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Financing Digital Public Infrastructure

Approaches to Sustain Digital Transformation

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About New America

We are dedicated to renewing the promise of America by continuing the quest to realize our nation’s highest ideals, honestly confronting the challenges caused by rapid technological and social change, and seizing the opportunities those changes create.

About Digital Impact and Governance Initiative

The Digital Impact and Governance Initiative (DIGI) works to catalyze next generation systems and solutions powering the field of digital public infrastructure through cross-sector collaboration with government partners, the technology sector, and civil society. Interoperable, open, and replicable civic solutions are the basis for more inclusive, transparent, and secure outcomes and do not need to come at the cost of privacy or human rights. Together, we can advance a people-centric digital transformation that strengthens communities and democratic values worldwide. The emerging field of digital public infrastructure is ever-evolving. As a result, DIGI’s work remains flexible to address the challenges and opportunities at the forefront of tech’s role in society. But our mission is always driven by the need to put people at the center of solutions, using tech as a tool to improve equity, inclusion, justice, and access.
## Contents

Overview 7

Executive Summary 7

Who Should Read This Report? 10

Methodology 11

Introduction 12

What Is Digital Public Infrastructure? 12

Why Is Sustainable Financing Essential Now? 14

Current DPI Funding Models 15

Government 15

Philanthropy 16

From Philanthropic to Self-Sustaining 17

Intergovernmental 18

Multilateral Organizations 18

Diverse Funding Streams 19
Contents Cont’d

Sustainable Funding Challenges 21
   Lack of Coordination 21
   Misalignment of Incentives 21
   Lack of Regulations Facilitating New Business Models 21
   Siloed, Sector-Based Funding Approach 22
   Disconnect between Tech Development and Funding Cycles 22
   Barriers to Discoverability 22
   Lack of Capacity Building 22
   Insufficient Funding to Meet Global Demand 23
   Innovation Aversion and First-Mover Disadvantage 23
   Competing Priorities and Political Will 24
   Complex Government Procurement Processes 24

Recommendations 25
   1. Create a Unified Funding Mechanism 25
   2. Emphasize Self-Sustaining Business Models 28
   3. Establish an Open Marketplace 30
Contents Cont’d

Conclusion: Advancing DPI 33
Appendix 1: Funding Model Examples 35
  Government: Aadhaar 35
  Philanthropy: Mojaloop 36
  From Philanthropic to Self-Sustaining: ProZorro 37
  Intergovernmental: X-Road 39
  Multilateral Organization: LACChain 40
  Diverse Funding Stream: District Health Information System 2 (DHIS2) 42
Appendix 2: Leveraging Financial Intermediary Funds 44
Appendix 3: Additional Readings 46
Overview

Executive Summary

For global digital transformation to be successful, stakeholders must assess how to develop and deploy more inclusive systems collaboratively, safely, and effectively. Recently, the COVID-19 pandemic accelerated the demand for digital solutions to improve countries’ public and private service delivery. Some countries, like Togo, were able to deliver seamless digital payments to their most vulnerable populations. Other countries, including the United States, pumped huge sums of public money through outdated systems that buckled under the weight of the crisis, resulting in unprecedented inefficiencies in the delivery of public services and benefits. The results are clear: Legacy systems are no longer fit to govern twenty-first century societies, and every country and community needs systems suitable for the modern digital age.

Our team assessed the challenges surrounding sustainable financing for digital public infrastructure (DPI)—the digital rails enabling core functions that all societies need to power more inclusive, effective, accountable service delivery, such as identity verification, payments, and data exchange. A growing movement of global leaders are investing in DPI, enabling solutions ranging from the digital economy, health, and education sectors to cash transfers and food distribution. We set out to examine the current landscape of DPI funding, potential sources of new financing, and recommendations for how the public, private, and social sectors might collaborate to resource DPI systems for social impact at scale.

With no single funding vehicle dominating the emerging DPI landscape, this paper first examines existing funding models across six categories, identifying an example solution for each:

- **Governments** are often invested in supporting DPI projects through their entire life cycle, given the significant advantages for their residents and organizations across all sectors. However, governments often lack incentives to scale solutions beyond their jurisdiction and may struggle with inflexible procurement, limited funds and political will, and sociopolitical and data privacy risks. *(Example: Aadhaar)*

- **Philanthropies** are well suited to provide early-stage funding for DPI, having a higher risk tolerance for experimentation, the ability to act nimbly, and the means to crowd-in other funders. However, this funding can lack long-term implementation and feasibility planning, as investment is subject to change based on broader strategies. *(Example: Mojaloop)*
• **Philanthropic to self-sustaining** models can leverage philanthropic capital as initial anchor funding to help incubate and de-risk solutions. Moving on to a self-sustaining model can help secure a solution’s longevity, though funding sources may be regressive. *Example: ProZorro*

• **Intergovernmental** collaboration is useful in lowering overall development and maintenance costs, scaling across jurisdictions, and managing risk. However, coordinating joint efforts and resources and finding willing partners may be a challenge. *Example: X-Road*

• **Multilateral organizations** can provide reliable financing, crowd-in other public and private funding, coordinate different sources of capital, supply technical and policy expertise, attract users, build in-country capacity, and convene stakeholders. Disadvantages may include institutional complexity, higher absolute costs, and decreased funder control, visibility, and preferences. *Example: LACChain*

• **Diverse funding streams** help diffuse risks across multiple stakeholders, increase the visibility of DPI projects, protect solutions from reliance on any single source of funding, and allow stakeholders with different incentives to support and scale common solutions. Challenges include coordinating funders and their goals, aligning investment incentives across stakeholders, and creating mechanisms to pool and allocate funds. *Example: District Health Information System 2*

We weighed the strengths and weaknesses of these existing models against a range of challenges underlying the sustainable financing of DPI. These include:

• **Lack of coordination among stakeholders**, leading to duplicative efforts;

• **Misalignment of funding incentives**, with no center of gravity to incentivize collaboration among actors and articulate return on investment at different stages;

• **Lack of regulations that facilitate new business models**, discouraging the development and financing of private-sector solutions;

• **Siloed, sector-based funding approach**, leaving foundational systems that could be leveraged by multiple sectors underfunded;

• **Disconnect between funding and technology development cycles**, with funding expiring just as systems begin to demonstrate impact;
• **Barriers to discoverability of successful DPI solutions**, with no single repository that holds the complete breadth of DPI solutions;

• **Lack of funding for capacity building**, preventing some countries from working with the private sector or implementing systems themselves;

• **Insufficient funding**, requiring a transition to more efficient infrastructure models;

• **Innovation aversion and first-mover disadvantage**, leaving many governments unwilling to accept the financial or social risk of deploying new DPI on their own;

• **Competing priorities and political will**, preventing teams from receiving the resources, capacity, and oversight needed to navigate organizational challenges; and

• **Complex government procurement processes**, resulting in cumbersome systems, vendor lock-in, and increased costs.

Through this process, we found that creating new financing architecture to align incentives and funding from a diverse set of actors—shifting from a funding approach to a financing approach¹—may best support the development and scaling of open DPI across jurisdictions. This paper identifies three key recommendations:

1. **Create a unified funding mechanism**: A unified funding mechanism could pool disparate funding sources under a common framework to promote coordination, derive more impact from available resources through both traditional and innovative financing mechanisms, and prioritize investments more efficiently. This architecture could create incentives for experimentation and participation, underpin multi-stakeholder governance models, support local technical capacity, facilitate scaling, and help ensure that successful products stay relevant. Pooled funding to support DPI could reduce first-mover risks, help provide a knowledge hub for the field, and address often overlooked, but critical, maintenance costs.

2. **Emphasize self-sustaining scale business models**: Solutions that are self-sustaining or have achieved long-term funding commitments are much more likely to succeed. Stakeholders should prioritize building solutions with explicit plans for how they will continually support themselves.
3. **Establish an open marketplace**: An open, transparent marketplace could connect implementers and technology providers with sources of funding, helping to aggregate demand and better coordinate the development of shared solutions. A marketplace could also provide both funders and civic innovators with more clarity on existing DPI solutions and certify technology providers that are qualified to build them. Civil society should have a key role in governing this institution and serve as an oversight body for the coalitions it facilitates.

In addition, governments can help build an ecosystem where such shared DPI efforts can thrive. This should include developing whole-of-government strategies for DPI that identify priority infrastructure investments, establish pro-innovation regulations that will make DPI more accessible, elicit proposals for public-private partnerships, incentivize private-sector companies to develop open solutions and build in-country capacity, and strengthen interoperability through open application programming interfaces (API) and collaborative arrangements, in order to drive the infrastructure approach and crowd-in private and other sources of capital.

It is time for open collaboration toward healthier and more sustainable digital ecosystems worldwide. DPI that is responsibly developed and deployed can provide a resilient foundation for public administration and economic activities, as well as support social progress across a range of Sustainable Development Goals.² While financing is just one of the areas that needs attention to create an inclusive and sustainable digital future, we hope the questions, analyses, and recommendations raised in this report will help advance this global effort.

### Who Should Read This Report?

As the field of DPI continues to grow, this report is intended to serve as a resource for digital government decision makers and civil servants, technologists, funders, and civil society actors who are exploring ways to fund and sustain DPI solutions, whether at the local, country, or global level. Given the breadth of multi-stakeholder funding arrangements, these categories may overlap. Outlined below is how we anticipate different audiences can best harness this content.

- **Digital government decision makers and civil servants**: This report encourages government actors to consider DPI as a tool to address common challenges, ranging from access to public services and the improvement of digital solution delivery to issues often present at the intersection of technology and democracy. Awareness of possible financing models, including those that leverage the contributions of multiple sectors, could help inform policy and funding decisions.
• **Technologists:** Private-sector technology providers, public interest technologists, open source vendors, and in-house experts in government and multilateral organizations can play a key role in developing and sustaining scalable DPI solutions. Understanding existing and possible funding approaches can assist in the development and deployment of such solutions.

• **Funders:** Governments, philanthropies, private-sector actors, finance experts at multilateral organizations, and other funders can use this report to prioritize DPI among currently funded digital initiatives and weigh the benefits of both traditional and innovative financing.

• **Civil society actors:** This report discusses how civil society entities, such as universities or other nonprofit institutions, can play a role in the governance and monitoring of projects and help to ensure sustained funding.

**Methodology**

In March 2021, New America’s Digital Impact and Governance Initiative (DIGI) convened key stakeholders to explore the financing architecture necessary for developing the field of DPI. The lack of a common financing architecture to support the development of replicable systems built by multi-stakeholder coalitions was identified as a critical gap. This report examines different models for financing DPI across various sectors, including government, philanthropy, international development organizations, and multilateral organizations.

The findings below are informed by interviews with more than a dozen experts from organizations across each of these sectors, including the World Bank, the Inter-American Development Bank, DHIS2, and Mojaloop, and builds on insights shared by funders and government leaders. Six representative funding models from this process are highlighted as examples to demonstrate how DPI has been funded to date and to illuminate the strengths and challenges of each model. Finally, this report outlines recommendations for future financing approaches for DPI initiatives and presents learning questions for further consideration.

This report is neither an exhaustive list of financing options nor an analysis of the merits or an endorsement of any particular DPI technology or solution; rather, it is an initial landscape examination of possible financing approaches. While this conversation is perhaps most advanced in the international development community addressing the needs of low- and middle-income countries (LMICs), DIGI sees value in considering and promoting DPI at a global level for the benefit of individuals and open societies across all income levels. It is our expectation that this discussion will continue to mature as knowledge of DPI and the availability of DPI examples expand.
Introduction

Over the past decade, our increasing reliance on digital systems has given rise to two parallel realizations: On one hand, digital solutions have incredible potential to power our economies and societies, but on the other, there is growing unease that our existing digital public infrastructure (DPI) is failing to deliver positive outcomes for all individuals due to a lack of sufficient accountability, accessibility, and security.

The COVID-19 pandemic highlighted this duality, as digital solutions provided avenues for recovery and resilience, but also exacerbated economic and social inequality in places where people lacked access to digital tools and where public institutions lacked effective systems to deliver pandemic response. Concerns in the political and economic arenas—ranging from the harmful consequences of misinformation and disinformation to the misuse and commercial manipulation of individuals’ data—further underscore that our digital ecosystem requires urgent attention. These issues manifest uniquely in many countries around the world, regardless of their level of income or economic development.

In part, these challenges are a by-product of the way in which our digital systems developed. While many forms of physical infrastructure (such as roads, water, and electricity) exist thanks to public-private partnerships that built and facilitated safe, universal access over time, the same has not been true of the development, governance, and funding of our digital infrastructure. Although private-sector led technical development has catalyzed incredible innovation at lightning speed, several of the basic functions on which public and private services depend—such as verifying identity, making payments, and exchanging data—were not built into the rails of our existing networks. Technology companies have filled in those functional gaps with a patchwork of proprietary systems, some driven by extractive data monetization business models that are incompatible with healthy and open societies.

What Is Digital Public Infrastructure?

A growing movement of stakeholders across governments, international organizations, philanthropy, the international development community, and the private sector is exploring the need to define, identify, and invest in DPI. DPI refers to solutions and systems that enable the effective provision of essential society-wide functions and services in the public and private sectors. This includes but is not limited to:

- Digital forms of ID and identity verification;
• Civil registries;
• Payments, including digital transactions and money transfers;
• Data exchange; and
• Information systems.3

To be of greatest use to the people and institutions both receiving and administering services, DPI should include digital platforms that are intended to:

• Reach population scale;
• Be replicable, interoperable, and adopted across organizations and jurisdictions,
• Facilitate cross-sector use cases; and
• Include a form of public accountability and governance to allow for greater transparency and oversight.

Essentially, DPI provides the foundation for public administration and economic activity for a diverse set of stakeholders, hardwired with accountability, effectiveness, equity, and security in order to provide better outcomes for individuals and societies. Just as roads, bridges, and other physical public infrastructure must be safe and easily accessible by everyone in society, so, too, should DPI.

One of the core value propositions of DPI is that it allows governments and organizations to develop replicable and open software solutions, share best practices, and promulgate applicable technical standards across organizational and jurisdictional boundaries. Rather than developing duplicative solutions to solve public challenges, stakeholders can collaborate to design and develop best-in-class solutions together and adapt them to meet local needs and use cases.

“Just as roads, bridges, and other physical public infrastructure must be safe and easily accessible by everyone in society, so, too, should DPI.”
It may be helpful to note that the lexicon is evolving to distinguish between DPI and the foundational components used to build DPI, known as digital public goods (DPGs) and building blocks. (For a more comprehensive explanation, see these definitions by the GovStack Community of Practice with the Digital Public Goods Alliance.)

Why Is Sustainable Financing Essential Now?

Among several issues that will need to be addressed to unlock the emerging potential of DPI, this report is specifically focused on exploring how different actors could contribute and engage with a sustainable financing architecture. This analysis is timely, as momentum to institutionalize architecture for DPI has increased in the wake of the COVID-19 pandemic. In the past year alone, global commitments include $295 million (USD) from multi-sector funders at the 2022 UN General Assembly to advance inclusive DPI, consultations to promote a Digital Public Goods Charter, and ongoing work to support the Summit for Democracy’s Year of Action through institutional readiness and digital transformation efforts. With engagement on the rise, innovative approaches are needed now to align and coordinate stakeholders. The decisions made today will determine whether DPI is sustained through a secure, inclusive, participatory ecosystem, with long-term implications for the health and vibrancy of societies.

Looking toward the future, one actionable goal is elevating DPI development among the digital initiatives in which stakeholders invest. For example, the G7 Leaders Forum recently launched the Partnership for Global Infrastructure to mobilize $600 billion (USD) by 2027 for global infrastructure investments in low- and middle-income countries (LMICs), including secure information and communications technology networks and infrastructure to power economic growth and facilitate open digital societies. If stakeholders create the architecture and incentives to invest a fraction of those funds into scalable DPI solutions, target countries could be better prepared to respond to sectoral challenges across the board.
Current DPI Funding Models

Currently, there is no single financing vehicle that dominates the emerging DPI funding landscape or is appropriate for all DPI initiatives. This report highlights a number of existing DPI funding models and provides a representative example for each (see Appendix 1 for more information on the individual use cases). In categorizing these examples, the test applied was whether the majority of the funds were provided by the particular source. The examples are not an endorsement of the implementing organizations or the solution; rather, they serve as real examples of how various funding models have previously been utilized to support DPI initiatives around the world.

The identified funding sources include:

- Government;
- Philanthropy;
- From Philanthropic to Self-Sustaining;
- Intergovernmental;
- Multilateral Organizations; and
- Diverse Funding Streams.

It is important to note that, while not included in this section as a primary funder of existing DPI examples, the private sector also has a role to play in the financing ecosystem. Historically, private-sector companies have often created and financed early versions of products or services such as railroads and energy grids that later became essential infrastructure. While private capital is the main source of funding for broader digital transformation efforts currently underway, in the case of DPI, funding and incentives provided by the public, philanthropic, or multilateral sectors could also help address areas of development with limited commercial viability and provide critical support to convene, coordinate, and scale multiparty efforts. Going forward, the private sector’s role merits deeper discussion, with an eye toward ensuring its activities are consistent with healthy democracies and competitive economies.

Government

Civic innovators in government and the social sector are increasingly keen to devote public resources to implementing DPI as a foundation of national digital
transformation efforts. DPI can support whole-of-government systems for identifying beneficiaries of services, sharing information across agencies, and facilitating cash payments and other flows of funds. Because DPI can also support innovative digital solutions that improve the operations and service delivery capabilities of other organizations (e.g., businesses, health institutions, nonprofit and civil society organizations, and the like), governments are often interested in building these capabilities for their residents. Public funding for DPI often comes from general tax revenue or other sources of public funding, which can be allocated to incentivize the use of common systems across government agencies or subnational government bodies.

One advantage of this model is that governments have skin in the game and are more likely to see technology projects through to success. However, potential challenges persist. Governments often lack the incentive to scale successful projects beyond their borders unless they can arrange a complex licensing process, stymieing the use of open source solutions. Many governments struggle with inflexible or internally siloed procurement processes, especially if they lack a designated body to deploy public-sector technology systems. Further, some governments, particularly those in the developing world, have limited funds and internal capacity for implementing digital solutions. There are also sociopolitical and data privacy risks to governments taking on too much control over a system that they solely fund.

One example of the government funding model is Aadhaar, India’s digital identity platform. There are well-documented security, privacy, human rights, and governance concerns related to the creation of one of the world’s biggest biometric databases, and these issues may be exacerbated by the lack of a cross-sector and multi-stakeholder approach to funding and oversight. However, for this research, we are interested in the Aadhaar solution as an example of a governmental funding approach to a population-wide digital solution. Read more about Aadhaar as a funding model in Appendix 1.

**Philanthropy**

Philanthropic support has significantly strengthened foundational approaches to DPI. Philanthropies often have a higher risk tolerance than governments for experimenting and for testing new solutions. In addition, philanthropic capital may be better aligned to near real-time concerns, as they can often act more nimbly than other funders, which was proven in many ways during the COVID-19 pandemic. They can also de-risk technical development by providing early anchor funding in the form of grants for innovative solutions and may help crowd-in other funders. However, this funding model can sometimes lack long-term implementation and feasibility planning.
For these reasons, philanthropic capital is typically well aligned as initial or seed capital for exploring or piloting DPI proofs of concept. However, philanthropic support for any single initiative can change as projects become more or less aligned to their initial investment strategy. This puts essential digital infrastructure at risk if other stakeholders, such as government partners, are unable to allocate funds for long-term system maintenance.

Mojaloop is one example of this model, where philanthropic capital was leveraged to develop an open source technology solution for digital payments in Tanzania and Uganda (with ongoing pilots in Myanmar and Rwanda). Core operating costs of the nonprofit Mojaloop Foundation, which was formed to govern and amplify these efforts, are funded by grants from philanthropies and membership dues. Initial Sponsor Members are the Bill & Melinda Gates Foundation, Coil, Google, ModusBox, and the Rockefeller Foundation. While this digital system can be deployed across multiple jurisdictions, philanthropic funders will need support from other stakeholders to effectively create the infrastructure needed to scale such DPI solutions. Read more about Mojaloop as a funding model in Appendix 1.

From Philanthropic to Self-Sustaining

One class of solutions leverages philanthropic capital for development costs and shifts to a self-sustaining funding source for future maintenance. This model of funding is particularly useful in developing economies, where scarce resources and underdeveloped digital ecosystems offer high-impact opportunities for funders. Philanthropic capital can serve as anchor funding to help incubate and de-risk solutions in difficult contexts, but it is unlikely to support critical e-government services in the long term. Moving to a self-sustaining model can help secure the longevity of a given solution.

However, it is important to note that certain self-sustaining funding sources may be regressive, depending on how they are administered. For example, if verifying an ID costs more than local residents can afford, a digital ID solution could become exclusionary without the government’s financial support.

Initially funded by small donations from local businesses, the ProZorro solution leveraged philanthropic seed funding to de-risk the development of a public procurement platform in Ukraine. ProZorro transitioned into a self-sustaining solution by charging small transaction fees to meet specific local needs. Information about ProZorro reflects the state of the platform before the 2022 Russian invasion of Ukraine. Read more about ProZorro as a funding model in Appendix 1.
**Intergovernmental**

Governments may collaborate and pool funding to support the development and rapid scaling of DPI across jurisdictions. This form of funding is most useful when one jurisdiction has successfully deployed or tested a system and shares the code base with other jurisdictions or even licenses the proven system for a royalty. To manage risk, governments can collaborate at the outset of a DPI development initiative or wait for early solution deployments in other jurisdictions to prove value for users before committing to join in the solution development effort. For example, the Oyster card digital transit payments solution was developed in London, and Transport for London licensed the successful solution to a service provider that won contracts to scale the system to New York, Brisbane, and Boston.\textsuperscript{9}

Governments that collaborate to fund a solution can benefit from lower overall development and maintenance costs, although coordinating such joint efforts and sharing of resources may be a challenge. To the best of our knowledge, there is no global institution connecting governments to build common solutions at scale.

**X-Road**, which was initially funded by Estonia and Finland, and later by Iceland through the nonprofit Nordic Institute for Interoperability Solutions before being implemented in other nations, is an example of this intergovernmental approach. It created an open-source, scalable solution for unified data exchange among organizations and service providers that removes the first-mover risk for other jurisdictions. Read more about X-Road as a funding model in Appendix 1.

**Multilateral Organizations**

Multilateral organizations, ranging from organizations such as the UN to international financial institutions, can support the development of DPI by providing reliable financing to launch or sustain an initiative. They can also attract and coordinate different sources of capital and funder contributions, supply technical and policy expertise via headquarters or in-country program teams, attract users, and build in-country capacity. For example, multilateral development banks (MDBs) can provide a stable source of development finance through loans, grants, risk-sharing instruments, guarantees, and investments, with the infrastructure sector being the largest recipient of multilateral development outflows.\textsuperscript{10} Additionally, they generate significant economies of scale, work closely with recipient governments, and direct funds to cross-country initiatives. MDBs are particularly valuable for catalyzing, mobilizing, and crowding-in both public and private sources of funds.\textsuperscript{11} MDBs’ blended finance strategies could also include facilitating innovative finance mechanisms such as trust funds (see Appendix 2 for a discussion of Financial Intermediary Funds). For example, the World Bank’s Identification 4 Development (ID4D) Multi-
Donor Trust Fund is shaping more than $1.5 billion (USD) in pipeline or committed financing for the implementation of digital ID and civil registration ecosystems in 35 countries.\textsuperscript{12}

Multilateral organizations also play a key role in convening and coordinating organizations developing and deploying DPI. For example, the Digital Public Goods Alliance (DPGA) is a multi-stakeholder initiative co-hosted by the United Nations Development Programme (UNDP), UN Children’s Fund (UNICEF), and the Norwegian Agency for Development Cooperation (Norad) that facilitates the discovery, development, and use of digital public goods, as well as investment in them. The UNDP also recently launched Digital X, a partnerships for scale program to find, match, and scale proven digital solutions by brokering relationships with UNDP country offices and other partners.

However, some possible disadvantages of channeling funds through multilateral bodies include institutional complexity and higher absolute costs due to cumbersome compliance procedures, as well as less donor control, visibility, and preferences, although it is possible to earmark contributions.\textsuperscript{13}

In one example of this model, the Inter-American Development Bank (IDB) led a cross-sector alliance to create a regional blockchain infrastructure and ecosystem, LACChain. The IDB provided the initial funding and staff to coordinate partner contributions and the technical development, conduct outreach to partners and users, launch the nonprofit governance entity, and develop the ecosystem. Private-sector partners contributed technical talent, legal expertise, and projects to run on the infrastructure, while nonprofit partners helped stand up the governance entity and provided additional technical, legal, and financial support. In the long term, LACChain is intended to be self-sustaining through membership fees and possibly funder support. Read more about LACChain as a funding model in Appendix 1.

Diverse Funding Streams

Sustaining DPI initiatives over the long term may require financing from diverse funding streams in arrangements that can range from simple to complex. Funding sources could include those noted above, as well as sovereign wealth capital and private-sector investment, whether within the parameters of a public-private partnership or other investment mechanisms. Platforms can be designed with funders’ varying budget resources and requirements in mind, for example, with the ability to accommodate both traditional contributions and innovative financing mechanisms (see Recommendations for further discussion).

Diverse funding streams help diffuse the risk of the investment across multiple stakeholders and protect DPI initiatives from reliance on any single source of funding. They may also have the ancillary effect of increasing the visibility of DPI
development projects to multiple governments for additional scaling. Collaborative funding models also allow stakeholders with different incentives to support common solutions. For example, a municipal jurisdiction may have an incentive to develop a solution that works for only its residents, but it may be willing to pilot an open source, scalable solution if philanthropic capital defrays some of the cost. If the pilot is successful, philanthropic partners could then scale the solution and make a broader impact across the country and globe, while coordinating with other sources of capital.

This funding category also presents certain challenges, including the difficulty in governing and coordinating the various funding actors and their objectives, as well as the need to align investment incentives for each stakeholder to the relevant stages of DPI development. Further, new mechanisms may be needed to create the fiscal architecture through which to pool and allocate funds.

An example of this model, District Health Information System 2 (DHIS2), is being used by ministries of health around the world for effective health data management, in collaboration with the private sector and civil society. Founded and governed by the University of Oslo, DHIS2 has received financing from global health agencies, the World Health Organization (WHO), Norad, the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR), the Bill & Melinda Gates Foundation, and the U.S. Centers for Disease Control and Prevention (CDC), as well as long-term funding partners Gavi, the Vaccine Alliance, and the Global Fund to Fight AIDS, Tuberculosis and Malaria. Read more about DHIS2 as a funding model in Appendix 1.
Sustainable Funding Challenges

Financing DPI is a complex endeavor. The current approach to funding is fractured, and existing models generally do not align the incentives of all stakeholders involved. DPI efforts often suffer from “pilotitis,” the inability to scale beyond the pilot phase.

Through research and interviews held with stakeholders of the broader DPI community, we identified the following interrelated barriers to the sustainable financing of DPI.

Lack of Coordination

There is currently no material center of gravity to support the multiparty development of DPI with the immediate intent to create shared systems across participating organizations and jurisdictions. Countries generally rely on word of mouth and their own networks to synchronize development of shared systems and solicit funding for projects. This lack of coordination leads to duplicative and fragmented funding efforts, as well as increased competition for the same sources of funding.

Misalignment of Incentives

Often, investment incentives are not aligned across different types of funders. Private-sector actors are usually perceived as those who should be the main, if not the sole, financiers of infrastructure projects. However, foundational layers of technology are capital-intensive and unprofitable as they generally do not demonstrate substantial value until application layers are created. Private-sector institutions may therefore be reluctant to invest in long-term DPI initiatives unless local governments, philanthropies, or other actors commit funding to de-risk early stages of development, and there is a clear articulation of potential return on investment.

Lack of Regulations Facilitating New Business Models

Without certain DPI-related regulations in place that allow new business models to flourish, there may be less incentive for private-sector solutions to be developed and financed. For example, allowing an open application programming interface (API) to access public records (such as health records, in certain countries) would encourage new private-sector solutions and financing.
Siloed, Sector-Based Funding Approach

Digital solution funders currently tend to channel funds toward sectors (such as health or education) or specific verticals (such as identity).¹⁵ Too often, they fund applications (apps) that re-create full stack solutions in silos rather than building common infrastructure that apps in many sectors can leverage. For example, a funder may support the development of an app to track malaria and create new identity and data management systems that cannot talk to similar apps for other diseases. This approach leads to fragmented solutions and leaves multi-sector, foundational DPI solutions underfunded; it also increases transaction costs and spreads scarce resources across too many digital efforts.¹⁶

Disconnect between Tech Development and Funding Cycles

Infrastructure projects are influenced by local market forces, government interests, and capacity issues. These dynamics often lead to case-by-case, jurisdiction-specific approaches to technology procurement and funding. Capital may not be optimally aligned to technology development cycles,¹⁷ creating a disconnect between funding and technical requirements, which can lead to preventable delays, waste, or project shutdowns.

Barriers to Discoverability

Few open source software repositories have intuitive, nontechnical search engines. As a result, existing open solutions that could be extended to new jurisdictions are available only to those who know how to discover them. This lack of comprehensive and integrated solution databases with user-friendly interfaces presents a major barrier to funding (one cannot fund what cannot be found) and exacerbates the fragmented approach to technology development described above. DIAL’s Catalog of Digital Solutions, the Digital Public Goods Alliance’s Registry, and GovStack’s Building Blocks platforms are all beginning to offer useful tools for government officials and social innovators to easily access the universe of successfully deployed DPI initiatives. These organizations have undertaken the challenging work of cataloging DPI projects to improve their discoverability, a key ingredient to scaling.

Lack of Capacity Building

Participants in a study conducted by DIAL highlighted that, without the presence of a full-time, dedicated, and well-rounded team, it is very difficult for countries to navigate the open source software world including its technical-, governance-, and funding-related nuances.¹⁸ Building in-country capacity for jurisdictions to
leverage open source software in their DPI efforts is essential. Without sufficiently trained resources and technical expertise, countries could face software lock-in issues if they decided to build DPI on open source modules that they are not capable of updating, integrating, or maintaining in the future. If capacity building is not prioritized, vendors will continue to fill capacity gaps, providing ongoing support and maintenance services, and leave countries reliant on proprietary solutions. Capacity building is also important vis-à-vis proprietary solutions, so that countries know how to operate and maintain those systems, all while reducing the risk of vendor lock-in.

**Insufficient Funding to Meet Global Demand**

Digital transformation is not a small financial endeavor. Worldwide government spending on information technology (IT) is forecast to reach $557.3 billion (USD) in 2022, an increase of 6.5 percent from 2021. Denmark, Estonia, and Finland spend, on average, approximately 2.4 percent, 1.3 percent, and 1.4 percent, of their state budgets, respectively, on certain digitization programs. In the United States, the Internal Revenue Service is undergoing a modernization initiative that includes digital transformation and is expected to cost the federal government $2.3 billion to $2.7 billion (USD) over six years. In India, the government’s IT spending is projected to total $8.3 billion (USD) in 2022, an increase of 8.6 percent from 2021. In short, government digital transformation is not cheap.

In the DPI space, preliminary estimates show that total funding needed in LMICs alone is approximately $30 billion (USD), of which roughly $20 billion is needed for digital health programs, $6 billion to ensure universal ID coverage, and $2 billion to allow the implementation of real-time retail payment systems. Most of this financial cost is expected to be borne at the local-country level, which could potentially exacerbate the lack of coordination and the siloed approach to technology development across jurisdictions. Thus, country-level investing could lead to duplicative efforts and even higher DPI development costs.

**Innovation Aversion and First-Mover Disadvantage**

Even in a developed context like the United States, only 13 percent of technology projects above $6 million (USD) succeed. To be successful, new DPI projects require a significant amount of bureaucratic process change and often cross-sector coordination across government, civil society, and the technology industry. Given these challenges and the political risk associated with public-sector innovation, many countries are reluctant to be the pioneer and adopt new DPI solutions, and instead opt for proprietary, closed systems where the risk of failure is shared with the systems’ developers and implementers. However, once projects have proven successful in deployment, such as CONSUL for civic
participation or DHIS2 for health management, civic innovators have a much easier time demonstrating solution value and achieving adoption across jurisdictions.

Competing Priorities and Political Will

Implementing DPI is as much of an organizational management challenge as it is a technical one. Successful DPI projects achieve high impact by changing the operating procedures of a broad range of agencies, which can be much more difficult than working within a single agency. Building DPI often requires committed teams with strong political support to navigate complex, siloed public-sector organizations and pursue innovative approaches to systems change. These teams require a long runway of support that includes substantive resources, capacity, and oversight.

Complex Government Procurement Processes

Governments lacking the in-house capacity often rely on private vendors to help develop, deliver, and maintain digital services and platforms. Because of fragmented, cumbersome, and outdated approaches to government procurement processes, a few large companies dominate the design, development, implementation, maintenance, and operation of government IT solutions. These private vendors tend to develop proprietary, closed-loop software systems that are often so large in magnitude and costs that other vendors or in-house capacity cannot maintain the systems, resulting in vendor lock-in. The difficulty in updating and managing these cumbersome systems that often fail to work effectively results in increased costs in time, money, and effort.
Recommendations

This exploration revealed three major recommendations to increase coordination and improve incentives for collaboration across the ecosystem. Geared toward stakeholders across all sectors, these recommendations are to:

1. Create a unified funding mechanism.
2. Emphasize self-sustaining business models.
3. Establish an open marketplace.

In addition, governments can help build the ecosystem where such shared DPI efforts can thrive. This should include developing whole-of-government strategies for DPI that identify priority infrastructure investments, establish pro-innovation regulations to make DPI more accessible, elicit proposals for public-private partnerships, incentivize private-sector companies to develop open solutions and build in-country capacity, and strengthen interoperability through open APIs and collaborative arrangements, in order to drive the infrastructure approach and crowd-in private and other sources of capital. If implemented properly in an enabling ecosystem, these mutually reinforcing architectures can help countries maximize the utility of funding available for DPI, while reducing waste and improving capital efficiency.

1. Create a Unified Funding Mechanism

A growing group of actors across governments, multilateral organizations, philanthropies, and the private sector are moving from an ecosystem in which individual funders support the building of discrete projects to a more comprehensive approach in resourcing the ecosystem. This includes global leaders’ commitment to implement and fund DPI through a newly established Digital Public Goods Charter, the multi-sector commitment of $295 million (USD) to advance inclusive DPI, and the launch of Co-Develop in response to the funder community’s desire to better incentivize experimentation and scaling of DPI platforms.

Elements to Consider for a Unified Funding Mechanism

Accommodate Both Traditional and Innovative Financing

A unified funding mechanism could be designed to provide funders and partners with a diverse portfolio of both traditional and innovative options. This would
offer two major benefits: to align with funders’ varying budget resources, requirements, and restrictions; and to help secure and leverage both immediate and longer-term funding.

“A unified funding mechanism could be designed to provide ... a diverse portfolio of both traditional and innovative options.”

Such a mechanism may be anchored by traditional funding in the form of direct bilateral and multilateral contributions from governments, philanthropies, and other private funders, and could be designed to accommodate both unrestricted and purpose-allocated funding. In addition, the platform could incorporate one or more innovative financing mechanisms in order to tap into new resources, derive more impact from the available resources, and attract multiyear funding commitments and longer-term investments. This could include securities and derivatives (for example, bonds and loan guarantees backed by philanthropies, bilateral development agencies, MDBs, or development finance institutions), results-based financing, trust funds, and other financial arrangements.

Of particular interest for DPI, a Financial Intermediary Fund (FIF) enables funds to be raised from a variety of public and private resources in a coordinated response to a global initiative, such as the provision of a global public good. Based on customizable arrangements, FIFs enable a financial intermediary institution to serve as Trustee, providing a range of agreed financial services that include receiving, holding, and investing contributed funds, and then transferring them, when and as instructed by the FIF governing body. For example, the World Bank, which serves as a Trustee of 26 FIFs, may also provide customized treasury management, bond issuance, hedging intermediation, monetization of carbon credits, or other financial services. In the case of the International Finance Facility-Immunisation (IFFIm), the World Bank uses long-term, legally binding donor pledges to back the issuance of vaccine bonds in capital markets to raise up-front money for Gavi, the Vaccine Alliance programs. (See Appendix 2 for more information on FIFs.)

However, such innovative financing mechanisms may not be appropriate for all funders for reasons that range from concerns about their cost-effectiveness and perceived feasibility, to policy and legal challenges posed by a need for making up-front, multiyear funding obligations, changes in tax law, or other issues.28 This underscores the importance of considering a diverse portfolio of options for
funders, which could require creating new fiscal architecture through which to pool and allocate funds.

**Designate a Governing Entity**

Depending on the platform’s level of complexity, this may require designating an entity to coordinate the diverse funding streams and monitor the conditions and requirements under which DPI support may be provided to recipients. For example, several of the funding model examples examined in this paper featured the participation, and sometimes the creation, of a neutral third party (such as a multilateral organization, university, or other civil society organization) to oversee governance aspects of an initiative, and ensure its sustained funding, including the transition to self-sustainability.

**Benefits of a Unified Funding Mechanism**

In addition to maximizing the advantages of different funder categories, a unified funding mechanism could offer an array of benefits to move DPI forward:

- **Establish a Center of Gravity to Align Incentives and Prioritize Investments Efficiently:** A unified funding mechanism could align funder incentives from the onset of a project, providing clarity as to which sources of capital will be available to sustain critical phases of technology development and how investors can generate a financial (or social) return on their capital investments along the way. Further, it could provide much-needed governance to channel funds toward foundational multi-sector solutions and to help determine priority areas for investment. These could include technical assistance for solution design and implementation, local capacity building, testing and pilot project deployment, support for scaling, and the maintenance of code bases.

- **Align Funding to Relevant Stages of Technology Development:** Addressing the full life cycle of DPI development, a unified funding mechanism can draw on different types of funding actors, blend their capital, and allocate it to DPI projects according to phases, based on funders’ unique resources, requirements, and priorities. This end-to-end, phased capital allocation can de-risk each phase of technology development and increase the likelihood of long-term sustainability of DPI efforts.

- **Reduce the First-Mover Disadvantage:** Initially, the unified mechanism could make larger, coordinated investments in friendly jurisdictions that demonstrate a strong appetite for piloting solutions and a willingness to change existing processes, such as procurement. Pooled investments could fund change management strategies, software
development, deployment plans, and project documentation. Deep investments in these areas could help bridge the capacity gap between the public and private sectors by supporting public interest technologists in government and civil society, improving the success of project pilots, and generating learnings for second-mover projects seeking to adopt similar solutions.

**Support Scaling through Dedicated Funding:** Pooled financing could support the expansion of DPI projects that entities are already investing in, with the stipulation that those entities build open, replicable, and scalable systems. Once these open pilots are established, the unified funding mechanism can help scale solutions to other contexts by allocating funds for technical assistance and expertise, project planning and implementation development, and integration with legacy infrastructure. Ideally, the bulk of these funds should focus on jurisdictions that demonstrate an interest in change management but that lack the resources for DPI projects.

**Ensure Long-Run Product Sustainability of Critical DPI:** Pooled financing architecture could include support for critical platforms that have achieved scale to multiple countries to ensure they continue to function properly. This can be separate from maintenance costs to support individual implementations on the ground. For example, DHIS2 raises specific funds for testing, maintenance, and updates to the core code base hosted at the University of Oslo that do not also support implementations on the ground.

**Create a Knowledge Hub for DPI:** A unified funding mechanism that supports projects in countries around the world would have unique insights into common pain points and could provide solution support for civic innovators. A knowledge hub could help countries design more flexible and innovative digital procurement strategies that create incentives for vendors to build modular and interoperable systems, adopt customizable open source systems, or default to open source technical requirements for new projects. It could also retain staff to provide rapid response technical support for jurisdictions issuing requests for proposals and implementations of critical systems.

2. **Emphasize Self-Sustaining Business Models**

Continued funding beyond implementation is necessary to make critical security and functionality enhancements that ensure the long-term viability of any DPI deployment. Just as software products in the private sector are expected to undergo continual development, DPI systems need to have a dedicated staff,
clear governance, and the financial resources to ensure the product continues to serve individuals and communities.

Two methods for generating sustainable support are:

- **Fees for Services**: Depending on the nature of the DPI solution, revenue streams could be created through a combination of transaction charges, fees for API access, license fees or royalties, or membership/subscription fees. These fees create a recurring source of revenue to reduce ongoing dependence on external funding sources. Drawing on the funding model examples in this report, ProZorro uses small fees on each public procurement transaction in Ukraine to finance its continual development, while the LACChain membership fees provide a level of network usage and technical support. Fees can be regressive and exclusionary depending on how they are administered (as discussed earlier). Public administrators should examine the impact of a fee on access before imposing one on identity management or other foundational systems.

- **Government Earmarking of Tax Receipts**: Jurisdictions could leverage tax earmarking to fund DPI efforts, thereby ensuring long-term capital availability. Historically, government earmarking of tax revenue to fund specific services or programs has been widely adopted across many national and subnational governments. Earmarking is defined as “the practice of assigning revenue—generally through statute or constitutional clause—from specific taxes or groups of taxes to specific government activities or areas of activity,” with the main goal to protect a certain category of expenditure from political fluctuations by linking it to a particular source of revenue.31 A classic example is a tax on gas that is used to fund physical public infrastructure such as highways. In this context, there seems to be a compelling case for the use of tax earmarking to fund DPI efforts, ensuring long-term capital to launch, scale, and maintain this critical form of infrastructure. U.S. states, for example, have a long history of earmarking substantial components of their tax receipts for critical government services. According to the Fiscal Affairs Program of the National Conference of State Legislatures’ quintessential analysis of state tax earmarking, U.S. states have, on average, earmarked close to 25 percent of tax receipts for a variety of specific purposes or programs since the late 1970s.32

Other forms of innovative financing may be necessary to support DPI, particularly in low-capacity environments and in underdeveloped economies, whose resource and tax bases are already stretched thin. However, a solution’s ability to generate support for its own sustainability should be seen as a good indicator of its long-term success. For more information, see the Principles for Digital Development’s Business Model Sustainability Toolkit.
3. Establish an Open Marketplace

An open, fully transparent three-sided marketplace for DPI could expedite market activation and innovation by each of these three classes of market participants: implementers (demand), technologists (supply), and funders (financing), while creating a central role for civil society to facilitate responsible digital solution development, deployment, and governance.

The objective would be to create a single destination for global DPI stakeholders to convene and form diverse teams to launch and manage DPI development projects and share best practices. A marketplace platform could include features that allow funders to de-risk the innovation, deployment, and maintenance of DPI and incentivize use across jurisdictions.

The marketplace could be composed of three main DPI stakeholders:

- **Implementers**, including governments (national, subnational, or municipal) or regional political and economic organizations (the European Union, African Union, and the like) that would initially deploy DPI for the benefit of their residents and organizations operating within the particular jurisdiction(s). Other implementers that see the value in leveraging DPI to solve critical issues in their sector could include businesses, banks, health institutions, start-ups, software developers, and nonprofit organizations.

- **Technologists**, including large and small software developers in the for-profit and nonprofit sectors, and the associated technology standards organizations, such as the United States’ National Institute of Standards and Technology or the Organization for the Advancement of Structured Information Standards.

- **Funders**, including governments and their foreign aid offices; philanthropies, with potential for expansion to sovereign wealth funds and other impact investors (principally those with an innovative technologies focus); international finance institutions; and regional finance institutions.

This type of funding architecture is similar to that of **Gavi, the Vaccine Alliance**, an institution that facilitates vaccination access in low-income countries by creating a three-sided marketplace that connects supply, demand, and sources of capital. Gavi provides the pharmaceutical industry with a demonstrable market opportunity by allowing countries to pool their needs and funders to support the gap between those needs and the price of delivery. DPI could be well suited for such a marketplace due to the potential to scale proven solutions across borders and sectors once they are developed. Like Gavi, institutions to support DPI are poised to make a profound impact on global well-being.
There are recent examples of governments developing or actively participating in digital marketplaces. The U.S. General Services Administration has instituted the Commercial Platforms program as a cross-agency, whole-of-government e-marketplace initiative to increase the usage of commercial digital marketplaces as a source for more efficient U.S. government procurement. In addition, the U.K. government has released their innovative digital marketplace, currently in beta, as a tool for public-sector organizations to find people and technology for digital projects. This new marketplace serves suppliers and public-sector buyers of digital technology and is a source for governments to find digital specialists, user research participants, and labs.

**Benefits of an Open Marketplace for DPI**

“ Ideally, a DPI marketplace could become a leading destination in the world for stakeholders to discover other jurisdictions with similar interests and needs.”

An open marketplace for DPI could bring much-needed transparency to the field and produce other valuable benefits, such as:

- **Aggregate Demand for DPI among Multiple Jurisdictions**: The field needs a trusted center of gravity for civic innovators and government officials to learn about new projects under development, open source projects underway, and successful existing solutions. Ideally, a DPI marketplace could become a leading destination in the world for stakeholders to discover other jurisdictions with similar interests and needs. Such a marketplace could aggregate demand across multiple jurisdictions to build once and deploy in several places.

- **Match Funding to Demand More Efficiently**: An open marketplace allowing countries to pool their demand could help funders support projects in response to explicit demand from governments and make a greater impact per dollar invested. In addition, the structure provided by a marketplace could clarify which funders are supporting specific investment domains to unify efforts and reduce duplication. The marketplace could provide much-needed transparency to clarify which funders are supporting experimentation and development of new DPI and
which organizations are scaling existing systems that have proven successful.

- **Vet Technology Providers Who Are Qualified to Build Replicable Solutions:** If technology providers receive support from funders to develop a replicable system that can reach multiple jurisdictions, that solution could divide overall development costs across the benefiting jurisdictions, while providing an incentive to developers to build scalable solutions. The marketplace could offer documentation of vetted technologists capable of developing scalable DPI, providing greater visibility and accountability. It could also provide a venue for technologists to feature their products, services, and solutions built on the DPI infrastructure that may be of interest to other implementers and consumers.

- **Expand the Role of Civil Society:** Civil society organizations could play an important role in the development and governance of an open marketplace. New financing mechanisms for DPI solutions should build on top of existing platforms that provide centers of gravity for DPI and connect them to each other—such as DIAL’s Catalog of Digital Solutions, the Digital Public Goods Alliance’s Registry, and GovStack’s Building Blocks platforms.
Conclusion: Advancing DPI

Digital systems promise to inject unprecedented efficiency into societies. Whether those solutions advance communities or exacerbate existing divisions will ultimately depend on how technologies and the structures that support them are designed, governed, and protected. As part of this effort, building and sustaining DPI in a way that lays the groundwork for a more secure, inclusive, participatory digital ecosystem is a formidable challenge requiring both patience and bold action.

Beyond the funding issues explored in this paper, several complementary areas remain ripe for further attention. Leaders committed to DPI will also need to work together on:

- **Defining Scope**: Stakeholders should assess the ideal scope of DPI efforts—whether to remain focused at a national level or on regional or global collaborations.

- **Field Building**: Advancing a shared understanding of DPI is critical. This could benefit from a comprehensive playbook for building DPI systems that are intentionally designed to be people-centric. Including users in the design process is a start, and in-depth mapping of strategies—as well as lessons learned from past implementations—can help ensure that new systems support inclusion and connectivity.

- **Establishing Governance Models**: Multi-stakeholder leaders must devise mechanisms to govern and facilitate responsible development, maintenance, and sharing of DPI solutions, building on foundational research to date (see Appendix 3).

- **Incentivizing Sustainable Development Models**: Building on the recommendations in this report, further thinking is needed about how governments can create incentives that support the DPI ecosystem.

- **Exploring Related Fields**: This could include learning from public-private partnership models common in the development of physical infrastructure or medical advancements, as well as the evolving possibilities posed by emerging technologies.

- **Strengthening Overall Capacity**: In addition to the need for technical skills, countries in both developing and developed economies would benefit from increased knowledge of policy development, procurement, and governance processes relevant to DPI.
- **Prioritizing Interoperability:** Next-generation DPI will be more effective if it is interoperable both within and across jurisdictional boundaries. For example, digital payment solutions should be interoperable with registries for delivering social assistance and, ideally, facilitate cross-border transactions. Projects that are piloted by multiple jurisdictions from their inception could be more likely to achieve such interoperability.

- **Advancing Technology Policies, Safeguards, and Standards:** Successful scaling of DPI will require government foresight to protect residents and organizations from certain risks associated with digital adoption. This could include regulation to ensure that personal data rights are protected and that artificial intelligence systems are unbiased and deployed in a manner consistent with societal values.

- **Implementing Software Development Best Practices:** Civic innovators will have to acknowledge that DPI solutions are often more effective when developed with best software development practices, such as open source systems, agile product development, and user-centered design.

Across a range of considerations, the decisions about DPI made today will have long-term implications for the health and vibrancy of societies in the future. Policymakers, funders, and technologists must prioritize sustainable funding discussions from the start to enable safer and trusted outcomes in the public digital ecosystem.
Appendix 1: Funding Model Examples

Note: Information about the solutions suggested below is current as of September 1, 2022, based on interviews with key stakeholders and publicly available information.

Government: Aadhaar

Solution: Aadhaar is a digitally enabled identity system that allows governments, businesses, start-ups, and software developers to leverage India’s robust digital infrastructure to address a myriad of critical issues. This innovative software solution brings millions of Indians into the formal digital economy and fosters innovation to develop new products to reduce friction across health care, finance, and education.

Deployed: India

Problems Addressed: Aadhaar allows businesses to perform e-Know Your Customer (eKYC) digital verification using biometrics or mobile one-time passwords. These capabilities have helped hundreds of millions of residents access bank accounts in India. Aadhaar also includes a new digital identity system allowing for efficient transfer of government benefits and subsidies. Lastly, Aadhaar helps reduce the use of physical documents via its e-signing and digital issuance and document verification capabilities.

Key features and Development Stage: The project has reached scale in India via IndiaStack, based on the number of active users (more than 1 billion) as well as the number of digital identity verifications (67 billion). A number of applications, such as India’s vaccine registration platform Co-Win, have leveraged these systems to reach population scale.

Funding: Aadhaar is funded by the Indian government. iSPIRT, a nonprofit think tank supporting public-purpose tech products, has been involved in the development of Aadhaar and provides pro bono support for entrepreneurs looking to make use of business opportunities provided by Aadhaar.

Governance: Aadhaar’s digital identity system (known as Aadhaar Authentication) and eKYC APIs are owned and governed by the Unique Identification Authority of India, a statutory authority established under the provisions of the Aadhaar Act, 2016 by the Government of India, under the Ministry of Electronics and Information Technology.

Advantages: Governments that fund the development and implementation of solutions have skin in the game and are more likely to see technology projects through to success.
**Potential Challenges**: Domestic and international civil society organizations have raised valid concerns about the security and governance of Aadhaar, along with the process by which it was rolled out. In considering government-funded models more generally, one challenge is that governments do not have the incentive to scale successful projects beyond their borders unless they can arrange a complex licensing process, stymieing the use of open source solutions. Further, many governments struggle with inflexible and/or internally siloed procurement processes, especially if they lack a designated body to deploy public-sector technology systems. Another challenge, particularly in developing economies, is that some governments have limited available funds and internal capacity for the development and maintenance of digital solutions.

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**Philanthropy: MojaLoop**

**Solution**: MojaLoop is an open source technology solution that can be leveraged in several ways to develop interoperable and digital payment systems that enable safe, efficient, and affordable transactions. Payments can be made among individuals, banks, government agencies, merchants, telecommunication network providers, and technology companies. MojaLoop technology is helping to connect the underserved (and the historically unbanked) with the global digital economy.

**Deployed**: MojaLoop is being deployed in Tanzania and Uganda (with ongoing pilots in Myanmar and Rwanda).

**Problems Addressed**: Many people in the world do not have much-needed access to banks and other financial institutions or products. As such, they face many challenges, including the necessity to use cash for their consumer transactions, lack of electronic accounts to store funds, inability to transfer funds to family members in an emergency, and inability to electronically receive employment wages, or stimulus checks, as we have witnessed during the COVID-19 pandemic. Further, merchants, manufacturers, and other businesses can leverage MojaLoop open source technology to prevent, deter, and fight financial fraud.

**Key Features and Development Stage**: MojaLoop technology is principally aligned to the following functional scenarios:

- Efficient transfer of funds from person-to-person;
- Individual checking accounts and point-of-sale e-payments benefiting consumers and merchants;
- Consumer purchase of goods via e-wallet accounts;
- Payroll and other bulk payments for small and medium-sized enterprises;
- Enterprise risk management via tiered risk framework;
- Enterprise fraud detection and development/maintenance of blacklists; and
- Financial services account management.

The initiative has been active for several years and is endorsed by several funders, technology companies, monetary authorities, and a community of developers. It is unclear whether the project has reached scale in each of the jurisdictions it is deployed in.

**Funding:** The Mojaloop open source software was developed by a multitude of volunteer software developers, coordinated by the core team at Mojaloop. Operating costs of the Mojaloop Foundation are funded by foundation membership dues and grants from philanthropies. Initial Sponsor Members are the Bill & Melinda Gates Foundation, Coil, Google, ModusBox, and the Rockefeller Foundation.

**Governance:** The Mojaloop code was launched in 2017 by the Bill & Melinda Gates Foundation, as part of an open source community project, and the Mojaloop Foundation was formed as a charitable, not-for-profit entity in 2020 to govern, amplify, and formalize those efforts.

**Advantages:** Philanthropic funders are more likely to invest in experimentation and test new solutions on a time horizon that governments may be unwilling to support. Whereas governments may be cautious to support higher-risk projects due to political considerations, philanthropies often have greater risk tolerance to de-risk new solutions.

**Potential Challenges:** Philanthropic support for any single initiative can change as projects become more or less aligned to their initial investment strategy. That puts essential digital infrastructure at risk if the government fails to allocate funds to maintain the system.

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**From Philanthropic to Self-Sustaining: ProZorro**

Note: Information about ProZorro reflects the state of the platform before the 2022 Russian invasion of Ukraine. Due to the shifting situation on the ground, this report may not contain up-to-date information.
Solution: **ProZorro** is a public procurement platform in Ukraine, enabling public electronic procurement transactions, storing all public data, and providing access to contract tenders. State enterprise representatives publish tender announcements, and businesses compete in the auction process, all with the help of an electronic auctions digital module.

Deployed: ProZorro is active only in Ukraine, but the system has been used as a template for MTender, a similar system that has achieved success in Moldova. MTender has saved the country over $25 million (USD), with a mere $1.2 million development cost. Elements of ProZorro monitoring software have also scaled in Kazakhstan, Tajikistan, and Uzbekistan.

Problems Addressed: Ukraine was reportedly losing more than €2 billion (EUR) annually from procurement corruption and limited competition for public bids: an estimated €1 billion (EUR) in “corruption tax,” and similarly, an estimated €1.1 billion (EUR) in annual losses resulting from limited competition for public bids.

Key Features and Development Stage: ProZorro was designed as a transparent procurement platform, and has the following features:

- Compulsory auction for price reduction;
- Open source code available for audit;
- Agile product development; and
- Public business intelligence (analytics) portal ensuring full transparency of the public procurement process.

Automatic screening of several factors allows the government to identify corruption-prone tenders. It also contains training modules, an e-library of typical procurement specifications, and relevant procurement related legislation in one place, to improve efficiencies. The project has been active since 2016 and appears to have reached scale in Ukraine.

Funding: ProZorro was initially funded by small donations from local businesses which were interested in reforming the procurement process. Civic innovators who were developing ProZorro then turned to large global philanthropies and bilateral funders, who funded the project development costs through trusted intermediary nonprofits. Since then, the solution has become self-sustaining by charging small fees for every transaction to support maintenance, updates, and system delivery.

Governance: It has been developed and governed by what the Ukrainian government refers to as the “golden triangle”:
Government institutions (around procurement rules and data storage); Commercial procurement platforms (private sector); and Civil society (to monitor and control procurement).

Several international partners—the Eurasia Foundation, Transparency International, USAID, and UK Aid—also contribute to the success of ProZorro.

**Advantages**: Philanthropic capital can help incubate solutions in difficult contexts, but it is unlikely to support critical e-government services in the long term. Moving to a model that is self-sustaining, often by the government, can secure the longevity of a given solution.

**Potential Challenges**: Self-sustaining funding sources can be regressive, depending on how they are administered. For example, if verifying an ID costs more than local residents can afford, a digital ID solution could become exclusionary.

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**Intergovernmental: X-Road**

**Solution**: X-Road is an open source software and ecosystem solution providing unified data exchange between organizations and service providers.

**Deployed**: X-Road was founded in Estonia and is also implemented in the Faroe Islands, Finland, Iceland, Japan, and Kyrgyzstan. Similar technology based on the Estonian interoperability experience has also been implemented in El Salvador, Namibia, and Ukraine. The history of code releases and solution rollouts is available on X-Road’s website.

**Problems Addressed**: The need for safe, secure, and efficient cross-border data exchange between organizations.

**Key Features and Development Stage**: Features include web address management; message routing; access rights management; organization, machine, and transport level authentication; time stamping; digital stamping of messages; logging; and error handling.

**Funding**: The project was initially funded by Finland and Estonia, and later by Iceland, through the Nordic Institute for Interoperability Solutions (NIIS). The platform has also benefited extensively from private-sector support and development contributions.

**Governance**: NIIS assumed governance responsibility for X-Road in 2018. NIIS is a nonprofit association and collaboration platform with the mission to ensure
the strategic development and maintenance of X-Road and other cross-border
digital government infrastructure assets. Estonia, Finland, and Iceland are the
members of NIIS. Cooperation between Estonia and Finland began in 2013, upon
execution of a memorandum of understanding (MOU) by the prime ministers of
the two nations. The MOU initiated cooperation to develop a software
environment enabling secure connectivity, searches, and data transfers between
the governments and private databases. Iceland later became a partner within
NIIS in 2018.

**Advantages:** Governments that work together to fund a solution face lower
overall development and maintenance costs. This method can save public funds,
de-risk innovative solutions, and help governments share successful, proven
solutions.

**Potential Challenges:** Coordinating the actions and resources between the
various governments participating in development and implementation of DPI
solutions can be challenging. Currently, these communications most often occur
through word of mouth. To the best of our knowledge, there is no global
institution connecting governments to build common solutions at scale.

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**Multilateral Organization: LACChain**

**Solution:** In 2019, the Inter-American Development Bank’s Innovation Lab (IDB
Lab) founded the LACChain Global Alliance with more than 60 cross-sector
partners to develop a blockchain infrastructure and ecosystem in Latin America
and the Caribbean (LAC). This blockchain infrastructure is a public good
intended for projects across many sectors with an impact on economic
development and inclusion. Ecosystem efforts include academic training
programs, a marketplace (L-Store) to share information about products and
solutions that entities have established on the infrastructure, and a search
feature to help connect projects seeking financing with those seeking to invest.

**Deployed:** LACChain serves Latin America and the Caribbean, with
stakeholders across 16 countries active in the ecosystem. Government entities,
enterprises, and the IDB have deployed more than 50 pilot projects on the
LACChain infrastructure for cross-sector use cases ranging from cross-border
payments to agricultural supply chain traceability, vaccine and academic
certification, and customs and trade.

**Problems Addressed:** LACChain was launched to address the absence of
neutrally governed, general purpose infrastructure; silos in the ecosystem;
information scarcity; regulatory uncertainty; high usage costs; carbon footprints;
and thousands of blockchain networks that were not suitable for the scalability of
government and enterprise use cases.
Key Features and Development Stage: LACChain offers a public-permissioned blockchain infrastructure, including a mainnet and a testnet. The infrastructure aims to become a quantum-safe blockchain network of networks consisting of three layers. Two of them, the public-permissioned blockchain ledger and a digital identity, are already available; the third, a tokenized money layer, is still under development. Features include:

- Nonprofit governance and orchestration provided by nonprofit LACNet;
- Environmentally friendly technology with no impact on carbon footprint;
- Open source technology supported by private-sector partners ConsenSys and Linux Foundation, complemented with open source tools developed by the LACNet tech team;
- GAS distribution protocol per node and block, avoiding denial of service attacks and allowing traceability of which node introduces each transaction;
- A 24/7 monitoring system; and
- Integration with IPFS registry for decentralized storage of heavy public files.59

Funding: The IDB provided the initial four-year funding for IDB Lab staff to manage the alliance, coordinate diverse funding streams, coordinate and lead the technical development, conduct outreach to new partners and users, launch the LACNet nonprofit governance entity, and develop the ecosystem. Private-sector partners contributed cash and in-kind resources, including technical talent to help build the infrastructure and participate in working groups to develop code and documentation; legal expertise and participation in legal working groups; projects to run on the infrastructure; and marketing and communication support. Nonprofit partners assisted in standing up LACNet, the nonprofit governance entity, and provided technical, legal, and financial support. After the initial four years of the project, the goal is for the LACNet governance entity and the LACChain infrastructure to be self-sustaining through membership fees and neutral donations from public, private, and multilateral entities. The membership model provides a level of network usage per block, as well as individualized technical support.

Governance:

- Centralized orchestration: The IDB, along with regional nonprofit partners LACNIC and RedCLARA, founded LACNet, a nonprofit, neutral entity based in Uruguay to orchestrate the blockchain
infrastructure, establishing a contractual legal framework between all
node operators in compliance with ISO standards. LACNet will also
manage membership, provide maintenance and support for the networks,
and maintain the technical and legal teams;

- **Decentralized governance**: All node operators can participate in the
technical aspects of the network through working groups; and

- **Decentralized operation**: Open infrastructure for any entity to deploy
and manage its own node, validator, boot, writer, and observer.

**Advantages**: Having reliable multiyear funding and staff support from a neutral
and recognized multilateral organization is helpful in launching infrastructure
initiatives, securing critical support from other alliance partners, attracting users
of the infrastructure, and setting up a comprehensive transition to a self-
sustaining model.

**Potential Challenges**: In general, disadvantages of channeling funds through
multilateral bodies include institutional complexity and higher absolute costs
due to cumbersome compliance procedures, as well as less donor control,
visibility, and preferences. Challenges of LACChain’s approach include the
need to secure contributions from different sectors—and eventually, sufficient
membership fees—to sustain the initiative past the initial funding. Further, this
model requires managing possible “co-opetition” by separating collaboration
and competition among alliance partners, including achieving alignment
between partners’ interests in developing and using scalable infrastructure;
recognizing partners’ need to pursue business opportunities based on the
infrastructure and enabling equal access to opportunities; and remaining
agnostic about partners and solutions.

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**Diverse Funding Stream: District Health Information System 2 (DHIS2)**

**Solution**: DHIS2 is an open source software system to report and disseminate
data for a variety of health programs; it has recently expanded into non-health
use cases.

**Deployed**: DHIS2 is in use by ministries of health in 73 countries, principally in
the Global South. Sixty of them have achieved national scale.

**Problems Addressed**: It supports a wide range of use cases within the health
sector, including universal health data management. The solution leverages
disease-specific modules to teach critical information to patient users. DHIS2 has
been the foundation for certain governments’ COVID-19 response, including
digital tools for vaccine distribution and management, as well as analytics to improve response.

**Key Features and Development Stage:** There is a flexible and modular core platform that encourages local innovation. The software is open source, free of any licensing fees. The platform supports a wide range of uses, within and outside the health sector. It leverages a standards-based health app that includes health systems and disease-specific modules, developed in collaboration with the World Health Organization. It also has a shared and integrated data warehouse for essential health data. Some DHIS2 applications:

- COVID-19 digital health data toolkit and data-driven deployment of vaccines;
- Real-time end-user vaccine stock management (DHIS2 Android);
- COVID-19 vaccine registry and tools to manage adverse events following immunizations; and
- Test cases in a few jurisdictions to generate COVID-19 test certificates and travel passes.

The platform has reached scale based on the number of jurisdictions in which it is currently used.

**Funding:** It is financed and endorsed by global health agencies, the WHO, Norad, PEPFAR, the Bill & Melinda Gates Foundation, and the CDC (each of these organizations has played a role in funding or supporting the platform at some point in its history). Gavi and the Global Fund are long-term funding partners.

**Governance:** DHIS2 was founded by the University of Oslo and continues to be governed by leaders in the Department of Informatics.

**Advantages:** Pooling diverse funds allows stakeholders with different incentives to support common solutions. For example, a municipal jurisdiction may have an incentive to develop a solution that works only for its residents, but it may be willing to pilot an open source, scalable solution if philanthropic capital defrays some of the cost. Philanthropic partners could then extend the successful pilot and make a broader impact across the country and globe, while coordinating with other sources of capital.

**Potential Challenges:** The main challenges to this model are coordinating the various funding actors, aligning investment incentives from each stakeholder to relevant stages of DPI development, and creating the fiscal architecture through which to pool and allocate funds.
Appendix 2: Leveraging Financial Intermediary Funds

One innovative financial arrangement of particular interest for digital public infrastructure (DPI), a Financial Intermediary Fund (FIF), enables funds to be raised from a variety of public and private resources in a coordinated response to a global initiative, such as the provision of a global public good. FIFs often involve innovative financing and governance arrangements, as well as flexible designs, that enable the financial intermediary institution to raise or aggregate funds and then disburse the funds to a range of recipients. By way of example, G20 leaders recently committed to the establishment of a FIF for pandemic preparedness and response (PPR). It is anticipated that this PPR FIF will incorporate a blended financing method in an attempt to close an estimated $10.5 billion (USD) gap in PPR financing.

At a high level, FIFs involve multiple parties with different or overlapping roles:

- **FIF donors and investors**, which can be private- or public-sector parties contributing funds for a specific cause.

- **Financial institutions**, such as the World Bank, can assume the role of Trustee of the funds, providing a range of agreed financial services that include receiving, holding, and investing contributed funds, and then transferring them, as instructed by the FIF governing body. The World Bank, which serves as a Trustee of 26 FIFs, may also provide customized treasury management, bond issuance, hedging intermediation, monetization of carbon credits, or other agreed financial services. For example, in the case of the International Finance Facility-Immunisation (IFFIm), the World Bank uses long-term, legally binding donor pledges to back the issuance of vaccine bonds in capital markets to raise up-front money for Gavi, the Vaccine Alliance programs. In addition to a trustee role, international organizations such as the World Bank may have other roles, including serving as an implementing agency (see below), providing secretariat services to the FIF, and being a FIF donor or investor.

- **Implementing agencies**, such as United Nations agencies or multilateral development banks (including the World Bank itself), that receive funding from the Trustee are responsible for project and program implementation. Alternatively, when a FIF’s governing body has the legal capacity to take on responsibility for the use of funds, as in the case of the Global Fund to Fight AIDS, Tuberculosis and Malaria, the Trustee remits...
the funds from donors directly to in-country, third-party entities that administer them.

- The **FIF Governing Body**, usually called the Trust Fund Committee, is responsible for setting the strategic direction of the FIF. In the case of the Clean Technology Fund, the Trust Fund Committee comprises representatives from contributor countries (donors), recipient countries (beneficiaries), a senior representative from the World Bank (overall coordinator of the committee), and representatives of multilateral development banks (implementing agencies).41

By offering innovative arrangements overseen by trusted institutions, FIFs offer a coordinated global financing framework that could be tailored to meet the needs of the global DPI effort.
Appendix 3: Additional Readings


**Co-Develop: Digital Public Infrastructure for an Equitable Recovery.** Kevin O’Neal and Nicole Rasul | The Rockefeller Foundation. August 2021.


**The growing demand for digital public infrastructure requires coordinated global investment and an ethical lens.** Govind Shivkumar | Omidyar Network. August 2021.


Notes


13 Homi Kharas, Rethinking the Roles of Multilaterals in the Global Aid Architecture (Washington, D.C.:


16 Wilson, “Digital ecosystems.”


23 Wilson, “Digital ecosystems components.”


25 UNDP, “Global Leaders Commit to Cooperation.”

26 UNDP, “Global leaders usher in a new era.”


40 Kharas, Rethinking the Roles; Gulrajani, Bilateral versus multilateral.

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