



# (UN)STACKING FINANCIAL MARKET INFRASTRUCTURE

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“(Un)stacking Financial Market Infrastructure.” Working Paper. Washington, D.C.: CGAP.

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## Introduction

In March 2019, a group of senior government officials, regulators, banking executives, and fintech CEOs from the Philippines gathered in Manila to discuss the future of financial technology in their country (Schellhase 2019). During the workshop, participants debated the potential of the market, highlighted opportunities to improve financial inclusion, and created a list of the barriers to success. Topping this list was the absence of a “Philippine Stack”—a financial infrastructure capable of providing safe, efficient, and ubiquitous digital rails.

The comments from the Manila workshop are far from unique. Similar conversations are happening in markets across the world, driven in part by the global popularity of “India Stack.” In India, several independent infrastructure systems work in tandem to improve digital financial services for poor people.<sup>1</sup> However, India Stack is more of a conceptual framework than an operational one.

It has provided a common narrative to describe how separate infrastructure systems can help to meet the various needs of poor people. India’s biometric identification system (Aadhaar) allows for remote account opening. Its payment rails (e.g., the unified payment interface [UPI]) allow customers to use those accounts to make interoperable payments. Its data-sharing ecosystem, which is supported by account aggregators, allows these payments to form a shareable transaction history capable of proving credit worthiness. The systems are not necessarily linked or even driven by the same institutional sponsors, but they leverage each other to improve the overall value proposition for customers.

Different elements of this arrangement can be found in many countries. The core of India’s real-time payments, a bank-led and participant-governed retail payment system, also is found in Kenya with PesaLink, the United Kingdom with Faster Payments, and many other markets.<sup>2</sup> There are ubiquitous biometric identity systems in Pakistan, Rwanda, Colombia, and other countries.<sup>3</sup> Collaborative facilities for sharing credit data are used in a wide variety of markets.

No two markets look exactly alike, and how well these systems work for poor people varies widely. While India has shown that a single narrative can help coordinate efforts around a clear set of goals, each market’s path will be different depending on the infrastructure already in place in the market. As a result, local champions are essential, and they often come from the topmost levels of government.

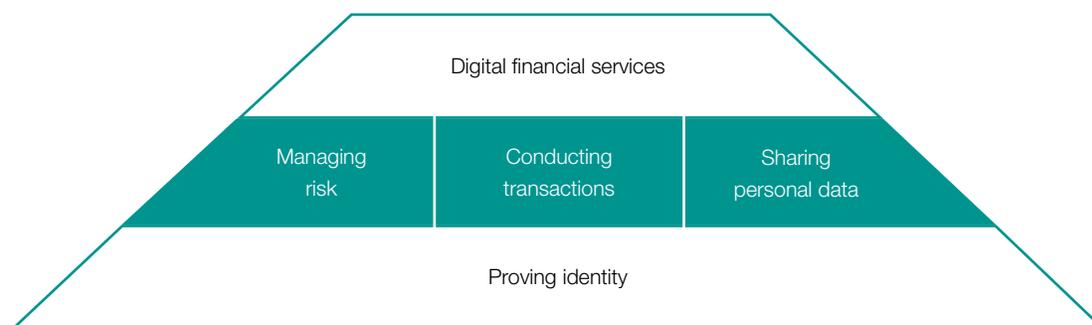
Understanding how to adapt infrastructure to meet the needs of poor people also requires thinking about how each component will help to advance one or more inclusion goals. This is what the Stack narrative has helped to achieve in India. It answers the question: What is the role of each system in advancing our financial inclusion goals? The abilities of these components to advance inclusion goals can be put in four main categories, as shown in Figure 1.

1 The Stack is used to describe complex systems as a neat pile of functions, arranged as conceptual layers.

2 PesaLink, <https://www.sc.com/ke/pesalink/>; Faster Payments, <https://moneyfacts.co.uk/banking/guides/faster-payments-how-do-they-work/>.

3 See the World Bank’s ID4D website, <https://id4d.worldbank.org/global-dataset-references>.

FIGURE 1. **How the Stack concept helps drive financial inclusion**



1. **Proving identity.** Digital identity improves the ability of financial services providers to offer identity verification and authentication remotely, including for account opening.
2. **Managing risk.** Collaborative due diligence allows financial institutions to better manage consumer and compliance risk, sharing the compliance burden to reduce provider costs while maintaining high levels of risk assurance.
3. **Conducting transactions.** Interoperable payment systems allow consumers fast, efficient, and secure payment transactions between institutions. They also help to build the transaction histories customers need to better access other value-added financial services, such as credit.
4. **Sharing personal data.** Data-sharing arrangements provide customers the ability to control and benefit from their own data. They can use the data to apply for loans, get insurance more easily, or simply to change their provider relationship more easily.

The biggest challenges in scaling effective financial infrastructures that work for poor people often are not about technology. Instead, they often revolve around questions of ownership, governance, economics, regulation, and political economy. These challenges are not small, but when addressed effectively, a system can emerge that improves the value of financial services for poor people.

This paper is intended for policy makers and others who are interested in improving the digital financial infrastructure in their countries with the goal of advancing financial inclusion. It advocates for a scheme approach to infrastructure and describes some of the ways countries have tried to accelerate progress toward better systems through a holistic narrative for better “digital rails” in the country.

## Enable financial inclusion through the Stack

iSPIRT describes the “Stack” as comprising “presenceless, paperless, cashless, and consent layers” that are intended to drive more than just financial services. These terms vary between markets as does the scope of what is included as part of the narrative. However, the layers

roughly correspond to four major activities related to enabling financial inclusion: proving identity, managing risk, conducting transactions, and sharing personal data.

## PROVING IDENTITY

Identity provides a point of entry into the financial system and helps improve service delivery in several ways. The World Bank's Identification for Development (ID4D) program identifies key roles for identity in advancing development goals, and several of these relate to financial inclusion (World Bank 2019).

Some of these include establishing proof of ownership, satisfying customer due diligence (CDD) requirements, proving uniqueness, authenticating transactions, and establishing proof of life.

Identity offers **proof of ownership** over property (e.g., to establish collateral for lending) and the **ability to satisfy CDD requirements** (e.g., to obtain an account). Digital identity allows these activities to happen remotely, which lowers the burden on customers. Countries like India and Pakistan have developed centralized digital ID systems that allow customers to biometrically verify their identity. Other countries offer digital ID systems where verification can be done remotely, though not through biometrics—the Integrated Population Registration Services system in Kenya is an example of this.<sup>4</sup> Most countries have some sort of digitized version of records; the question is more often about how easily that information can be used by the market.<sup>5</sup>

Second, identity systems that offer deduplication within a given population can help to establish the **uniqueness** of consumers. For example, they help to ensure the same consumer does not have several credit profiles. At a market level, uniqueness may be limited where ID systems are used in federated or open-market models—where several entities can provide government-recognized identification (World Bank 2019). In countries with multiple systems, such as the United Kingdom, the United States, and Brazil, establishing unique identities for the purposes of assessing credit or performing consent-based data sharing fall to the systems offering those services or to financial services providers themselves.

However, even in markets with centralized systems, such as India with Aadhaar, the use of the ID system to establish uniqueness can be contentious. When India's tax authority announced the use of Aadhaar to establish uniqueness, multiple stakeholders challenged the legality of this action.<sup>6</sup> India's public credit registry, which is in development, intends to link credit reporting records to tax identification to establish uniqueness in the system. However, it relies on Aadhaar's centralized database only indirectly. India's consent-based personal data-sharing scheme has opted to avoid some of these challenges by not relying on a single unique identifier, even though this is theoretically available through Aadhaar.

Secure payment **authentication** (e.g., proving payers are who they say they are) and **proof of life** (e.g., ensuring a social protection recipient is still present or alive to receive benefits) are

4 See IPRS Kenya, <https://immigration.go.ke/integrated-population-registration-systemiprs/>.

5 There are very few examples of fully nondigital identification (i.e., where no portion of the information is digitized). One example of this is the Kebele card in Ethiopia where paper-based cards are issued through decentralized issuance centers and no digital record is maintained.

6 Addendum to India's Income Tax Act, 2017, <https://www.incometaxindia.gov.in/Acts/Finance%20Acts/2017/10212000000064612.htm>. See also LiveMint (2020).

two more ways that identity, and biometrics in particular, can support financial services. In cash transfer schemes, biometrics can help ensure the intended beneficiary received the payments. Examples of this include the United Nations High Commissioner for Refugees' iris-scan payments in Jordan using a United Nations beneficiary registry and Aadhaar-based transfers for social protection payments in India. In Kenya, social protection payments are secured by biometrics, but the biometrics are held with the financial institution and collected at the time of enrollment. The commonality in all these cases is that some biometric token helps to prove information. A foundational national identity is only one among a variety of options for meeting these objectives.

Finally, digital signature solutions in coordination with digital identity also offer consumers the ability to digitally sign documents such as loan agreements and other contracts (FATF 2020). These have a long history with services like Verisign, which serves wealthy customers in developed markets, but are becoming increasingly relevant in developing markets.<sup>7</sup>

## MANAGING RISK

Some components of financial infrastructure help manage the risk and cost absorbed by providers when they comply with anti-money laundering and combatting the financing of terrorism (AML/CFT) requirements. Solutions such as collaborative know-your-customer (KYC) assessments make it possible for a customer to avoid repeated KYC checks by sharing the assessment already performed by a provider.

India established a centralized KYC solution in 2015. The system is operated by the Central Registry of Securitization Asset Reconstruction and Security Interest of India. However, it is not widely used. There are few other examples of markets that have tried the model, and questions remain around whether the right economic incentives exist to drive adoption.

The Association of Banks in Singapore pursued a utility that would support both customer identity verification and beneficial ownership checks of corporate customers, but a lack of a viable business case led the service to be shut down (Lyman, de Koker, Martin Meier, and Kerse 2019). Collaborative models for managing risk may struggle, in part, because liability often remains with the provider. Shared services will not offer efficiency gains unless providers are also comfortable reducing their own internal compliance activities and costs.

Other facilities for shared transaction monitoring and reporting, assessment of beneficial ownership, and risk assessment and profiling have the potential to collaborate and standardize activities that drive up costs for providers, but there are similarly few global examples. As open banking regimes gain traction, new decentralized mechanisms for improving risk management also may become available, but this remains to be proven.

## CONDUCTING TRANSACTIONS

Digital payments offer a well-documented value to financial inclusion through sending remittances, receiving social protection payments, and driving other solutions. They are becoming more relevant in helping to build the data footprints necessary for poor people to

<sup>7</sup> Verisign is a global provider of domain name registry services and internet infrastructure.

obtain other financial products, such as credit, for the first time. Interoperable services improve the value proposition for payments by allowing customers to conduct transactions across providers rather than in silos.

Interoperable payment systems have a long history in card-based models and interbank transfers, but they are becoming increasingly positioned to support the small-dollar, real-time transactions relevant for poor people. Instant payment systems are becoming popular in both developed and developing markets—from Faster Payments in the United Kingdom and NPP in Australia, to FAST in Cambodia, InstaPay in Philippines, and PesaLink in Kenya, among many others.

Increasingly, these systems are expanding to accommodate new types of actors that are more likely to serve poor people with accounts that are the on-ramp to formal financial services. Examples include JomoPay in Jordan, which includes bank and e-money participants, and NPCI in India, which extended participation to prepaid issuers. Services like UPI in India also push the boundaries of payment interoperability by allowing for transactions to be initiated by services providers other than those who hold (issue) the account (Cook and Raman 2019).

## SHARING PERSONAL DATA

Accounts and digital transactions offer an on-ramp to financial services for poor people, but a broader array of services is needed to improve livelihoods (FinAccess 2019). Consent-based data-sharing models, such as open banking and India's data-sharing architecture, allow consumers to use their data to obtain services such as credit and insurance and get better financial advice. They also help providers build better user experiences.

Other collaborative models, such as MyData, have voluntary data-sharing frameworks with public and private collaboration, but few have achieved scale.<sup>8</sup> One reason behind the limited adoption of these models may be that while financial services providers may have a clear incentive to participate in an arrangement for payment interoperability, which would allow their customers to make and receive more transactions, those same providers may have less incentive to participate in a data-sharing arrangement that they believe will benefit only other actors. India's account aggregator model attempts to address this by requiring participants who are able to receive data to also share data (Datwani and Raman 2020).

The most ubiquitous examples of data-sharing infrastructure are credit bureaus and public credit registries. These services often are different from consent-based data sharing in that they focus on consumer liabilities rather than assets (Nilekani 2019; Aiyar 2017). Consent-based models often are not well-positioned to report on liabilities because consumers could opt not to consent to sharing information that puts them in an unfavorable light.

Infrastructure solutions that support better digital identity, risk management, financial transactions, and data sharing can vary widely between markets. These systems have the potential to carry unique consumer benefits, project needs, and participant incentives, depending on market context. However, designing a scheme is complicated and requires looking beyond technology to the governance and economic considerations that drive effective use.

8 See MyData, <https://mydata.org/>.

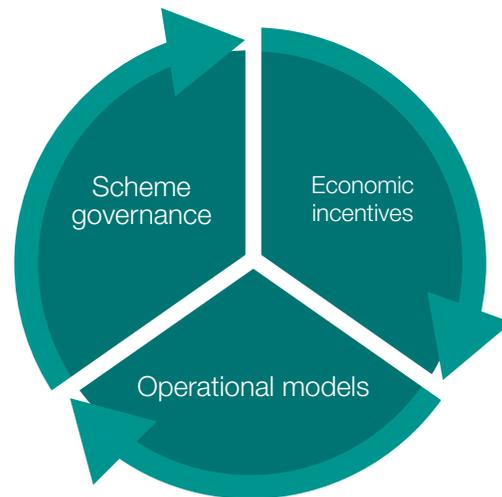
## Focus on schemes over technology

Policy makers and other champions of inclusive financial services infrastructure tend to approach these issues as technology problems. However, infrastructure is about more than technology. The ability of financial services infrastructure to effectively serve poor people depends heavily on building sustainable and inclusive schemes.

A scheme generally is defined as a large-scale plan or arrangement. In the payment systems space, schemes define the rules for how participants will work together, how incentives will be balanced, and how systems will provide the necessary level of support, and the same conceptual framework can be useful in promoting effective models for other types of financial infrastructure. These three elements (shown in Figure 2) form the basis of an inclusive, effective infrastructure that is capable of advancing the needs of poor people.

- **Scheme governance** defines the power structure of the scheme and the way decisions will be made. Fair and inclusive governance helps ensure participation from a variety of actors, including those best positioned to serve poor people, such as e-money issuers. The role of the infrastructure owner or operator in making these decisions—and its ability to self-supervise—will depend on local laws and regulations.
- Balanced **economic incentives** between infrastructure operators and participants help ensure use of the system at scale and a sustainable commercial model to support ongoing operation. Infrastructure owners and operators must cover costs to ensure sustainability, either through fees to participants (users) or through some form of subsidy. Understanding and applying the right incentives help to ensure costs are not passed on to poor people, except where necessary.
- Effective **operational models** help ensure the system is reliable and that appropriate contingencies have been considered in case of failure. They also help owners and operators manage emerging risks, clearly communicate expected service levels, and define mitigating actions when things go wrong. For poor people, this means being able to count on the services they use. Financial products offered to consumers will be only as reliable as the infrastructure that products ride on.

**FIGURE 2. Three elements of an effective scheme**



Taking a scheme view of infrastructure components and thinking about the impact of governance and economic incentives, operational models help to ensure individual infrastructure components are best placed to serve poor people. For example, questions such as the following go beyond

technology investment but have significant impact on how financial infrastructure will or will not support financial inclusion:

- What are the rights of an e-money issuer in accessing a digital ID system for CDD verification as compared to that of a bank?
- How does a payment system use interparty fees to balance participant incentives?
- What measures in a data-sharing arrangement help to maintain data-blind intermediaries?

While the champions, owners, and operators of these arrangements can be drawn from the public or private sectors, the public sector is likely to play a role in any scheme discussion. This role may be limited to oversight, such as ensuring fair use and compliance with relevant policy and regulation, but it also could take on the role of a catalyst that prompts the private sector to take certain action or a directly operational role that is responsible for owning and operating the infrastructure system (Cook and Raman 2019).

The nature of the public sector's role will vary depending on the type of infrastructure and the market context. While identity systems frequently are operated by the public sector and retail payment systems frequently are governed by industry, there are exceptions to both. For policy makers, improved service delivery, stability, integrity, and consumer protection drive these decisions. For financial services providers, incentives more frequently include cost reductions and the ability to provide new services that are native to digital.

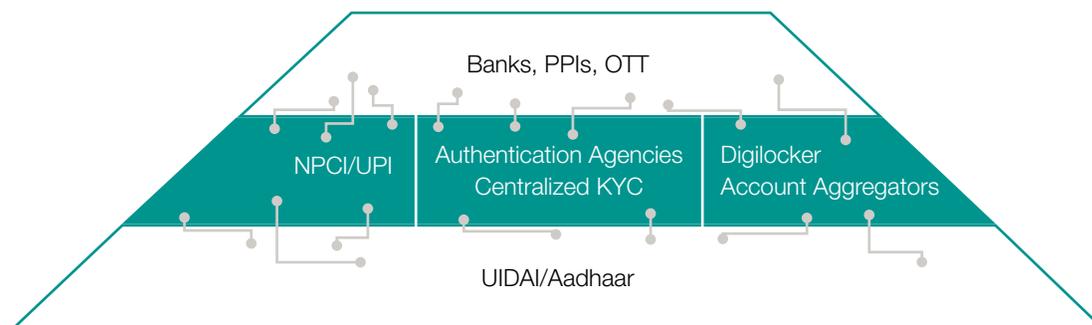
Building effective infrastructure systems that meet the needs of all participants and encourage sustainable growth is not easy. Yet some markets have taken the discussion around infrastructure to another level of abstraction, drawing conceptual lines around a series of infrastructure systems in the market to highlight how these systems might work in tandem as a Stack to address the needs of poor people.

## Bring infrastructure systems together

Anyone who has ever met Sharad Sharma, co-founder of iSPIRT, India's civic technology think tank, probably has heard the story about Rajni. Rajni is a poor fruit seller in Mysore. She needs credit to run her business but that requires a variety of services: a credit history, a way to safely receive the funds, and a way to get an account in the first place. However, Rajni historically has not had access to these services.

India Stack (as shown in Figure 3) first helps address her need for a financial account with the digital identity proofing provided by Aadhaar. Once she has an account, Rajni can use UPI to make interoperable digital payments from her mobile phone and thus build a transaction history. Through India's data-sharing framework, her transaction history is made available to other services providers who can check her creditworthiness and provide a loan offer. Finally, India's digital signature solution gives her the ability to sign the loan agreement remotely. The funds are transferred into her account, from which she can spend and repay digitally and can continue to build her digital footprint to obtain future services.

FIGURE 3. India's approach to the Stack



This type of visioning—a mix of human-centered design and strategic planning—forms the basis of what iSPIRT has championed as India Stack. For this one loan transaction to work effectively, several digital infrastructure components must work in tandem. These infrastructure systems are separately developed and serve different purposes in the market, but they work together to achieve a common goal.

This type of narrative helps to build the vision of infrastructure systems in relatable rather than technical terms. However, consumer needs will be different in every market, and there is likely to be more than one user profile—more than one Rajni. A narrative helps tell the story, and this narrative continues to evolve as new innovative use cases are added.

Global experience suggests that two factors are typically necessary to drive a market-level narrative: finding a champion and building popular legitimacy.

## FINDING A CHAMPION

Nandan Nilekani—former CEO and current Chairman of the technology company Infosys—first outlined a form of the vision for India Stack in a book that was published in 2007 (Nilekani 2009). In 2009, he was appointed to a cabinet-level position to oversee the implementation of India's digital ID system, Aadhaar. In driving Aadhaar, Nilekani recruited talented people from the private sector as volunteers. These volunteers provided early technical skills and capacity that would have been difficult for the government to easily acquire. The team deliberately built in flexibility and scalability. It used open technologies and standards to avoid being locked into using only one or two vendors.

It was in this context that the volunteer organization iSPIRT was founded by Sharad Sharma in 2013. iSPIRT draws on the belief that private innovation can build value only when local communities create foundational public goods as an open ecosystem.

Over the same period, the Reserve Bank of India (RBI) led the creation of the National Payments Corporation of India (NPCI), and more recently, it played a leading role in driving consent-based data sharing (Datwani and Raman 2020). RBI provided direction, institutional memory, convening power, and legitimacy for these projects. However, iSPIRT has continued to act as a champion for each, and it also has continued to connect the dots between efforts to help to provide capacity and drive the narrative for change.

Champions work outside government or at a high level within an administration to drive a holistic narrative for change can be seen outside India. Examples include Anir Chowdhury working with a2i, an e-government initiative directly supervised by the Prime Minister's Office in Bangladesh, and Nadeim Makaram, co-founder and CEO of Go-Jek, holding in a cabinet-level position in Indonesia (Potkin 2019). In Kenya, a comprehensive strategy toward market infrastructure has been championed in part by FSD Kenya. The plan, called "Digital Finance 2.0," includes aspects of digital identity and eKYC, retail payment infrastructure, and personal data sharing.

What makes an effective champion? Ideally, a champion's ability to motivate extends beyond her ability to mandate. This may be one reason why India and an increasing number of other countries are looking beyond government and toward civil society to help drive change. Representation from civil society allows initiatives to maintain continuity through political changes.

The champion's role of inspiring change is not necessarily the same as that of a neutral facilitator or resource center, but the hats are often worn together. Successful examples such as iSPIRT offer both additional (free) capacity to the market and a voice that is independent from constituencies inside and outside government.

The case for change often is rooted in a vision that can be hard to quantify—for example, think about all the ways Rajni's life will improve when these systems work in tandem to solve her problems. However, the achievement of intermediate goals likely will be driven by more immediate realities. For example, Aadhaar's adoption largely was driven by an opportunity to improve the process for disbursing social protection payments, which helped the government save money. The system solved an immediate pain point for stakeholders, while at the same time it put down the first plank toward the vision of a broader digital future for poor people.

Centralized environments—such as Thailand, China, or Vietnam—where strong public sector institutions have played a coordinating role seem to have an obvious advantage in setting a marketwide roadmap. However, the importance of popular acceptance is not to be undervalued.

## **BUILDING POPULAR LEGITIMACY**

While Nandan and the iSPIRT team helped shape a vision, they were contributing to a much larger agenda. In July 2015, Indian Prime Minister Narendra Modi launched "Digital India," a campaign by the Government of India to improve digital infrastructure in the country. It covers everything from e-governance and communications to the infrastructure supporting financial services.

The digital nation, waving a banner for technology, is a familiar concept, but the success of these programs varies widely. Commitment from the topmost levels of government is a key success factor.

"There needs to be a vision from the political side. It needs to be there always—a policy, not politics. But the politicians need to live it," said Marten Kaevats, Estonia's national digital adviser in 2017 as he described his country's path to progress. The Estonia government has consistently championed its country's digital infrastructure and as a result, invested heavily in that infrastructure. "We had to set a goal that resonates, large enough for the society to believe in," said Taavi Kotka, former chief innovation officer of Estonia (Heller 2017).

A similar ethos was embraced by India. Progress on initiatives like the payment systems reforms driven by NPCI were tracked in weekly reporting up to the level of the Prime Minister's Office.

Part of building legitimacy involves applying what makes a country culturally unique to create a narrative that resonates. *Aadhaar*, which means “foundation”; *Bharat*, which means “truth seeker”; and *BHIM*, which is a reference to Bhimrao Ambedkar, the architect of the Indian constitution, all draw on a sense of patriotism in a country with high trust in government institutions. A part of what drove membership in NPCI after some initial reticence from mid-tier banks was a demand from consumers who wanted their BHIM app because it was named and championed by the Prime Minister. To offer BHIM, banks had to join NPCI as participating members (Cook and Raman 2019).

In Estonia, forming this narrative meant reaching into cultural heritage for a sense of identity in a post-Soviet society. For example, the term *kratt*, which refers to an assembly of objects brought to life in Estonian folklore, was used to establish a new discourse around the roles of algorithms and technology in public life (Heller 2017). The discourse was important in the context of emerging as a digital nation, and the term connected with the public in a way that technical jargon could not.

## Looking ahead

Even in India, the *what* of India Stack continues to evolve as new use cases are imagined and new infrastructure systems are developed. Some use cases such as centralized KYC remain underused. Others such as India's account aggregator model for open banking will soon be tested. And yet India's progress remains defined in terms of the whole rather than the success or failure of individual systems.

In India, a government benefactor found great value in driving a government-to-person use case to promote early change. Is this repeatable? In some markets, maybe. Countries like Bangladesh and Indonesia are picking up a portion of the India playbook to develop similar solutions for enabling social protection payments. Other markets are looking toward different government use cases and still others are looking to the private sector to drive the change toward better, more connected digital rails.

More than ever before the necessary technology tools are available. Biometric identity systems are cheaper to build. Open source platforms like the Modular Open Source Identity Platform are being implemented in markets like Morocco and the Philippines (Ganapathi and Karwa 2018). Best practices in the development of infrastructure components are being championed through the projects of global partners such as the Bank of International Settlements, the World Bank, ID4D, and others. However, these remain tools to help implement a broader vision.

The vision for change and the narrative must be local—as must the champions who drive that narrative. Civil society has a unique role to play in bridging public and private sector conversations, attracting the right talent, and pressing an agenda for change that outlives changing political fortunes. However, public sector leadership is equally important in solidifying legitimacy, building popular support, and in many cases, ensuring adequate funding.

Where all these pieces come together, infrastructure systems have the potential to go beyond siloed technologies and instead become the building blocks for financial inclusion.

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