Industry Report on Mobile Money**

GSMA's mobile money reports provide global data and analysis on mobile money accounts, transaction values, agent networks, adoption, and use cases. They are among the best sources for understanding mobile money ecosystems and how digital payments work in low-infrastructure settings.

### **Suri and Jack - Research on M-PESA and Household Welfare in Kenya**

Research by Tavneet Suri and William Jack is widely cited for showing how mobile money affected household welfare and financial resilience in Kenya. It gives empirical support to the idea that digital payment access can affect poverty, resilience, and household risk-sharing.

### **Bill & Melinda Gates Foundation - Digital Financial Inclusion Resources**

The Gates Foundation has supported extensive work on digital financial inclusion, payment systems, and public infrastructure. These resources help readers understand how digital payments relate to development, inclusion, and public policy.

## 3. Real-time payments and public payment rails

### **National Payments Corporation of India - UPI Statistics and Product Information**

NPCI publishes information and statistics on UPI, India's interoperable real-time payment system. It is essential for understanding UPI's scale, use cases, and role in India's digital payment ecosystem.

### **Reserve Bank of India - Payment and Settlement Systems Publications**

The Reserve Bank of India publishes reports, policy documents, and data related to payment systems, digital payments, and regulation. These sources provide institutional context for India's payment infrastructure and regulatory direction.



### **Banco Central do Brasil - Pix Reports and Statistics**

Brazil's central bank publishes information on Pix, including usage, transaction values, participant information, and policy context. It is the primary source for understanding Pix as a central-bank-led instant payment system.

### **Bank for International Settlements - Fast Payments and Payment Infrastructure Research**

The BIS publishes research on fast payment systems, central bank roles, payment innovation, and cross-border payment improvement. It provides a global central-bank perspective on payment infrastructure and policy design.

## **4. Cross-border payments and remittances**

### **World Bank - Remittance Prices Worldwide**

This database tracks the cost of sending remittances across corridors and providers. It helps readers understand why remittance cost, transparency, and access remain major global payment issues.

### **World Bank - Migration and Development Briefs**

These briefs provide data and analysis on remittance flows, migration, and economic development. They connect remittances to household welfare, development, and global economic participation.

### **Financial Stability Board - G20 Roadmap for Enhancing Cross-Border Payments**

The FSB's roadmap focuses on making cross-border payments faster, cheaper, more transparent, and more inclusive. It is one of the most important policy frameworks for understanding the global cross-border payment reform agenda.

### **BIS Committee on Payments and Market Infrastructures - Cross-Border Payments Reports**

CPMI reports examine settlement, interoperability, messaging, and institutional barriers in cross-border payments. They explain why

cross-border payment reform is difficult and why cooperation across jurisdictions matters.

## **5. Payment regulation and consumer protection**

### **World Bank - Retail Payments and Consumer Protection Guidance**

World Bank materials on retail payment systems often address consumer protection, transparency, access, and safety. They help readers understand the regulatory side of payment system design.

### **Financial Conduct Authority and Other National Regulators - Payment Fraud and Consumer Protection Publications**

Regulators in different countries publish guidance on scams, fraud liability, payment service providers, and consumer rights. These sources show how fraud and consumer protection are becoming central payment policy issues.

### **OECD - Consumer Finance and Digitalization Reports**

OECD reports often examine digital finance, consumer protection, financial literacy, and data governance. They provide a broad policy perspective on how digital financial services affect consumers.

## **6. Data governance, privacy, and digital identity**

### **World Bank - Identification for Development**

The World Bank's ID4D work examines digital identity, inclusion, public services, and governance. It helps readers understand the link between identity systems and digital payment access.

### **OECD - Data Governance and Digital Economy Publications**

OECD materials provide policy frameworks for data protection, consent, digital markets, and responsible data use. They are useful for understanding why payment data should be treated as sensitive infrastructure.

### **BIS - Data, Technology, and Finance Reports**

BIS publications examine how data and technology are reshaping financial systems, including payments. They provide a financial-system perspective on data governance, innovation, and risk.

## **7. Cash, resilience, and payment system continuity**

### **Sveriges Riksbank - Payments Reports**

Sweden's central bank publishes important work on cash use, digital payments, and payment resilience. These reports help readers understand the policy challenges of a highly cash-light society.

### **European Central Bank - Payment and Cash Reports**

The ECB publishes data and analysis on payment behavior, cash use, digital payments, and payment infrastructure. It provides insight into how advanced economies balance digital payment adoption with cash availability and resilience.

### **BIS and Central Bank Publications on Operational Resilience**

Central banks and international bodies publish guidance on payment system resilience, cyber risk, and continuity planning. These sources explain why payment systems must be designed for stress, not only normal conditions.

## **8. Platform payments and competition**

### **BIS and IMF Reports on Big Tech in Finance**

BIS and IMF publications examine the role of large technology platforms in financial services and payments. They help readers understand the risks of platform concentration, data power, and market dependency.

### **Competition Authority Reports on Digital Markets**

Competition regulators in the United States, European Union, United Kingdom, and other jurisdictions publish reports on digital platforms, app stores, payments, and market power. These sources explain why payment systems are increasingly linked to competition policy.

## 9. Open banking and open finance

### **Open Banking Implementation Entity and Related UK Sources**

The United Kingdom's open banking experience provides practical lessons on APIs, consent, payment initiation, and competition. It shows how data access and payment initiation can be regulated to support competition and innovation.

### **European Union - PSD2 and Payment Services Regulation Materials**

European payment regulation has shaped discussions around open banking, strong customer authentication, consumer protection, and competition. It helps readers understand how regulation can open payment markets while managing security and liability.

## 10. Practical sources for ongoing monitoring

### **Ongoing institutional monitoring**

Readers who want to stay current should monitor central bank payment-system reports, World Bank financial inclusion and remittance data, GSMA mobile money reports, BIS and CPMI payment infrastructure publications, Financial Stability Board cross-border payment updates, national payment system statistics, regulatory updates on fraud and consumer protection, and research from CGAP, IMF, OECD, and development institutions.

## Appendix E takeaway

The best way to understand digital payments is to read across disciplines. Digital payments are not only a technology topic. They involve finance, public policy, development, consumer protection, data governance, competition, resilience, and social inclusion. A reader who follows only fintech product news will miss the deeper infrastructure questions. A reader who follows only regulation will miss the innovation dynamics. A reader who follows only financial inclusion will miss data and resilience risks. The strongest understanding comes from connecting all of these perspectives.



# References and Selected Reading

This book draws on public reports, institutional publications, policy research, and academic work on digital payments, financial inclusion, mobile money, payment systems, remittances, consumer protection, and financial infrastructure. The references below are intended to support further exploration rather than provide an exhaustive academic bibliography.

## Financial Inclusion and Digital Payments

World Bank. The Global Findex Database. Washington, DC: World Bank.

World Bank. Payment Aspects of Financial Inclusion. Washington, DC: World Bank.

World Bank. Digital Financial Inclusion. Washington, DC: World Bank.

CGAP. Digital Financial Services for Financial Inclusion. Washington, DC: Consultative Group to Assist the Poor.

International Monetary Fund. Fintech and Financial Inclusion. Washington, DC: IMF.

Bill & Melinda Gates Foundation. Digital Public Infrastructure and Inclusive Financial Systems. Seattle: Gates Foundation.

Vishvakarma, R. (2026). Digital Payments as Economic Infrastructure: A Comparative Framework for Inclusion, Resilience, and Governance Across Global Economies. <https://doi.org/10.5281/zenodo.19959257>

## Mobile Money and Low-Infrastructure Settings

GSMA. State of the Industry Report on Mobile Money. London: GSMA.

GSMA. Mobile Money Metrics and Global Adoption Reports. London: GSMA.

Suri, Tavneet, and William Jack. “The Long-Run Poverty and Gender Impacts of Mobile Money.” Science, 2016.

Jack, William, and Tavneet Suri. “Risk Sharing and Transactions Costs: Evidence from Kenya’s Mobile Money Revolution.” American Economic Review, 2014.

World Bank. Mobile Money and Financial Inclusion. Washington, DC: World Bank.

CGAP. Agent Networks and Digital Financial Services. Washington, DC: CGAP.

## **India, UPI, and Digital Public Infrastructure**

National Payments Corporation of India. UPI Product Statistics and System Information. Mumbai: NPCI.

Reserve Bank of India. Payment and Settlement Systems in India. Mumbai: RBI.

Reserve Bank of India. Annual Report. Mumbai: RBI.

Bank for International Settlements. Fast Payments: Enhancing the Speed and Availability of Retail Payments. Basel: BIS.

World Bank. Digital Public Infrastructure and Digital Financial Inclusion. Washington, DC: World Bank.

## **Brazil, Pix, and Instant Payments**

Banco Central do Brasil. Pix Statistics and Institutional Reports. Brasilia: Banco Central do Brasil.

Banco Central do Brasil. Instant Payments System Reports. Brasilia: Banco Central do Brasil.

Bank for International Settlements. Central Banks and Payments in the Digital Era. Basel: BIS.

International Monetary Fund. Digital Money and Payment Innovation. Washington, DC: IMF.

## **Cross-Border Payments and Remittances**

World Bank. Remittance Prices Worldwide. Washington, DC: World Bank.

World Bank. Migration and Development Brief. Washington, DC: World Bank.

Financial Stability Board. G20 Roadmap for Enhancing Cross-Border Payments. Basel: FSB.

Bank for International Settlements, Committee on Payments and Market Infrastructures. Enhancing Cross-Border Payments: Building Blocks of a Global Roadmap. Basel: BIS.

International Monetary Fund. Cross-Border Payments: A Vision for the Future. Washington, DC: IMF.

World Bank. Remittances and Development. Washington, DC: World Bank.

## **Payment Regulation, Consumer Protection, and Governance**

World Bank. Retail Payment Systems: A Practical Guide for Policymakers. Washington, DC: World Bank.

World Bank. Consumer Protection in Digital Financial Services. Washington, DC: World Bank.

OECD. Consumer Protection in Digital Financial Services. Paris: OECD Publishing.

Financial Conduct Authority. Payment Services and Consumer Protection Publications. London: FCA.

Bank for International Settlements. Principles for Financial Market Infrastructures. Basel: BIS.

Bank for International Settlements. Payment Systems and Financial Stability. Basel: BIS.

## **Data Governance, Digital Identity, and Privacy**

World Bank. Identification for Development. Washington, DC: World Bank.

World Bank. Principles on Identification for Sustainable Development. Washington, DC: World Bank.

OECD. Data Governance in the Digital Economy. Paris: OECD Publishing.

Bank for International Settlements. Big Tech in Finance: Opportunities and Risks. Basel: BIS.

International Monetary Fund. Data, Digitalization, and Financial Services. Washington, DC: IMF.

## **Cash, Resilience, and Payment Continuity**

Sveriges Riksbank. Payments Report. Stockholm: Sveriges Riksbank.

European Central Bank. Study on the Payment Attitudes of Consumers in the Euro Area. Frankfurt: ECB.

European Central Bank. Cash and Payment Statistics. Frankfurt: ECB.

Bank for International Settlements. Operational and Cyber Resilience in Payment Systems. Basel: BIS.

Federal Reserve. Diary of Consumer Payment Choice. Washington, DC: Federal Reserve.



Federal Reserve. Payments Study. Washington, DC: Federal Reserve.

## **Platform Payments, Competition, and Open Finance**

Bank for International Settlements. Big Tech in Finance. Basel: BIS.

International Monetary Fund. BigTech in Financial Services. Washington, DC: IMF.

OECD. Competition in Digital Financial Markets. Paris: OECD Publishing.

European Commission. Payment Services Directive and Open Banking Materials. Brussels: European Commission.

Open Banking Implementation Entity. Open Banking Standards and Implementation Materials. London: OBIE.

Competition and Markets Authority. Digital Markets and Payment Competition Reports. London: CMA.

## **Selected Country and Institutional Sources**

National Payments Corporation of India. UPI monthly and annual statistics.

Banco Central do Brasil. Pix statistics and annual reporting.

Sveriges Riksbank. Reports on cash use, payment behavior, and resilience.

Federal Reserve. Consumer payment behavior and payments-system data.

European Central Bank. Euro-area payment statistics and cash-use studies.

World Bank. Global financial inclusion and remittance databases.

GSMA. Mobile money adoption, agent, and transaction data.

Bank for International Settlements. Fast payment, payment infrastructure, CBDC, and cross-border payment research.

## **References takeaway**

The literature on digital payments is spread across many fields: finance, development, public policy, technology, regulation, consumer protection, and economics. This reflects the central argument of the book. Digital payments are not only a fintech topic. They are part of modern economic infrastructure.

# About the Author



Rajeew Vishvakarma is a seasoned professional in the fields of technology and financial services, possessing over twenty years of experience in banking, payments, software delivery, quality assurance, regulatory technology, and digital transformation. He has extensively contributed to the Banking, Financial Services, and Insurance (BFSI) sector, supporting large-scale technology initiatives for global financial institutions.

His professional endeavors encompass project management, product delivery, software quality, Agile execution, testing strategy, financial platforms, and risk-aware technology modernization. Throughout his career, he has cultivated a profound interest in the influence of digital infrastructure on financial inclusion, consumer trust, operational resilience, and economic participation.

Rajeew's scholarly work is situated at the confluence of fintech, digital payments, responsible technology, financial regulation, software quality, and public-interest infrastructure. His recent research investigates the design of payment systems, AI-enabled financial platforms, and digital financial services to foster innovation while safeguarding users, merchants, and institutions.

This book delves into his expansive interest in viewing digital payments not just as convenient tools, but as a crucial economic infrastructure influencing households, businesses, governments, and the future landscape of financial engagement.