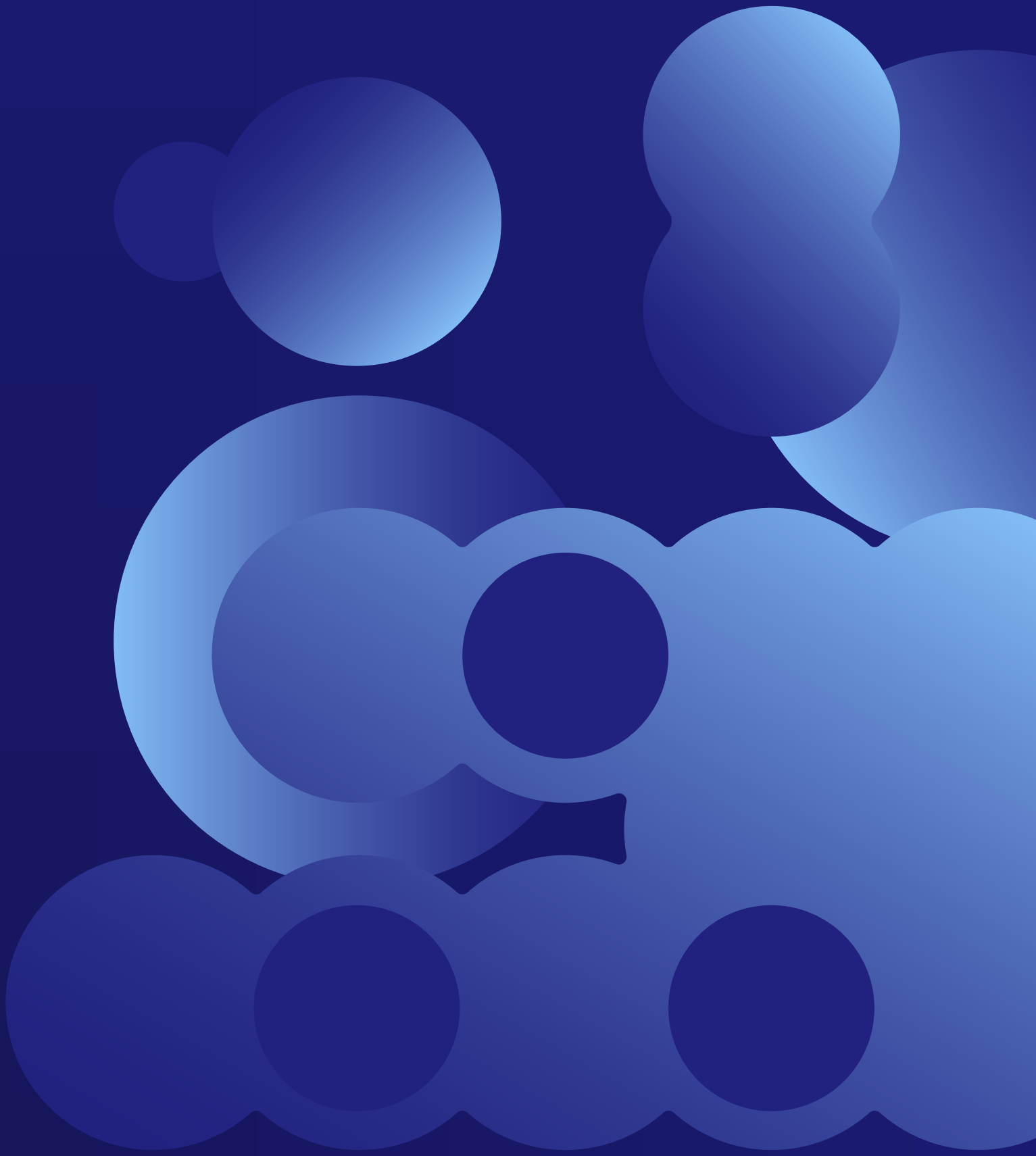
Building Open Digital States: Country Case Studies on the Impact of DPGs for DPI

Digital Public Goods Alliance



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About the Digital Public Goods Alliance

Established in 2019, the Digital Public Goods Alliance is a multi-stakeholder initiative with a mission to accelerate the attainment of the sustainable development goals in low- and middle-income countries by facilitating the discovery, development, use of, and investment in digital public goods. Digital public goods are open-source software, open data, open AI systems, and open content collections that adhere to privacy and other applicable laws and best practices, do no harm, and help attain the SDGs. To learn more, visit digitalpublicgoods.net or contact **hello@digitalpublicgoods.net**.

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Executive Summary

Two competing dynamics are shaping the global digital landscape: the widespread diffusion of digital technologies – especially across the Global South – and the simultaneous concentration of control over core digital infrastructure in the hands of a small number of firms and countries. This combination of diffusion and dependency presents significant risks for policymakers, raising critical questions about digital sovereignty, economic resilience, and long-term sustainability. At the same time, there is demand for interoperable, locally-governed solutions that can improve government performance, efficiency, and autonomy. In response, there has been a global surge of interest in public approaches to digitization, with **digital public infrastructure (DPI)** emerging as a potential solution.

DPI connotes foundational, digital systems—such as identity, payments, and data sharing —designed for the public benefit.[1] This report specifically examines the role of digital public goods (DPGs) as core components of DPI. **Digital public goods** are open-source software, open datasets, AI systems and content collections that comply with privacy and safety best practices while accelerating progress on the Sustainable Development goals. This definition is operationalised through the **DPG Standard** – a set of nine indicators that are used to determine whether or not open-source software, open datasets, open AI systems, and open content collections are digital public goods.

Potentially, DPGs offer a flexible, modular, and open pathway to DPI, reducing reliance on proprietary vendors and mitigating long-term lock-in risks. While enthusiasm for DPG-based DPI is high and implementations are proliferating, robust empirical evidence detailing actual impact across various dimensions—economic, social, governance, and political—remains limited and fragmented.

This report aims to help bridge this evidence gap. After presenting an overview of existing evidence, it proposes a conceptual framework for understanding the multi-dimensional value of DPGs. This framework emerged from primary research into DPG-for-DPI implementations in three countries: The Philippines, Kyrgyzstan, and Rwanda. These country case studies serve both to elicit evidence for the value of DPGs, as well as to illustrate the implementation stories and lessons learned of policymakers pursuing the adoption of DPGs as part of their DPI strategies.

A DPG-for-DPI Value Framework

The conceptual framework developed in this report is rooted in the stated objectives of policymakers – i.e., both the actual and perceptual value of DPGs to the decision-makers adopting these technologies. This framework moves beyond easily quantifiable metrics to assess value across four dimensions:

Economic Value: Focused on direct fiscal savings, avoiding vendor lock-in, stimulating market competition, and enabling domestic entrepreneurship.

Social Value: Concentrated on expanding access to essential services (health, payments, ID) for underserved populations, improving equity, and supporting progress toward the SDGs.

Governance Value: Dealing with strengthening state capacity, improving interoperability and institutional coherence, and supporting anti-corruption efforts through transparency.

[1] Different definitions of DPI exist. This study adopts the one offered by Co-Develop: "We understand digital public infrastructure (DPI) to be society-wide, digital capabilities that are essential to participation in society and markets as a citizen, entrepreneur, and consumer in a digital era. Because it is essential, DPI should be guaranteed by public institutions to be 1) inclusive, 2) foundational, 3) interoperable, and 4) publicly accountable, as it is deployed in countries around the world."

Political Value: Addressing technological sovereignty, strategic autonomy, geopolitical positioning, and regional and global soft power.

Within each dimension, special attention is paid to ecosystem effects—the indirect, cumulative, and relational forms of value, such as cultivating trust in state systems, enabling market innovation and competition, and building long-term institutional capacity.

The report's three country case studies illustrate how DPGs, when implemented strategically, can deliver value across these four dimensions:

Economic Value

DPG-based systems have demonstrated significant financial benefits and market-shaping potential. In the Philippines, a system based on the DPG Mojaloop that aims to connect all payment providers and enable instant transfers is projected to cost at least 90% less over a 10-year period than a proprietary incumbent system. Low, fractional-cent transaction fees will create a crucial, low-cost way for rural banks and microfinance groups to connect, directly reducing market concentration. In Kyrgyzstan, the X-Road–based Tunduk interoperability platform saved citizens an estimated 21 million hours and 1.7 billion soms (around US$19 million) in 2024 by eliminating the need for physical travel and paper certificates. DPG implementation in Rwanda catalyzed a local innovation ecosystem, as local firms developed deep Mojaloop expertise and began exporting their services, demonstrating how DPG-for-DPI development can anchor domestic service industries.

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"We grew with the project. The technology demanded that we become world-class."

Alain Kajangwe
CEO of WiredIN, a local firm from Rwanda that began exporting services based on Mojaloop.

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Social Value

DPGs have proven instrumental in expanding service accessibility and improving development outcomes. Rwanda's national health information system, built on DHIS2 since 2012, was central to the country's COVID-19 pandemic response, enabling rapid vaccination rollout and contributing to a dramatic reduction in maternal mortality (over 50% decline from 2010 to 2019) and malaria incidence (nearly 50% decline from 2010 to 2023). The system also allows for highly granular targeting of interventions, ensuring that rural and vulnerable populations are reached. In the Philippines, the PhilSys national digital ID system, built on MOSIP, has enabled as many as 8.3 million previously unbanked Filipinos to open a bank account for the first time, substantially advancing financial inclusion.

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"DHIS2 was critical in the fight against Covid… we leveraged it for contact-tracing, diagnosis, and keeping track of vaccination and treatment."

Noella Bigirimana
Deputy Director General of the Rwanda Biomedical Centre.

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Governance Value

DPG-based DPI can reshape institutional relationships and state capacity. Kyrgyzstan's anti-corruption motivation for adopting Tunduk was realized by standardizing data exchange and reducing discretionary paper-based processes, removing steps where corruption typically occurred. In Rwanda, DHIS2 has institutionalized a culture of evidence-driven decision-making, with completeness of routine health data rising from 88% to 95% and timeliness improving from 60% to over 90% in key districts.

Political Value

This motivation, though often only implicitly expressed by policymakers, is perhaps the most strategic: DPGs enhance national autonomy. All three countries explicitly framed DPGs as a way to retain long-term control over critical infrastructure and avoid structural dependence on proprietary foreign vendors. Kyrgyzstan's choice of X-Road over a proprietary alternative was a strategic move to ensure national control and security. Rwanda is leveraging its success with DHIS2 and Mojaloop to become a regional leader and exporter of DPG expertise, contributing innovations back to the global ecosystem and building South–South cooperation.This contribution increases the country's soft power and influence in shaping international technical agendas and norms. Similar to the experience of other small states such as Estonia, which has increased its global influence by sharing the DPG X-Road, Rwanda is amplifying its profile through non-zero-sum collaboration, knowledge-sharing, and contribution to a digital public good.

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"**X-Road was good technically and open source and it really checked the box for digital resiliency... We could see all the source code and manage and control the data.**"

Aziz Soltobaev
Policy Adviser, Government of Kyrgyzstan.

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Lessons for Policymakers

The analysis in this report found that DPGs adopted as components of DPI are not merely cost-saving tools; they are instruments of political, social, and institutional change. Several cross-cutting lessons emerged from the study:

Recognize the Political and Geopolitical Value of DPGs

Across all three countries, policymakers emphasized national autonomy – i.e. ownership, agency, and authority – as central motivations for adopting DPGs for DPI. By instantiating a model of what the tech policy analyst and advisor Pablo Chavez terms "**hybrid sovereignty**"—a combination of domestic ownership and cross-border technology partnerships—DPGs allow states, especially smaller and developing ones, to articulate a distinct path through today's concentrated global technology landscape.

Implement Incrementally

DPG adoption is often successful when implemented through phased, low-risk migration, rather than big-bang transitions. Rwanda used adapters and parallel systems during the Mojaloop rollout; Kyrgyzstan onboarded agencies to Tunduk incrementally; and the Philippines, which experienced obstacles from moving rapidly to implement a MOSIP-based identity system, is now piloting and deploying DPGs through in a gradual, iterative way. DPGs work best when governments

sequence reforms, protect existing services during transition, and allow institutions time to adapt.

Capacity-Building is Key to Realizing the Benefits of DPGs

DPGs mitigate lock-in risks, but the degree of autonomy they enable depends on a country's ability to maintain and steer the evolution of those systems over time. This means sustained, dedicated investment in in-house technical capacity to maintain, adapt, and extend the open-source code.

Adopt a Pragmatic, Mixed-Model Implementation Strategy

Instead of attempting a risky overhaul of all existing IT systems, this approach entails weaving DPGs into the existing ecosystem where they provide immediate value and in ways that increase the likelihood of sustained adoption. The Philippines, for instance, is using DPGs for new "greenfield" systems, piloting them alongside legacy platforms, and deploying them to fill specific market gaps. This approach reduces risk while enabling governments to test DPG performance in real operational conditions.

Embed DPGs in Durable Institutional Mandates

Successful DPG for DPI implementations, like Tunduk in Kyrgyzstan, required translating high-level political priorities into durable institutional mandates, such as creating a dedicated State Enterprise with the authority to enforce data-sharing and adoption across reluctant agencies.

Align Incentives and Build for Interoperability to Make DPGs Work

DPGs succeed when rules and incentives encourage all actors to connect and collaborate. In Rwanda, Mojaloop worked beca+use the national bank set clear requirements, reduced the cost of joining the system, and engaged closely with banks, MFIs, and mobile-money providers to build trust and buy-in.

Use Crisis Moments

In all three countries, the COVID-19 pandemic acted as an accelerator, validating DPG investments and creating the political momentum needed to pivot to more resilient, open infrastructure.

The evidence base presented in this report suggests that DPGs offer countries a robust pathway to strengthen state capacity, spur domestic innovation, and ultimately shape their digital futures on their own terms. For developing nations, DPGs-for-DPI represent a promising model for expanding agency and creating inclusive, sustainable digital transformation.

Introduction

Introduction

Two powerful—and largely contradictory—trends have defined the global digital ecosystem in recent years. On the one hand, digital technologies have diffused more widely than ever before. From payments and identity systems to agriculture, education, and public service delivery, digital tools are reaching more people and shaping more aspects of daily life. Even though digital dissemination remains uneven and refracted through various inequalities, the promise of digital transformation has become increasingly tangible, especially across the Global South.

On the other hand, the global technology landscape has also become more concentrated. A small number of firms, almost all based in the United States and China, now dominate essential layers of the digital stack. As a result, many countries find themselves in an uneasy position: becoming more deeply embedded in digital ecosystems while also growing more dependent on external actors who control the core infrastructure on which their societies and economies increasingly rely.

For policymakers—particularly in the Global South—this combination of diffusion and dependency presents real risks. It raises questions about digital sovereignty, economic resilience, national security, and the long-term sustainability of digital transformation efforts. In response, there has been growing recognition of the need to build more open, interoperable, and locally governed foundations for the digital economy. This has led to renewed interest in public approaches to digital systems—approaches that democratize access to key technologies and distribute the benefits of digital transformation more equitably.

Digital public infrastructure (DPI) has emerged as one such approach. In the words of the **World Bank**, "DPI is an approach to digitalization focused on creating foundational, digital building blocks designed for the public benefit". The **Gates Foundation** likewise defines DPI as "foundational, reusable systems such as digital ID, payments, and data sharing [that] work together for the public benefit". Importantly, the DPI movement is not monolithic. Countries have taken diverse pathways in designing and implementing their digital stacks, depending on political priorities, institutional capacity, and local context.

This report examines one particular approach: the use of digital public goods as core building blocks of DPI. DPGs—open-source software, open datasets, AI systems and content collections that comply with privacy and safety best practices while accelerating progress on the Sustainable Development Goals —offer a flexible and modular approach to infrastructure development. Their openness supports local ownership and adaptability. Their modularity allows them to be integrated into broader digital ecosystems, with relatively low switching costs and high extensibility. And their governance structures can reduce dependence on proprietary vendors and mitigate long-term lock-in risks. As a result, governments, development agencies, and multilateral institutions have shown rising interest in adopting DPGs, particularly as part of larger DPI strategies.

Yet fundamental questions remain: what is the actual impact of DPGs for DPI? What do DPGs do in practice, and under what conditions do they generate economic, social, governance, or political value when implemented as part of DPI?

Despite growing global enthusiasm, there is still relatively limited empirical evidence on the real-world effects of DPG-for-DPI adoption. The evidence that does exist is fragmented and uneven, and we know relatively little about DPG implementation dynamics, their contribution to digital ecosystems, or the conditions under which they succeed or struggle. As a result, the existing evidence base offers a limited guide to policymakers and other stakeholders considering DPG or DPG-for-DPI implementations.

This report aims to help fill that gap by providing:

- **An overview of existing evidence**.
- **A conceptual framework** for understanding the multi-dimensional value of DPGs:
    - This framework is **grounded in the priorities expressed by countries** themselves.

We asked policymakers and implementers what they hoped to achieve with DPG-for-DPI systems, and we built the framework around those motivations rather than preconceived categories.
  - The framework also incorporates **indirect or ecosystem effects**—changes in market structure and institutions, broader innovation effects, and enhancements to governance capacity—that are harder to quantify. These longer-term dynamics often represent the most durable forms of value and are essential to understanding the impact of DPGs.

- **Three country case studies**:
  - The Philippines
  - Kyrgyzstan
  - Rwanda
- **An assessment of evidence and remaining gaps** across four dimensions of value:
  - Economic Value
  - Social Value
  - Governance Value
  - Political Value

Taken together, we show that DPGs, especially when implemented as part of coherent DPI strategies, can create significant public value by enabling open, interoperable, and inclusive digital ecosystems. In the conclusion, we synthesize the case studies and their available evidence, presenting a set of cross-cutting lessons and emerging principles. Taken together, these lessons provide a practical roadmap that can help guide policymakers and others considering implementing DPG-for-DPI solutions.

I. DPGs and DPI: Definitions and Relationship

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What is a Digital Public Good (DPG)?

Digital public goods are open-source software, open datasets, AI systems and content collections that comply with privacy and safety best practices while accelerating progress on the Sustainable Development Goals (SDGs). This definition is operationalised through the **DPG Standard** – a set of nine indicators that are used to determine whether or not open-source software, open datasets, open AI systems, and open content collections are digital public goods.

Over the past five years, DPGs have moved from a relatively technical idea to a visible component of global digital governance. In 2019, the UN Secretary-General's High-Level Panel on Digital Cooperation elevated the concept in **The Age of Digital Interdependence**, calling for a "platform for sharing digital public goods," supported by a multistakeholder alliance, that would help advance the SDGs. This recommendation played a key role in the formation of the Digital Public Goods Alliance (DPGA), which now maintains the DPG Standard and **DPG Registry** and works to increase discovery, use, and investment related to DPGs. Subsequently, the UN Secretary-General's **Roadmap for Digital Cooperation** (2020) highlighted the concept, providing clearer definition and identifying DPGs as "essential in unlocking the full potential of digital technologies and data to attain the Sustainable Development Goals, in particular for low- and middle-income countries." More recently, the **Global Digital Compact**, adopted by the UN General Assembly in 2024, treats DPGs and digital public infrastructure (DPI) together as key drivers of inclusive digital transformation and calls for increased investment in both. In parallel, initiatives such as **GovStack** explicitly position DPGs as open, reusable "building blocks" within modular DPI architectures, providing reference implementations that governments can adapt rather than build from scratch.

This policy journey helps explain both the growing importance of DPGs and why they are now central to many governments' DPI strategies. As countries seek to scale digital identity, payments, data exchange, and other modular services, they face mounting concerns about cost, vendor lock-in, and dependence on a small number of foreign technology providers. DPGs offer the potential of a different pathway: shared, standards-based components that can be reused across borders, locally adapted, and embedded in national ecosystems even while remaining anchored in global norms around openness, inclusion, and safety.

In short, a DPG is not simply "open source." It is a publicly oriented digital solution that is designed to be widely reusable, interoperable across contexts, accessible for adaptation and local ownership, and governed in line with globally accepted standards of privacy, inclusion, and sustainability.

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DPGs and DPI: A Potentially Self-Reinforcing Ecosystem

DPGs and DPI are conceptually distinct but deeply complementary. While DPI refers to foundational public systems—such as digital identity, payments, and data-exchange layers—on which societies and economies increasingly rely, DPGs provide modular, open-source components that can be used to build or enhance those systems. A number of countries are already using **DPGs for their DPI** strategies.

Countries Using DPGs for DPI[2]

DPG for DPI	Core Function	Key Implementations & Adopters (Non-Exhaustive)
MOSIP	**Digital ID** Modular Open Source Identity Platform.	Philippines, Ethiopia, Morocco, Sri Lanka, Togo, Uganda.
X-Road	**Data Exchange** Secure data exchange layer.	Estonia, Finland, Iceland, Kyrgyzstan, Ukraine, Cambodia.
OpenG2P	**Digital Payments** G2P payments & beneficiary management.	Sierra Leone, Philippines, Ethiopia, Zambia, Timor-Leste.
OpenSPP	**Digital Registries** Integrated social protection information system.	Philippines, St. Lucia, Barbados, Haiti.
OpenCRVS	**Digital Registries** Birth & death registration.	Bangladesh, Niue, Madagascar, Zambia, Pakistan.
Mojaloop	**Digital Payments** Instant payment clearing loop.	Rwanda, Tanzania, Myanmar, Malawi.
DIGIT	**Digital Registries** Platform for citizen services.	India (Andhra Pradesh, Punjab), Sri Lanka, Indonesia.
Mifos X	**Digital Payments** Financial inclusion platform.	India (Novopay), Nigeria (Kwikcash), Myanmar, Kenya, Ghana, Tanzania.
Mifos Payment Hub	**Digital Payments** Payment integration layer.	India, Mexico, Sierra Leone, Kenya.
OpenFn	**Data Exchange** Workflow automation & interoperability.	Thailand (Health), Ghana (Health), Cambodia (Social Affairs), Nigeria, Ethiopia.
Sunbird Ed	**Digital Registries** Learning & skilling infrastructure.	India (DIKSHA - National School Education Platform), USA (Learning/Skilling pilots).

[2] This collection features DPGs that are being implemented by countries as part of their DPI and reviewed by the DPGA Secretariat's technical team as part of the solutions being verified as a DPG. It is limited to solutions that are relevant to the four DPI use cases listed above. This collection will continue to grow as more solutions become DPGs.

DPG for DPI	Core Function	Key Implementations & Adopters (Non-Exhaustive)
QuarkID	**Digital ID** Self-sovereign identity protocol.	Argentina (Buenos Aires City).
CREDEBL	**Digital ID** Decentralized identity management.	Bhutan, Papua New Guinea.
Janssen Project	**Digital ID** Cloud-native identity & access management.	Global (Used as a core component in various trust frameworks).

DPGs are not the only available pathway to building DPI, nor do they prescribe a single implementation model. Countries can deploy DPGs in multiple ways—self-hosted on national infrastructure, cloud-hosted, offered as a managed service, or embedded within hybrid architectures—meaning that their ultimate outcomes and impact depend heavily on deployment and governance choices, not merely on the underlying technology. Likewise, governments can build DPI through a range of approaches: fully proprietary systems; modular open-source components such as GovStack building blocks; DPG-based platforms; or emerging models like DPI-as-a-Service (**DaaS**), which offer pre-built, cloud-ready modules with minimal customization needs. Clarifying these pathways is important because DPGs do not dictate a single route. Instead, they expand the menu of options available to countries seeking interoperable, affordable, and adaptable digital public infrastructure.

When used within well-designed governance and implementation frameworks, DPGs can help strengthen key DPI principles by providing reusable components that align with national standards and can be extended across sectors. In particular, the following properties of DPGs and DPIs may be mutually complementary:

Strengthening Openness and Interoperability

DPGs can strengthen openness and interoperability—defining principles of DPI. Because DPGs are built on open-source licenses (and sometimes open standards), they naturally encourage interoperability across agencies, sectors, and countries. This reduces fragmentation and supports the creation of cohesive national digital stacks rather than scattered, vendor-driven systems. Openness and interoperability also create predictable interfaces that preserve long-term flexibility—allowing governments to adjust, replace, or enhance components as needs evolve, rather than being locked into rigid or proprietary architectures.

Digital Public Goods and Government Autonomy

Proprietary digital systems often lock governments into long-term contracts, making it difficult to adapt or evolve critical infrastructure without depending on a small number of private actors. By contrast, DPGs offer countries genuine choice: governments can host the infrastructure locally, customize the code, or build capacity among domestic firms. This does not eliminate dependence—no technology stack is entirely sovereign, and DPGs may also be hosted outside a country's borders—but it diversifies options and reduces the structural vulnerabilities associated with concentrated global technology markets.

Inclusion and Access Through Digital Public Goods

DPGs advance inclusion, another core objective of DPI. Because DPGs are typically lower-cost, modular, and adaptable, they lower the barrier to deploying foundational digital systems. This matters especially in the Global South, where institutional capacity, fiscal constraints, and legacy infrastructure may limit the adoption of expensive proprietary solutions. DPGs can expand access to digital services—payments, health systems, identity, education—by enabling governments to deploy infrastructure that is both affordable and tailored to local needs.

DPGs: Existing Evidence

Over the past five years, DPGs and DPI have moved from being niche concepts to central pillars of national industrial, development, and innovation strategies. The growing acceptance has been accompanied by heightened donor interest, from multilaterals, philanthropies, and specialized funds.

As the field matures, advocacy and experimentation are no longer sufficient. The question is shifting from whether to use DPGs toward how, when, and under what conditions they deliver value. A recent **World Bank publication** stated that "to maximize the potential of DPI and keep the focus on outcomes, rigorous evidence-building is needed to test and document impact." **UNDP** states that "despite increasing evidence, the development impact of DPI remains largely an under-researched area." And the **World Economic Forum** likewise argues that "more evidence for the impact of DPGs for building DPI is required." In other words, as the promises attached to DPGs and DPI grow, so does the imperative to understand what actually works in practice.

For DPGs, this turn toward evidence is not simply about accountability; it is also about alignment between technology, governance, and society. Clearer impact data can help governments match their policy objectives with appropriate DPG choices, calibrate implementation strategies, and design regulatory and institutional reforms that unlock the full value of open, interoperable infrastructure. It can also surface trade-offs—between speed and safeguards, openness and control, or centralization and local autonomy—that might otherwise remain hidden. In this report, we build on this emerging evidence base, while also arguing in the next section that to truly understand the impact of and establish the value proposition for DPGs, we must start from policymakers' own objectives and examine how value manifests across multiple dimensions: economic, social, governance, and political.

Various studies in recent years have examined the benefits and impact of open-source and reusable solutions—including but not limited to DPGs. It is still early days, however, and especially when it comes to evaluating DPGs in national DPI buildouts, the evidence base is nascent. As part of this report, we conducted a targeted literature review of impact evaluations, case studies, and macro-level analyses. We first reviewed the different methods used in the literature to measure impact. We then pulled out a set of recurring value dimensions applicable to the focus of our research-starting with the broader impact of open-source software (OSS) and then zooming in on more specific public-sector and DPG deployments.

Measurement Methods

Existing studies have used various methods to measure the benefits and impact of DPGs. At least four methods were identified.

Direct cost and efficiency metrics, including total cost of ownership analyses and key performance indicators, can provide quantitative evidence of:

- Financial savings (measured as the difference between the estimated value and the final contract value, or total public funds saved)
- Time savings (measured in work-years saved or in reduction of process time)
- Data availability time (measured as the lag between data collection and usability)
- Cost-per-unit (measured as the cost per beneficiary or per data point)

Adoption and scale metrics, though they do not provide direct evidence of value generation, are also often cited in the literature as indicators of the impact of a platform or application on societies. While incomplete in terms of measuring outcomes, these may nonetheless illustrate the reach and uptake of a DPG along different dimensions:

- Number of users or downloads.
- Geographic scale (i.e. the number and range of countries or other jurisdictions adopting the system).
- Volume (e.g. total transactions processed or total digital IDs generated).

Other methods attempt to measure the outcomes of DPG use. **Randomized-controlled trials** and other quasi-experimental analyses seek to establish a causal link between the adoption of a DPG and a particular outcome. These have been carried out primarily in the **health sector**, but are rare in other areas. **Qualitative and mixed-methods** evaluations seek to reveal insights about DPG impact. These include systematic case studies and focus groups that elicit the opinions, perceptions, and experiences of those involved in the adoption and use of a DPG. From these micro-level

data points, such studies seek to draw transferable or generalizable lessons and insights about impact.

Finally, **economic modeling and similar methods** attempt to measure the system-wide impact of DPGs at a national-level or across markets. Macroeconomic models quantify the impact on an entire economy in terms of metrics such as GDP growth, cost-benefit ratio of public investment, and job creation. There have also been attempts to build bespoke platform and ecosystem models that aim to describe the specific economics of a DPG-based ecosystem before it is built. Notably, the **Inclusive, Instant Payments System (IIPS) Hub Estimator** is an evaluation framework for the Mojaloop ecosystem that allows a country or organization to compare the Total Cost of Ownership (TCO), Profit & Loss (P&L), transaction volume projections, and time-to-market of a Mojaloop-based hub versus a proprietary vendor or an in-house proprietary build.

Each of these methods has distinct strengths and limitations. Quantitative approaches are useful for estimating measurable effects—such as financial savings, efficiency gains, or macro-level economic impacts—but they often struggle to capture institutional, behavioral, or ecosystem-level changes. Qualitative methods, by contrast, can reveal more nuanced insights into user experience, governance practices, and the political or organizational impacts that shape long-term success. In this report, we therefore adopt a mixed-methods approach that combines quantitative indicators with qualitative evidence to produce a more comprehensive and contextually grounded assessment of DPG value.

Backdrop: The Value of OSS

At the macro level, there is now robust empirical evidence that open-source software generates substantial economic and innovation benefits. While not all open-source software meets the DPG Standard–and thus the findings cannot be mapped one-to-one onto the DPG context–this body of research offers directional insights into the potential value of DPGs.

A **2021 study** for the European Commission estimated that OSS contributed between €65–95 billion to EU GDP in 2018. It finds that a 10% increase in OSS contributions would be associated with 0.4–0.6% additional GDP per year and more than 600 additional ICT start-ups annually, yielding a cost–benefit ratio of roughly 1:4 to 1:10 when public and private investments are taken into account. Likewise, **evidence from another recent cross-country study** suggests that in general, GDP is increased across countries due to the growth of OSS; if countries stopped contributing to the global OSS ecosystem, the study finds, average GDP would decline by 2.2%.

A **complementary study** by Hoffmann, Nagle, and Zhou reinforces these macro-level findings by estimating the economic value created by widely used open-source software. The authors distinguish between supply-side value—the amount it actually costs to build and maintain open-source projects—and demand-side value, which represents what firms and governments would have had to spend if these tools did not exist. Their analysis suggests that while the supply-side cost of major OSS projects is roughly $4.15 billion, the value to users—the avoided cost of purchasing or building proprietary equivalents—is nearly $8.8 trillion. They conclude that, across firms, software budgets would have to increase by 3.5 times if open source software did not exist.

While this study is not explicitly on DPGs, it contains important lessons and findings—notably, that when countries and governments invest in open, reusable digital components, the benefits multiply far beyond the initial investment (especially as other countries and institutions adopt, adapt, and build on the same shared infrastructure, thus helping to build an overall ecosystem).

Direct Fiscal and Efficiency Value of DPGs

Beyond the general benefits of open source software, studies document direct fiscal savings and efficiency gains from investing specifically in DPGs. **Estonia** estimates that by eliminating redundant paperwork and allowing instant access to reliable information, the use of the open data exchange platform X-Road saves that country's workforce a total of 1,345 years of working time every year. A concrete example is Mifos, a DPG core-banking platform, where **large-scale deployments report** loan processing that is up to six times faster and operating costs that are more than fifteen times lower per loan than proprietary alternatives. Importantly, these gains compound over time: features developed for one implementer are reused across the ecosystem, reducing long-term costs and avoiding repeated, bespoke development.

Complementary evidence from the broader open-source ecosystem reinforces this pattern. For example, a **case study on GeoNode**, an open-source geospatial data platform used by hundreds of institutions worldwide, estimates that the project has delivered roughly a 200% return on investment. Total investment made by the Global Facility for Disaster Reduction and Recovery (GFDRR) in building the software was $1-$1.5 million; because GFDRR invested in a shared open-source codebase rather than commissioning a one-off system, the accumulated contributions from a global community of partners mean that the functionality now available would have cost an estimated $2–3 million if built in-house as closed software. This is a clear example of how institutional investments in DPGs can lower total cost of ownership while expanding functionality over time.

Improved Government Services

Another cluster of studies focuses on improvements in service delivery, particularly in health and other social sectors. **DHIS2**, which is discussed further below, has been widely evaluated as a health management information system. Across multiple countries in Africa and Asia, DHIS2-based systems are associated with dramatic improvements in the completeness and timeliness of routine health reporting, better data availability for managers, and more consistent use of data for supervision and planning. **One qualitative study** of DHIS2 in Ethiopia concluded that it had "significantly improved data quality and accessibility in Ethiopia, enhancing healthcare management and accountability across facilities."

Relatedly, CommCare, a mobile case-management DPG, has one of the strongest quantitative evidence bases among digital health tools. A **2024 synthesis** of more than 90 peer-reviewed studies—many of them using RCTs--found that in Bihar, India, community health workers using CommCare achieved a 73% increase in timely antenatal care visits, a 58% increase in pregnant women receiving iron–folic acid tablets, and a 36% rise in modern contraceptive use compared with control groups. Other findings from the study include a 74% institutional delivery rate for Tanzanian patients using CommCare (compared to 63% for the control group); a 79% percent patient adherence rate among patients in Burkina Faso (54% in the control group); and an increase in the frequency of antenatal HIV tests performed by healthcare workers to 82.2% (67.5% in the control group).

Other studies have shown improved government service delivery in domains beyond health. Data gathered from a **pilot implementation** of OpenCRVS in two sub-districts in Bangladesh found that use of the system resulted in a 49% increase in birth registrations and a 45% increase in death registrations. The developers of foundational national data exchange and identity systems, such as **X-Road** and **MOSIP**, release up-to-date adoption metrics that demonstrate digitization of core government services.

Sovereignty and Ownership

Finally, several recent studies and policy documents explicitly connect DPGs and open-source DPI to strengthening digital sovereignty and national control over critical technological systems. The European Commission's **OSS impact study** highlights "digital autonomy and technological sovereignty via Open Source" as a central policy motivation, noting that open-source adoption in the public sector reduces switching costs, mitigates vendor lock-in, and fosters competitive markets. In the European energy sector, the **LF Energy** PowSyBl project is framed as a community-led open-source grid modeling tool that allows transmission system operators to avoid dependence on closed, foreign vendors while jointly maintaining critical infrastructure software.

Similarly, a recent "lessons learned" report from the **Digital Impact Alliance** emphasizes that MOSIP's open-source, standards-based architecture allows countries to work with multiple system integrators, reduces the risk of being tied to a single proprietary vendor, and enables governments to own and govern their foundational ID systems. Commentary from practitioners and **partner universities** further underlines that the key value proposition of open-source digital public goods lies in "technology independence": the ability to adapt, maintain, and extend critical systems without ceding control to external actors—provided that local capacity is built alongside code. These findings, though often reliant on qualitative data, are prominent in the literature and reinforce the notion that DPGs can strengthen not just technical sovereignty (control over infrastructure) but also institutional sovereignty (capacity to steer and govern digital trajectories).

II. A Framework for Value: Understanding why DPGs Matter to Countries

II. A Framework for Value: Understanding why DPGs Matter to Countries

The emerging evidence base around DPGs reveals a great deal—but it is also uneven and limited. Existing evaluations tend to focus on what can be measured most easily: direct cost savings, improvements in data quality, or gains in service delivery. These findings are important, but they offer only a partial, fragmentary picture of why governments adopt DPGs and implement DPI, and what forms of value they ultimately hope to create. Our research—drawing on both literature reviews and interviews—suggests that the motivations behind DPG-based reforms extend far beyond the narrow value-adds typically measured. Policymakers consistently emphasized goals such as inclusion, institutional coordination, local capacity-building, digital sovereignty, and the long-term resilience and trustworthiness of their digital ecosystems.

One reason these broader goals remain underexamined is that they are inherently difficult to quantify. It is perhaps conceivable to develop metrics for aspects of sovereignty, trust, or institutional capacity, but these concepts are by their nature multidimensional, deeply contextual, and far more nuanced than standard monitoring frameworks can easily capture. Many forms of value resist reduction to simple indicators. That is why this report adopts a qualitative, mixed-methods approach, using structured interviews and narrative case studies to surface what matters to policymakers themselves. The case studies are briefly summarized in **Section III** and described in detail in the **Appendix**.

Section IV presents our analysis of DPG value and outcomes, based on the three country case studies. It offers a more fine-grained, bottom-up understanding of value—one grounded not in preconceived categories or in what existing studies happen to measure, but in the priorities articulated by the people designing and implementing DPG reforms. Rather than imposing a top-down framework, we asked policymakers and other stakeholders what problems they were trying to solve, what outcomes they hoped to achieve, and what they viewed as the country's long-term digital goals. This approach is somewhat unusual in policy analysis, which often prescribes what should matter–but it yields insight into what actually does matter for governments, citizens, and other stakeholders navigating real-world constraints and tradeoffs.

Four Dimensions of Value

What emerged from this research was a DPG for **DPI Value Framework** rooted in the experiences and expectations of national policymakers, especially in the Global South. This framework has four broad dimensions.

Economic Value

Policymakers consistently framed DPGs as a means to reduce long-term costs, avoid vendor lock-in, and stimulate competition and innovation in domestic digital markets. Several officials described DPGs as leveling the playing field, allowing smaller firms or local integrators to enter markets traditionally dominated by a few proprietary vendors. Others highlighted the potential for DPG-based systems to accelerate innovation by lowering barriers to entry and building local capacity. In each country, economic value was understood not only as cost savings (sometimes easily quantifiable), but as broader market-shaping potential that could unlock private-sector investment, enhance technical skills and capacity, and unleash local innovation and entrepreneurial capacity.

Social Value

Across interviews, stakeholders emphasized the ability of DPGs to extend essential services—

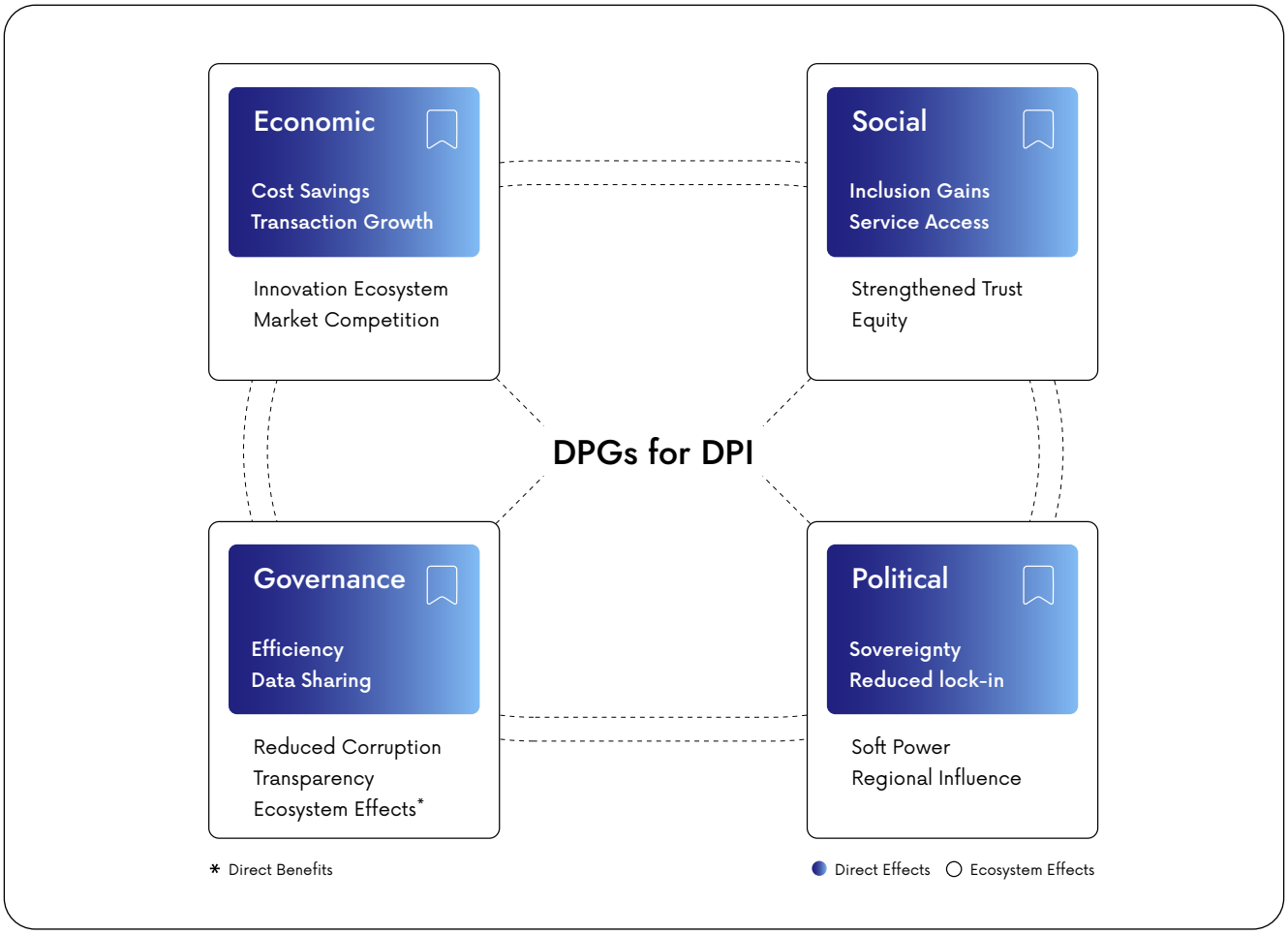
such as payments, identity, or health services—to populations historically underserved by digital systems. Interviewees described how DPGs were making it easier to deliver benefits equitably, especially in rural or low-connectivity areas. In both the Philippines and Rwanda, officials linked DPG adoption explicitly to inclusion goals: reaching new beneficiaries, reducing friction in accessing public services, and improving the consistency and reliability of frontline service delivery. Social value was thus conceptualized as both access and quality: not just reaching more people, but reaching them with better, more responsive services.

Governance Value

Interviewees repeatedly mentioned improvements to coordination, data-sharing, and overall institutional capability as core aspirations in their DPG and DPI implementations. DPG-based systems were described as mechanisms for strengthening interoperability among public agencies by standardizing data flows and enabling cross-agency collaboration. In health and civil registration, officials pointed to stronger data quality, more reliable reporting, and increased use of evidence for planning and resource allocation. Policymakers also highlighted how DPGs can strengthen internal capacity: by adopting open, modular platforms, ministries gain flexibility, institutional memory, and the ability to manage systems over the long term without rebuilding from scratch each time political priorities shift.

Political Value

Finally, policymakers framed DPGs as instruments of sovereignty, strategic autonomy, and regional or international "soft power." Several stakeholders—from digital identity teams to payments regulators—described DPGs as a way to retain control over critical infrastructure while avoiding deep structural dependence on proprietary vendors. The desirability of this approach was linked not only to lower costs and greater flexibility, but also to national security, bargaining power, and the desire to shape the country's digital trajectory on its own terms. In interviews, political value was often articulated in understated but clear terms: DPGs give governments options, reduce exposure to geopolitical pressures, and enhance regional and international prestige and standing.



Ecosystem Effects

Within each of these categories, special attention is afforded to what we describe as "ecosystem effects." This sub-category attempts to synthesize the aspects of value that are indirect, cumulative, and relational: they emerge over time, through interactions among institutions, developers, regulators, and users. Such indirect or ecosystem effects—sometimes described in the literature as the "ripple effect"—are also part of what makes the full value of DPGs and DPI so difficult to capture in traditional evaluations.

Some of these ecosystem effects connect directly to the categories identified above: lowering barriers to entry, encouraging competition, and enabling more responsive public-sector digital services. Others are more diffuse and constitute their own categories of value—for example, the cultivation of trust in national digital ecosystems, the strengthening of domestic innovation capacity, or the institutional learning that accrues as countries adopt shared, interoperable architectures. Economists might frame these as positive externalities, especially those that play out longitudinally and are therefore difficult to quantify. Yet despite their measurement challenges, these ecosystem-level effects often represent the most durable and strategically significant value that DPGs create. We highlight these effects and elaborate on them in **Section IV**.

III. Country Case Studies

III. Country Case Studies

The Case Study Approach and Methodology

As noted, the core research for this report was mixed-methods quantitative and qualitative case studies of DPG for DPI implementations in three countries: the Philippines, Rwanda, and Kyrgyzstan. There are various definitions of case studies and the case method.[3] This research used what are often referred to as "lessons learned" cases, which retroactively document a policy implementation and derive insights that are transferable to similar situations and contexts.

Case studies provide a window into the black box of an organization, revealing the motivations, strategies, and relationships that determine policymakers' actions. They provide a nuanced, non-idealized and non-abstracted view of the complex constraints policymakers face and the countless variables involved in a policy process. This enables researchers to test hypotheses that would be impossible to assess at the aggregate level with quantitative data. Scholars have noted that these qualities make case studies useful tools for building theories of politics and policymaking.[4] [5]

A case study approach was well-suited for this study, where key research goals are to reveal policymakers' motivations for pursuing DPGs and to understand the specific steps they took to implement those systems. Additionally, the audience for this report is not only the DPG, DPI, and open source research communities, but also policymakers and entrepreneurs in countries all over the world. These cases aim to provide blueprints and lessons learned that might benefit leaders pursuing similar digital transformation efforts.

Three factors motivated country selection: (1) contextual diversity (in terms of geography, income level, and population size), (2) maturity of DPG for DPI adoption, and (3) accessibility of government officials for primary interviews. Research for each case began with a review of relevant literature related to digital transformation, DPI, and DPGs in each country – including media reports, government policies and strategies, academic studies, and other third-party reports.

The core of the research was primary source interviews, conducted by video and audio call. We interviewed 25 people, including government officials and advisors, academics, think tank experts, entrepreneurs, development assistance partners, and DPG developers.

Summaries and key elements of each case are below, with full narratives in the **Appendix**.

[3] Gerring, John (2004) "What is a Case Study and What is It Good For?" American Political Science Review 98 (2): 341–354.

[4] Eckstein, Harry (1975) "Case Studies and Theory in Political Science." In Fred I. Greenstein and Nelson W. Polsby, eds. Handbook of Political Science. Vol. 7: Strategies of Inquiry, 79–138. Reading, MA: Addison-Wesley.

[5] George, Alexander L., and Andrew Bennett (2005) "Case Studies and Theory Development in the Social Sciences." Cambridge, MA: MIT Press.

Country Profiles and DPGs Implemented

Case Study 1: The Philippines

Per Capita GDP (USD)
$3,984.80 (2024)

—

Population
~116.8 million (2025 est.)

—

Government Type
Unitary Presidential Constitutional Republic

—

DPGs for DPI (start dates)
MOSIP (2019), Mojaloop (2025), OpenCRVS (2023), OpenG2P (2023), OpenSPP (2024)

—

Case Study 2: Kyrgyzstan

Per Capita GDP (USD)
$2,423.90 (2024)

—

Population
~7.3 million (2025 est.)

—

Government Type
Presidential Republic

—

DPGs for DPI (start dates)
X-Road (2016)

—

Case Study 3: Rwanda

Per Capita GDP (USD)
$999.70 (2024)

—

Population
~14.1 million (2025 est.)

—

Government Type
Presidential Constitutional Republic

—

DPGs for DPI (start dates)
DHIS2 (2012) and Mojaloop (2025)

—

Case Study 1: The Philippines

Background and Motivations

The Philippines is undergoing a significant digital transformation, driven by a pragmatic shift away from proprietary vendors toward DPGs. While the government has ambitious plans for financial inclusion and good governance, these have historically clashed with negative experiences involving external IT vendors. Policymakers have expressed frustration with vendor lock-in, high long-term costs, and a "paywall culture" in which they feel unable to make essential modifications to their own infrastructure. Consequently, various agencies are now prioritizing strategic autonomy and ownership over the direction of national technology.

Implementation

This shift is characterized by a decentralized, agency-led adoption of DPGs rather than a single top-down mandate. The Philippine Statistics Authority (PSA) led the way by implementing MOSIP for the national digital ID system (PhilSys) after a government working group visited India to observe the Aadhar system. Building on this momentum, other DPGs are coming online: the PSA is piloting OpenCRVS for civil registration, and the Department of Social Welfare and Development is preparing to launch OpenG2P and OpenSPP for targeting social benefits.

The private sector is also leveraging DPGs to solve market failures, specifically in the payments sector. After the Central Bank opened the door for competition to address an expensive, restrictive legacy system, a new venture-backed initiative called Abli Payments Technologies used the DPG Mojaloop to build a rival payments switch. By using open-source components, Abli estimates its system will cost $10–$11 million to build and maintain—around 95% less than the 10-year contract for the incumbent proprietary system over the same period—while enabling one-cent transaction fees to support financial inclusion.

Current Status

Despite this momentum, the transition is in its early days and faces hurdles. In an illustration of how DPGs are not a panacea for vendor lock-in, the integration of PhilSys has been slowed due to reliance on an external systems integrator. There is a recognized lack of technical capacity within the government to fully implement these systems without support. However, the passage of a new e-Governance Act creates a legal framework for shared government-wide systems and interoperability. Leaders are now focused on building technical capacity and demonstrating that DPGs like PhilSys can function effectively at a national scale.

Mojaloop was the perfect solution. We didn't have to build a new switch from scratch, or get a license from anyone, and it was up to the standards that the Central Bank had authorized.

— Abli Co-founder and CEO Vicente Catudio

Case Study 1: The Philippines
Key Elements

Policymaker Motivations

Avoiding Vendor Lock-in
Frustration over negative experiences with external IT vendors, including high long-term costs, inability to make essential modifications, and no recourse for underperformance.

Inclusion and Anti-Corruption
To achieve digital transformation goals, primarily strengthening financial inclusion and good governance/anti-corruption.

Implementations

Deployments and Pilots
A series of agency-led adoptions and pilots of DPGs for DPI, most in early stages of implementation.

- The Philippines Statistics Agency (PSA) deployed MOSIP for the PhilSys national digital ID beginning in 2019.
- The PSA began piloting OpenCRVS for local civil registration in 2023.
- The Department of Social Welfare and Development began piloting social benefit targeting and payments using OpenG2P (2023) and OpenSPP (2024).
- A private-sector-led, Mojaloop-based payments switch launched in 2025 to compete with an expensive and limited proprietary incumbent.

Value and Impact Highlights

Digital Autonomy and Ownership
The primary value proposition is gaining greater ownership and control over the country's digital transformation path, after a history of disadvantageous experiences with external vendors.

Cost-savings
DPGs offer the potential to save costs both for public agencies and citizens, such as a 95% reduction in the total cost of an interoperable instant payments system.

Financial Inclusion
The introduction of PhilSys has enabled as many as 8.3 million additional Filipinos to open bank accounts and further gains to inclusion are expected from the scaling up of pilots.

Case Study 2: Kyrgyzstan

Background and Motivations

In 2016, the government of Kyrgyzstan faced a crisis of public corruption. A fragmented maze of incompatible government databases and paper-based processes cost citizens time and money, and created opportunities for rent-seeking. To address this, the government sought an interoperable data exchange solution, ultimately rejecting a proprietary system due to concerns over strategic dependence and potential security vulnerabilities. Instead, policymakers chose X-Road, a DPG from Estonia. To drive adoption, the government established the Tunduk State Enterprise directly under the Prime Minister, providing the necessary political authority to enforce a mandate requiring reluctant agencies to connect their systems to this new backbone.

Implementation

The implementation strategy combined a top-down mandate from the highest levels of government with a bottom-up campaign to prove value and persuade agencies to adopt the platform. The 2020 COVID-19 pandemic served as a catalyst for widespread adoption. The crisis transformed Tunduk from an administrative efficiency tool into an essential lifeline, as it became the only mechanism for managing electronic movement permits and targeting social assistance to vulnerable populations. This stress test validated the system, allowing the government to shift its post-pandemic strategy toward scaling citizen-facing services through a mobile app that functions as a legally valid digital document wallet for 1.5 million authenticated users.

Beyond government services, Tunduk evolved into a "platform of platforms" that supported a broader expansion of the digital economy. By exposing open APIs, the state allowed private sector actors, including commercial banks and other financial services providers, to integrate government services directly into their consumer interfaces. This move was part of a deliberate industrial policy where the Central Bank leveraged the Tunduk infrastructure to mandate open banking standards, effectively using a public utility to spark private sector innovation and create a domestic fintech market.

Current Status

By 2024, the platform was processing 3.5 billion transactions annually, generating an estimated $19 million in savings for citizens by eliminating the need for physical travel and paper certificates. Of equal primary value for policymakers was sovereignty: in a turbulent geopolitical region, reliance on an open-source DPG allowed Kyrgyzstan to retain control over its data and development path. The case was an illustration of a DPI implementation driven by political imperatives – to maintain independence and redesign institutions to eliminate the opacity that fosters corruption.

A big reason X-Road was appealing as a solution was that it was the tried and tested global solution with a whole community and network behind it.

– Aziz Soltobaev, policy adviser, Government of Kyrgyzstan

Case Study 2: Kyrgyzstan Key Elements

Policymaker Motivations

Combatting Corruption
A drive to bring transparency and efficiency to a system where officials often demanded bribes and processes were opaque.

Digital Sovereignty
A strategic decision to be able to control the system and avoid the strategic dependence and security risks associated with proprietary systems from foreign vendors.

Implementations

Public Agencies
Tunduk was adopted across public agencies, linking databases, replacing incompatible proprietary systems, and digitizing essential government-issued documents.

Crisis Response
The platform successfully pivoted during COVID-19 to manage electronic permits and targeted social aid applications.

Digital Wallet Adoption
The Tunduk mobile app was downloaded 2.85 million times, replacing physical IDs and licenses with legally valid digital versions.

Private Sector Integration
Major commercial banks and e-wallets integrated Tunduk's APIs to offer government services within private apps.

Value and Impact Highlights

Strategic Autonomy
The use of a DPG, via its open source nature, allowed the country to maintain control over its national data and avoid vendor lock-in.

Economic Efficiency
In 2024 alone, the system saved citizens an estimated 21 million hours and 1.7 billion soms ($19 million).

Market Innovation
The platform served as a foundation for the private fintech market, enabling open banking and new G2B business models.

Social Contract
The system strengthened trust by making data silos and public service opacity a visible and quantifiable governance failure rather than an accepted reality.

Case Study 3: Rwanda

Background and Motivations

Rwanda's embrace of DPGs is rooted in a long-running national strategy to build a knowledge-based economy after the 1994 genocide. A series of concerted policy moves—including Vision 2020, Vision 2050, successive National ICT (NICI) Plans, and the SMART Rwanda Master Plan—have clearly articulated national priorities such as human-capital development and inclusion, strengthening local autonomy and digital sovereignty, and establishing Rwanda as a regional hub of entrepreneurship and innovation.

In recent years, a number of disparate technical reforms have cohered into a more explicit DPI strategy, especially with the creation of the Center for Digital Public Infrastructure (CDPI) within the Rwanda Information Society Authority (RISA) in 2025. As a foundation for DPI, Rwanda has emphasized the strategic value of DPGs—DHIS2 and Mojaloop in particular. This emphasis has been motivated partly by a desire for national ownership and long-term technical independence, and partly by the goal of building more competitive markets, encouraging innovation, and lowering barriers to entry (especially in the case of Mojaloop).

Implementation

DHIS2

Rwanda adopted DHIS2 in 2012 to replace fragmented paper-based reporting with a single national health information system. The Ministry of Health and its implementation arm, the Rwanda Biomedical Centre, rolled out a unified DHIS2 instance across more than 700 facilities, supported by investments in a HISP Rwanda technical team, a Health Informatics unit, and district-level data managers. These choices produced rapid gains in data completeness, timeliness, and consistency—gains that were accelerated during the COVID-19 pandemic, when DHIS2 became the backbone for case reporting, lab results, and vaccination tracking, and Rwanda was recognized by the WHO as one of Africa's strongest performers in vaccination and testing coverage.

Rwanda has also made substantial contributions to the regional and global DHIS2 ecosystems, developing tools related to geospatial data and malaria-risk forecasting, presenting new analytics modules internationally, and supporting neighboring countries in their own DHIS2 implementations. This evolution illustrates one of the core advantages of DPGs: the ability of countries to build on shared platforms, contribute improvements back to the ecosystem, and generate network effects that benefit both domestic users and global partners.

Mojaloop

Rwanda's payments landscape had long been constrained by siloed bilateral integrations, high off-net fees, and growing dominance by a major mobile-money operator. A 2018 national payments strategy called for an all-to-all Instant Payment System (IPS) to improve competition and inclusion; after considering various options, Mojaloop was adopted as the open-source platform for this strategy. Implementation was technically and politically complex, involving a range of local stakeholders including the National Bank of Rwanda (BNR), commercial banks, microfinance institutions (MFIs), savings and credit cooperatives (SACCOs), and mobile-money operators.

A key part of the complexity was the need to maintain and integrate a live payments system during migration, ensuring continuity while shifting traffic to new Mojaloop rails. This required building API adapters, running parallel systems, and coordinating phased onboarding of various stakeholders. The private sector—especially RSwitch, a majority state-owned but industry-supported scheme operator, and WiredIn, a local engineering firm—played central roles in this transition, demonstrating how open-source infrastructure can catalyze domestic capability and accelerate innovation. WiredIn, in particular, developed critical integration components, expanded its team, and has since begun exporting its Mojaloop expertise to other countries. Although full migration of payment flows remains underway and questions remain around long-term sustainability, Rwanda represents a rare example of a country reverse-engineering a

proprietary solution into an interoperable, publicly governed switch.

Current Status

Rwanda's DPG-enabled systems are operational, expanding, and increasingly central to the country's DPI ambitions. In health, DHIS2 is becoming more deeply integrated into the medical system and community health worker programs, contributing to a culture of data-driven governance and targeted interventions that are able to prioritize often-excluded regions in areas such as malaria prevention, and HIV and TB treatment.

In payments, the Mojaloop-based switch is live with most ecosystem players connected. Additional use cases—some merchant and bill payments, G2P transfers, and cross-border corridors—are being integrated. RSwitch has published scheme rules, and reconciliation, fraud monitoring, and settlement systems are running, though incentive alignment, long-term cost-recovery, and sustainability remain active challenges.

The goal of DPG-based DPI is to remove reliance on private vendors and proprietary solutions," replacing them instead with "local systems managed by local people.

— Sharon Umunyana, Director of Rwanda's Center for Digital Public Infrastructure (CDPI)

Case Study 3: Rwanda Key Elements

Policymaker Motivations	**Building a Knowledge-Based Economy** A long-running national strategy (Vision 2020, Vision 2050) to transform Rwanda into a knowledge-driven state, with digital modernization at the center of development. **Digital Sovereignty** Reducing dependence on foreign technology vendors and proprietary systems to maintain control over strategic digital infrastructure and national data. **Fostering Innovation and Entrepreneurship** Establishing Rwanda as a regional hub of innovation and cultivating a domestic digital economy. **Social Inclusion and Development** Improving service delivery, transparency, and evidence-based policymaking across health and other public services to advance financial inclusion and strengthen the social contract.
Implementations	**DHIS2 for Health** Adopted in 2012 as a unified national health information system across 700+ facilities, replacing fragmented paper-based reporting. Evolved into a central platform for routine health data, COVID-19 response, malaria early-warning systems, TB and HIV treatment and prevention, and climate-health analytics.

Case Study 3: Rwanda
Key Elements

Implementations

Mojaloop for Payments
Implemented as open-source foundation for national Instant Payment System to replace fragmented bilateral integrations and concentrated market power. Enables all-to-all interoperability for banks, mobile money operators, MFIs, and SACCOs.

Institutional Coordination
Establishment of Center for Digital Public Infrastructure (CDPI) within RISA to consolidate and coordinate DPI, bringing DHIS2 and Mojaloop components into a unified strategy.

Value and Impact Highlights

Strategic Autonomy
DPGs enabled Rwanda to own and govern core digital systems, avoiding vendor lock-in and maintaining sovereign control over national data and development path.

Health System Transformation
DHIS2 improved data completeness from 88% to 95% and timeliness from 60% to 90%+, enabling targeted interventions. Maternal mortality fell by over 50% (476 to 203 deaths per 100,000 live births, 2010-2019). During Covid, Rwanda achieved 77%+ full vaccination coverage using DHIS2-integrated digital certificates and national ID linkage, ranking among top African performers in testing and vaccination.

Innovation and Market Competition
Implementation of Mojaloop has eased market concentration and improved payments interoperability. It also increased the capacity and expanded customer base of local firms (especially WiredIn), demonstrating how DPGs can catalyze startup ecosystems.

Regional Leadership
Rwanda exports DHIS2 and Mojaloop expertise to neighboring countries, and contributes innovations back to the global DPG ecosystem. The country is recognized as a regional—and, increasingly, global—leader in the DPI space.

IV. Assessing Impact: Evidence and Gaps Across Four Dimensions of Value

IV. Assessing Impact: Evidence and Gaps Across Four Dimensions of Value

Returning to the DPG for DPI Value Framework developed in **Section II**, this section evaluates what we know—and do not yet know—about the impact of DPGs for DPI along four dimensions of value: economic, social, governance, and political. For each dimension, we draw on the three country cases to highlight both direct, measurable outcomes and more indirect ecosystem effects that may be harder to quantify but are often among the most strategically important forms of value.

Where possible, we point to concrete indicators (e.g., cost savings, time savings, new entrants, coverage rates). At the same time, we underline the limits of the current evidence base and identify areas where further research and more systematic measurement are needed. We use a mix of qualitative and quantitative research derived both from published studies and our own interviews with key stakeholders.

Economic Value

We define economic value broadly to include direct fiscal savings, efficiency gains, market development, and the ways in which DPG-based systems can reshape incentives and enable new forms of entrepreneurship and innovation.

Direct Fiscal and Efficiency Gains

Across all three countries, there is emerging evidence that DPG-based DPI can reduce costs and improve efficiency—though the time horizon and pattern of savings vary.

Payments Infrastructure in The Philippines

The custom-built system from Abli Payments Technologies, centered on a Mojaloop-based national payment switch, is projected to cost roughly US$10–11 million to build and maintain. This is around 95% lower than the US$200 million, 10-year contract signed by the incumbent national payments consortium for a proprietary Vocalink system. Abli's projected switching fees of 10 centavos (around one US cent) per transaction dramatically undercut incumbent prices, making digital payments viable for low-value transactions and low-income users.

Interoperability in Kyrgyzstan

By 2024, the X-Road–based Tunduk system was estimated to have saved the Kyrgyz state 1.2 billion soms (around US$13.7 million) in administrative costs. For citizens, the platform eliminated the need to travel physically and queue for paper certificates, saving an estimated 21 million hours and 1.7 billion soms (around US$19 million) in 2024 alone.

Instant Payments in Rwanda

Rwanda's Mojaloop-based instant payment system, launched in 2025, is too new for robust transaction-level impact data. However, interviews suggest a reduction in fees across key use cases. Under the old system, transaction charges were tiered in ways that often made smaller-value transfers relatively expensive, creating barriers for lower-income. For instance, fees for some transactions could reach as high as $1.50 for a $50 transfer. While current fees remain somewhat in flux, they are generally lower than under the old system. In addition, processing fees for person-to-merchant transactions are set to zero for the first six months, in order to onboard users to the new system. Interviewed stakeholders expect pricing reforms to continue and play a major role in making payments more accessible and inclusive.

Time-to-Implementation Savings

In addition to fee reductions, policymakers in Rwanda emphasized the time savings associated with building on Mojaloop rather than a proprietary platform. The head of Rwanda's Center for Digital Public Infrastructure estimated that using Mojaloop likely saved roughly two years of implementation time, due to the availability of a mature open-source codebase, established community, and reusable components. Based on this timeframe, and information provided by interviewees on likely engineering costs and requirements, we estimate that the cost savings for Rwanda of building on an existing code base were at least USD$1.08 million.

Health Information Systems in Rwanda

A detailed **cost–benefit analysis** of DHIS2-linked electronic immunization registries in Rwanda illustrates both the complexity and the long-term potential of DPG investments. In the early years of implementation, the full cost of rolling out the electronic tracker system was estimated at US$1.6 million, largely driven by one-time hardware expenditures and training costs. At that stage, analysts concluded that data management costs for immunization had increased by roughly 30%, imposing an additional annual financial burden of about US$128,735. However, most of these costs were associated with maintaining a dual paper-and-digital system. Scenario analysis performed in the study suggested that once the country transitioned to fully digital registries, immunization-related costs could fall by around 41%, with potential annual savings of up to US$170,204—a reduction of up to 58% in total immunization costs.

—

Taken together, these experiences point to an important lesson: DPG-based systems do not always generate immediate fiscal savings–though sometimes they do–especially in early implementation phases when countries are investing in infrastructure, training, and dual systems. Over time, however, and particularly as paper systems are retired and digital workflows are consolidated, the potential for significant cost reductions and efficiency gains becomes clearer.

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Market Development, Competition, and Entrepreneurship

Beyond direct, quantifiable cost savings, DPG-based DPI can reshape markets, lower entry barriers, and stimulate domestic innovation.

Philippines and Rwanda: Lowering Entry Barriers and Easing Market Concentration

By adopting Mojaloop, the Philippines' new payment switch offers a low-cost on-ramp for rural banks, microfinance institutions, and cooperatives that were previously excluded or disadvantaged by expensive bilateral connections and proprietary schemes. This reduces concentration in the payments market and creates space for new players to innovate on top of common rails.

A very similar dynamic was on display in Rwanda, where a major motivation for adopting Mojaloop was to reduce the quasi-monopolistic power of a dominant mobile-money operator. By shifting to an all-to-all interoperable system governed as a public utility, policymakers aimed to create a more level playing field for banks, smaller providers, and new entrants.

Rwanda: Catalyzing Innovation

At the same time, the implementation process has catalyzed a local innovation ecosystem. WiredIN, a local software services firm, is a good example (see box). It has developed deep Mojaloop expertise, expanded its team, and begun exporting integration services to neighboring countries, illustrating how DPGs can anchor domestic service industries rather than simply importing proprietary solutions. Several interviewees noted that Mojaloop's open, well-documented APIs made it significantly easier for new fintechs to prototype services and plug into the national switch, compared with the closed bilateral integrations that had previously prevailed. Over time, this combination of domestic technical capability and lower integration costs is likely to generate second-order effects, as local firms reuse the same skills and components in adjacent domains, from merchant services and credit scoring to cross-border remittances. The Mojaloop implementation is thus emerging as an anchor component of Rwanda's broader innovation ecology–alongside institutions like CMU-Africa, Norrsken, and the Kigali Innovation City–

aligning with the country's wider ambition to position itself as a regional hub for entrepreneurship and digital services.

Kyrgyzstan: Platform of Platforms and Open Banking

Tunduk's open APIs allowed commercial banks and other private providers to integrate government services directly into their apps—turning a government interoperability layer into a "platform of platforms". The National Bank subsequently used this infrastructure to mandate open API standards, deliberately promoting a more competitive domestic fintech ecosystem and enabling new business models around Government to Business (G2B) and Business to Government (B2G) services.

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These developments illustrate a recurring pattern across cases: DPGs can act as market-shaping instruments, not just technical tools. By reducing switching costs and standardizing interfaces, they enable new forms of competition, entrepreneurship, and innovation that would be difficult to achieve on closed, vendor-controlled stacks.

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WiredIn: A Young Rwandan Firm Steps In

One of the most striking parts of the Mojaloop story in Rwanda is the role of **WiredIn**, a Kigali-based software company founded by young engineers. WiredIn became the primary local implementation partner for Mojaloop. Its team helped customize core modules, integrate Mojaloop with RSwitch's existing systems and the central bank's settlement infrastructure, adapt the fraud-monitoring stack, and build onboarding flows and APIs for participating financial institutions.

The spillover effects were significant. Rwanda not only gained an interoperable payments system; it also cultivated a domestic engineering team fluent in modern payment architectures—microservices, container orchestration, high-throughput transaction processing—that had previously been the preserve of big global vendors. WiredIn has since expanded its engineering team, acquired new clients, and is working with the government of South Sudan (via the Bank of Sudan) to implement its own Mojaloop-based payments switch—all evidence of DPGs can build local capacity, help foster domestic innovation, and contribute to a nation's regional influence. As Alain Kajangwe, CEO of WiredIN, put it: "We grew with the project. The technology demanded that we become world-class."

Financial Inclusion and "Spillover" Economic Effects

In practice, economic and social values often overlap. Several of the most important economic effects of DPG-based DPI manifest through improved financial inclusion and shifts in how citizens and firms interact with the formal economy.

Philippines: First-Time Account Ownership

PhilSys, built on MOSIP, has enabled as many as 8.3 million residents to open a bank account for the first time, substantially advancing national financial-inclusion targets. This is both a social inclusion outcome and an economic one, as newly banked individuals gain access to savings, credit, and digital payment services.

Rwanda: Changing Deposit Behavior and Credit Access

Interviews in Rwanda highlighted an unanticipated but important spillover from Mojaloop: under the old system, many users immediately withdrew funds from bank accounts and moved them into the dominant mobile-wallet platform to avoid higher fees and frictions. With lower and more standardized fees on Mojaloop rails, more users are leaving funds in bank accounts, giving banks better visibility into transaction histories and increasing the pool of deposits. This, in turn, makes it easier for banks and Savings and Credit Cooperatives (SACCOs)6 to extend credit—especially to smaller, rural customers—and strengthen the capital base of local financial institutions.

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These types of indirect benefits—changes in savings, credit, and investment behavior—may be among the most significant long-term economic effects of DPG-based DPI. At the moment, they remain only partially documented: more systematic, longitudinal research is needed to capture them.

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Ecosystem-Level Economic Effects

Across countries, we see a set of cross-cutting economic ecosystem effects:

Domestic capacity building and exportable expertise (e.g., WiredIn's Mojaloop work; HISP Rwanda's DHIS2 skills).

Lower barriers to innovation via open APIs and standardized interfaces.

Reduced strategic dependence on single vendors, which alters bargaining power and procurement dynamics over time.

Social and economic inclusion, by expanding first-time account ownership, lowering transaction costs (disproportionately benefit low-income users), enabling rural access to digitized public services, and improving credit visibility and availability for small borrowers.

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These effects are diffuse and cumulative, but they shape the long-run economic trajectory of national digital ecosystems. They merit explicit attention in any future measurement framework—for example, through indicators on domestic service industries, number and size of local DPG implementers, and export of DPG-related services.

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Social Value

Social value refers to the ways DPGs can advance a country's broader development goals, including expanding access to essential services to improving health outcomes, strengthening social protection systems, and supporting progress toward the Sustainable Development Goals (SDGs). It encompasses the broader social capabilities that digital systems enable: equity, inclusion, resilience, and the ability of governments to reach historically underserved populations. Across our cases, these effects manifest in more reliable and equitable service provision, improved accessibility (particularly in rural and low-resource settings), and measurable gains in health and other social outcomes.

Service Delivery

DPG-based DPI has strengthened governments' ability to deliver social assistance reliably and equitably, improving targeting, reducing leakage, and enabling rapid response during crises.

Philippines: Targeting Social Assistance and Crisis Response

The OpenG2P pilot in the Department of Social Welfare and Development (DSWD) has been used to streamline the Assistance to Individuals in Crisis Situations (AICS) program, simplifying the delivery of cash grants and vouchers during emergencies. PhilSys

[6] Savings and Credit Cooperatives: member-owned financial cooperatives that provide savings accounts, small loans, and basic financial services, especially in rural or low-income areas.

serves as a foundational layer for improving social protection delivery more broadly; by March 2025, over 2.8 million beneficiaries of the flagship 4Ps cash transfer program had had their identities authenticated through PhilSys, reducing leakage and helping ensure that benefits reach intended recipients.

Kyrgyzstan: Crisis-time Social Protection

During the COVID-19 pandemic, Tunduk became an essential lifeline, enabling rapid issuance of electronic movement permits and targeting of social assistance and food support to vulnerable populations. What began as an administrative efficiency tool evolved into the backbone of emergency social protection delivery, demonstrating how DPG-based DPI can be repurposed in crisis situations.

Rwanda: Data-enabled health delivery at national scale

Since 2012, Rwanda's web-based R-HMIS, built on DHIS2, has collected routine data from more than 700 public health facilities nationwide, integrating routine, individual and disease-surveillance data. The DHIS2-based electronic immunization registry was rolled out to all 505 health centres delivering immunization services, providing individual-level vaccination data across the country. During COVID-19, this infrastructure enabled Rwanda to administer at least one vaccine dose to over 10.9 million people (81.3% of the population) and a complete primary series to 10.4 million (77.3%), placing it among only three countries in the WHO Africa region to surpass the 70% coverage target.

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Taken together, the evidence reveals that DPGs change how states deliver services, not just how efficiently they do so. Open, interoperable systems enable governments to authenticate beneficiaries, verify eligibility, and target interventions with a level of precision that was previously impossible—whether in social protection, crisis response, or public health. They also shift service delivery from reactive to proactive: frontline officials gain real-time visibility into gaps, rural populations become easier to reach, and national systems can flex rapidly during emergencies.

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Service Accessibility

DPG-based systems have expanded the reach of essential services, reducing geographic, administrative, and infrastructural barriers that disproportionately affect rural and underserved populations–in the process, contributing to greater inclusion and progress toward development.

Civil Registration and Local Capacity in The Philippines

The OpenCRVS pilot is designed to provide a free, standardized tool to around 1,600 local civil registry offices, with a particular focus on under-resourced local governments. By standardizing data formats and workflows, the system helps ensure that births and deaths are recorded consistently and uploaded to central registers, improving access to legal identity and associated services for even remote or rural areas.

Digital Document Wallets in Kyrgyzstan

The Tunduk mobile app functions as a legally valid digital document wallet, replacing physical IDs and licenses. By August 2024, the number of services available through the Tunduk portal had grown from about 60 to 165, allowing citizens to access a wide range of public services without navigating multiple agencies or credentials. Unified authentication through the national ESI system reduces friction and disproportionately benefits citizens who previously faced long travel times and bureaucratic complexity.

Granular targeting in Rwanda's Health System

DHIS2 in Rwanda supports highly disaggregated analysis by demographic group and geography, down to village or sector level. Combined with geospatial modules (e.g., proximity to water, marshland, elevation), this enables fine-grained malaria risk mapping and targeted preventive interventions in the most vulnerable areas. **Evidence** suggests that rural health facilities are more likely to be frequent users of the DHIS2 system than urban ones (60% vs. 40%), indicating that digital tools are not confined to better-resourced urban centers.

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Across these cases, DPG-based DPI reduces the structural barriers that traditionally limit access to public services—distance, paperwork, socioeconomic exclusion, and fragmented authentication systems. By standardizing interfaces and bringing services closer to users, these platforms help ensure that rural, low-income, and marginalized populations are not left behind. They also create the foundations for more equitable access across sectors, from civil registration to health to everyday administrative services.

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Health Outcomes in Rwanda

Rwanda's experience with DHIS2 illustrates how DPG-enabled systems can contribute to sustained improvements in health outcomes, a key SDG. Direct attribution is complex and multi-causal. However, it is notable that over roughly the period of DHIS2's deployment (beginning around 2012), Rwanda has **recorded**:

- An increase in life expectancy from 64.2 years (2010) to 67.5 years (2021).
- A decline in malaria incidence from 104.7 cases per 1,000 population (2010) to 53.6 (2023)—nearly a 50% reduction, supported by real-time surveillance and targeted interventions with DHIS2-enabled platforms.
- A fall in maternal mortality from 330.8 deaths per 100,000 live births (2012) to 229.5 (2023)—a decline of more than 30%.
- A reduction in tuberculosis incidence from 72 per 100,000 (2012) to 55 (2023), and in HIV incidence from 0.9 per 1,000 to 0.2 per 1,000 over the same period.

Rwanda is also one of a small number of African countries to have achieved the "95-95-95" HIV targets.[7] As noted above, during COVID-19, Rwanda reached around 77% full vaccination coverage by August 2022 and 81% with at least one dose, placing it among the top performers on the continent. Officials repeatedly emphasized the role of DHIS2's electronic immunization registry and its integration with national ID in enabling rapid rollout, targeted mobilization, and closure of coverage gaps.

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These improvements reflect the interaction of many factors—governance, financing, frontline capacity—but they underscore how a DPG-based health information system can act as both a technical and institutional backbone for sustained progress.

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Ecosystem-Level Social Effects

A number of broader, longitudinal effects cut across the above examples:

Greater Adaptive Capacity in Social Sectors

Unified, real-time data systems give governments the ability to identify emerging needs, target at-risk groups, and adjust programs more quickly—especially in health, social protection, and emergency response.

Long-Term Gains in Equity and Inclusion

By lowering barriers to access, reducing the burden of distance and bureaucracy, and ensuring that underserved populations are visible in administrative data, DPG-based DPI creates structural conditions for more equitable distribution of public services over the long run.

Normalization and Trust in Digital Public Services

As citizens come to rely on consistent, on-time service delivery, digital channels become the default rather than an exception. This normalizes digital engagement, reduces stigma for low-income users, and builds trust in state systems over time.

[7] 95% of people living with HIV know their status; 95% of those diagnosed are on treatment; 95% of those on treatment are virally suppressed.

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Once again, these broader ecosystem effects are difficult to measure with standard indicators, yet they shape how citizens experience the state and how inclusive digital transformation feels in practice.

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Governance Value

Governance value captures how DPG-based DPI strengthens the state's ability to coordinate across agencies, enforce rules transparently, and make decisions using timely, reliable data. Across the three countries, this dimension is where ecosystem effects are most visible. DPGs do not simply digitize existing processes: they reshape institutional relationships, shift incentives, and create new governance capacities that compound over time.

Anti-Corruption and Transparency

DPGs reduce discretion and standardize verification, shrinking the space for fraud, leakage, and informal payments. Unified identity layers, audit trails, and automated data exchange create structural checks on corruption that paper-based systems cannot match.

Combatting Fraud and Leakage in The Philippines

One of the original motivations for digitization in general and PhilSys in particular was to fight corruption: officials sought a robust identity and authentication to prevent individuals from using multiple identities to claim benefits fraudulently. By providing a unified, verifiable ID system, PhilSys aims to reduce opportunities for leakage and ghost beneficiaries across social programs.

Kyrgyzstan: Reducing Rent-Seeking

In Kyrgyzstan, an explicit anti-corruption agenda motivated the adoption of X-Road and creation of Tunduk. By standardizing data exchange and reducing discretionary paper-based processes, Tunduk limited opportunities for rent-seeking and informal payments that had become widespread in the pre-digital era.

Interoperability and Institutional Coherence

Interoperability is often the most transformative governance effect of DPG-based DPI, and a core part of data-driven decision-making. Shared data layers and common standards knit fragmented agencies into a coherent system, enabling coordination and collaboration.

Connecting Fragmented Systems in Kyrgyzstan

Tunduk connected 37 public agencies, replacing a patchwork of fragmented, incompatible, and often proprietary systems. This interoperability reduced duplication, lowered operational complexity, and laid the groundwork for a more coherent approach to digital governance.

Philippines: e-Governance Act

In the Philippines, the Department of Information and Communications Technology, motivated in part by the possibilities created by DPGs like MOSIP, spearheaded an e-Governance Act (signed in 2025) that mandates the creation of shared, interoperable systems. The Act provides a legal backbone for government-wide DPG integration and pushes agencies toward common standards, rather than siloed, vendor-specific solutions.

Rwanda: Unified Payments and DPI Coordination

The transition to a unified Mojaloop-based payments switch in Rwanda has strengthened regulatory oversight by giving the national bank and other authorities a consolidated view of retail payment flows. With all providers integrated into the same scheme, regulators can standardize tariffs, enforce scheme rules, and align fee structures with national inclusion goals. The payments infrastructure also underpins broader e-governance platforms such as Irembo, Rwanda's national digital services portal: by dealing with a single standardized payments interface, Irembo can focus on user experience and service expansion rather than maintaining multiple bilateral integrations.

Data-Driven Decisionmaking and State Capacity

DPGs also function as capacity-building infrastructure. By forcing the adoption of standardized data practices, they cultivate new skills, improve institutional memory, and embed evidence into routine decisionmaking.

Building In-House Capacity

In Kyrgyzstan, collaboration with Estonia's e-Governance Academy and hands-on work with the X-Road platform strengthened the technical capacity of government IT staff, reducing dependence on external vendors for system maintenance and upgrades.

Rwanda's Health Data Culture

DHIS2 has played a central role in institutionalizing data-driven decisionmaking in Rwanda's health sector. As one senior official put it, "whatever we're doing, it's based on evidence." DHIS2-based HMIS (often referred to as R-HMIS) now covers more than 700 health facilities. Evaluations have documented improvements in **completeness** of monthly reporting (from 88% to 95%) and **timeliness** (from around 60% to over 90% in key districts). More than **two-thirds** of district teams report using DHIS2 data during supervisory visits, and over **90%** have data monitoring improvement plans in place. During Covid, integration of DHIS2 with national ID reportedly cut registration times by up to 90% at some vaccination sites, embedding data tools directly into frontline workflows.

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These developments suggest that DPG-based systems can act as training grounds and scaffolding for building enduring state capacity—not only in IT departments, but also among planners, regulators, and frontline managers.

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Ecosystem-Level Governance Effects

Across countries, we observe governance ecosystem effects such as:

New legal and institutional arrangements (e.g., e-Governance Acts, DPI centers, data protection rules) that lock in interoperability, openness and overall regulatory coherence.

Strengthening of government skills and institutional capacity, as officials and agencies learn to maintain open platforms, manage APIs, and use real-time data in routine supervision, planning, and regulatory oversight.

Rising trust in the state and governance, as digital services become more transparent, efficient, and rules-based. Standardized processes and clean audit trails reduce arbitrariness in service delivery, strengthening institutional legitimacy over time.

Political Value

Political value captures the way DPGs affect sovereignty, strategic autonomy, geopolitical positioning, and soft power. Broadly, this form of value can be divided into two categories: an internal-facing focus on enhancing sovereignty and strategic autonomy, and a more outward-facing project of regional and international influence and power. Both categories emerged as central themes in interviews, often articulated more quietly than economic or social goals but no less strongly felt. For policymakers, this dimension is without question one of the most important values added by DPGs.

Technological Sovereignty and Strategic Autonomy

DPGs can strengthen countries' ability to control their core digital systems, reducing strategic dependence on proprietary vendors and giving governments greater autonomy over rules, data, and long-term digital trajectories.

Philippines: Avoiding Lock-In and Geopolitical Dependence

The decision to build PhilSys on MOSIP was explicitly framed as a way to avoid vendor lock-in and retain

long-term control over a foundational system expected to last for generations. DPGs were also seen as a way to maintain a degree of neutrality in a landscape where proprietary technologies are often aligned with competing geopolitical blocs.

Kyrgyzstan: Hybrid Sovereignty

Kyrgyzstan's choice of X-Road over a proprietary was driven by concerns over strategic dependence and security vulnerabilities. The Tunduk project illustrates a model of "hybrid sovereignty": the government maintains full control over the platform and its data, while external partners (such as Estonia's e-Governance Academy and multilateral donors) provide funding and technical support during early stages. Capacity-building efforts are structured explicitly to ensure long-term local self-sufficiency. As one DPG product developer put it, "sovereignty is the thing countries are paying for" when they acquire and implement that DPG.

Rwanda: DPGs as a Hedge Against Dependency

In Rwanda, interviewees underscored that sovereignty, control, and ownership were central motivations for choosing DPGs. Mojaloop, in particular, was chosen in part to avoid recreating a proprietary dependency in the payments layer, ensuring that the state can adapt rules, fees, and governance models without needing permission from a single vendor. As one interviewee put it, the goal was to build "local systems managed by local people."

Rwanda: Enhancing Local Capacity

Political value is also expressed through who builds, maintains, and steers digital systems. In Rwanda, Mojaloop implementation has built local development skills and seeded a startup ecosystem around payments and integration services (e.g., WiredIn: See box). In addition, as seen above, DHIS2 has required data training and awareness-building within health agencies, in the process fostering a broader capacity and skillset across government. These examples show how DPGs can advance goals such as local innovation and governance capacity–but they were also framed in distinctly political terms by interviewees, who see them as a way to strengthen national agency, reduce structural dependence on foreign providers, and root critical digital systems in local institutions and capabilities.

Regional and Global Influence

DPG-based DPI can also function as a source of soft power and international standing. For policymakers, this is an essential–if often implicit and un-stated–dimension of value.

Regional Influence and South—South Leadership

Rwanda's experience with DHIS2 and Mojaloop has made it a regional reference point for DPG-based systems. Rwandan practitioners have supported DHIS2 implementations and training in neighboring countries, and local firms such as WiredIn are now deploying Mojaloop integrations in South Sudan, exporting technical capability and institutional know-how across borders (and potentially leading to eventual regional integration of payment systems). These South–South exchanges strengthen Rwanda's profile as a DPG and DPI leader in the region.

Global Influence and Participation in International Networks

Rwanda's contributions to the global DHIS2 ecosystem (e.g., geospatial modules) have increased its visibility and credibility in international forums. Participation in global conferences and communities of practice allows Rwanda to learn from others while also shaping emerging standards and norms.

Ecosystem-Level Political Effects

Across countries, DPG-based DPI has broader political and geopolitical implications than may be evident in any single decision or implementation; these wider effects often represent some of the most significant forms of value for policymakers.

Maintaining Political and Technical Neutrality

By adopting open, non-proprietary systems, governments avoid alignment with any single geopolitical bloc or dominant technology vendor. This preserves room for maneuver and reduces the risk of structural dependence—concerns raised explicitly in several interviews.

Enabling South–South Cooperation and Regional Alignment

Shared DPGs create practical channels for cross-border collaboration, from DHIS2 training and technical support in neighboring countries to Rwanda's domestic firms exporting Mojaloop integration expertise to South Sudan. These exchanges reinforce political ties and build regional coalitions around open infrastructure.

Increasing Countries' Ability to Participate in (and Shape) Global Digital Conversations

Contributions to global DPG ecosystems give smaller states a voice in international technical communities. This visibility strengthens their influence in global standards-setting spaces and enhances credibility with donors and partners.

Conclusion

Conclusion

In this concluding section, we build on the findings above to draw out a set of cross-cutting lessons for both policymakers and researchers engaging with DPGs as part of broader DPI strategies. While the case studies highlight distinct political economies, institutional capacities, and technological pathways across three countries, they also reveal a series of recurring themes that shape the success or failure of implementation. Rather than offering a one-size-fits-all template, our aim is to surface these underlying patterns so that countries and policymakers can adapt them to their own contexts, constraints, and ambitions.

At the same time, the analysis underscores that the future of DPG-for-DPI is not simply a matter of better technology, but of strengthening the knowledge systems, evaluation practices, and institutional arrangements that underpin digital transformation. Many of the most important forms of value are indirect, long-term, or political and geopolitical in nature, and therefore require research approaches capable of capturing change across multiple dimensions. The central proposition animating this conclusion is therefore straightforward: evidence and policymaking must evolve in tandem. Durable, equitable, and sustainable digital infrastructure will only emerge when decisions are guided by rigorous, context-sensitive evidence.

Lessons and Best Practices for Policymakers

Recognize the Political and Geopolitical Value of DPGs

Across all three countries, policymakers emphasized national autonomy – i.e. ownership, agency, and authority – as central motivations for adopting DPGs for DPI. By instantiating a model of what the tech policy analyst and advisor Pablo Chavez terms "**hybrid sovereignty**"—a combination of domestic ownership and cross-border technology partnerships—DPGs allow states, especially smaller and developing ones, to articulate a distinct path through today's concentrated global technology landscape.

Implement Incrementally

DPG adoption is often successful when implemented through phased, low-risk migration, rather than big-bang transitions. Rwanda used adapters and parallel systems during the Mojaloop rollout; Kyrgyzstan onboarded agencies to Tunduk incrementally; and the Philippines, which experienced obstacles from moving rapidly to implement a MOSIP-based identity system, is now piloting and deploying DPGs through in a gradual, iterative way. DPGs work best when governments sequence reforms, protect existing services during transition, and allow institutions time to adapt.

Capacity-building is Key to Realizing the Benefits of DPGs

DPGs mitigate lock-in risks, but the degree of autonomy they enable depends on a country's ability to maintain and steer the evolution of those systems over time. This means sustained, dedicated investment in in-house technical capacity to maintain, adapt, and extend the open-source code.

Adopt a Pragmatic, Mixed-Model Implementation Strategy

Instead of attempting a risky overhaul of all existing IT systems, this approach entails weaving DPGs into the existing ecosystem where they provide immediate value and in ways that increase the likelihood of sustained adoption. The Philippines, for instance, is using DPGs for new "greenfield" systems, piloting them alongside legacy platforms, and deploying them to fill specific market gaps. This approach reduces risk while enabling governments to test DPG performance in real operational conditions.

Embed DPGs in Durable Institutional Mandates

Successful DPG for DPI implementations, like Tunduk in Kyrgyzstan, required translating high-level political priorities into durable institutional mandates, such as creating a dedicated State Enterprise with the

authority to enforce data-sharing and adoption across reluctant agencies.

Align Incentives and Build for Interoperability to Make DPGs Work

DPGs succeed when rules and incentives encourage all actors to connect and collaborate. In Rwanda, Mojaloop worked beca+use the national bank set clear requirements, reduced the cost of joining the system, and engaged closely with banks, MFIs, and mobile-money providers to build trust and buy-in.

Use Crisis Moments

In all three countries, the COVID-19 pandemic acted as an accelerator, validating DPG investments and creating the political momentum needed to pivot to more resilient, open infrastructure.

Implications and Priorities for Researchers

Value is Multidimensional, Longitudinal, and Difficult to Quantify

DPGs generate economic, social, political, and governance value—often in ways that unfold over years. Researchers must therefore account not only for measurable outcomes but also for institutional, perceptual, and long-term ecosystem-level effects.

Policymaker Motivations Provide Critical Insight Into Impact

Too often, policy research preaches to those directly involved in implementing on the ground. By asking policymakers what they hoped to achieve, rather than relying solely on predefined categories, this report highlights the values that actually animate DPG adoption. Understanding these motivations is essential for designing research that reflects real-world priorities.

More Rigorous Empirical Studies are Needed as Systems Mature

As implementations evolve, opportunities will grow for randomized-controlled trials, quasi-experimental evaluations, and more robust causal inference. Such studies can help quantify the specific contributions of DPGs to service delivery, efficiency, or economic outcomes.

Qualitative Inquiry Remains Essential

At the same time, case studies, interviews, and other qualitative methods capture user experiences, institutional dynamics, and political factors that are often invisible to quantitative metrics. These insights, too, are indispensable for explaining why implementations succeed or fail.

A Call for Future Work

DPGs and DPI are still early in their global trajectory. The empirical base—both to document impact and to show what works in implementation—is strengthening, but much work remains to be done in order to truly create the foundations for evidence-based policymaking.

We end by observing that the field would benefit from sustained investment in data collection, empirical evaluation, and comparative research. We therefore call on philanthropic organizations, research institutions, and development partners to fund surveys, RCTs, quasi-experiments, and mixed-methods studies that can more precisely measure the multidimensional value of DPGs. The analytical framework presented here is only a starting point. It will grow more robust as more evidence accumulates, more countries implement DPI systems, and more researchers engage with this rapidly evolving field.

The strategic value of building this evidence base lies in the broader potential of DPGs. As the case studies in this report illustrate, DPGs, when embedded within coherent DPI strategies, offer countries a rare opportunity to shape their digital futures on their own terms—reducing dependence on external actors, building systems that reflect local priorities and values, and contributing to the SDGs. At a moment when digital power is consolidating globally, DPGs for DPI therefore represent one of the most promising pathways for expanding agency, inclusion, and innovation—especially for countries that have historically been marginalized in the global technology landscape. This potential is what makes rigorous evidence so essential: understanding what works, for whom, and under what conditions is key to realizing the full promise of this emerging model of societal transformation.

Appendix: Country Case Studies

Appendix: Country Case Studies

A Country Betting on Digital Change: Rwanda's Path to Development and Innovation Using DHIS2 and Mojaloop

Introduction

In the mid-1990s, Rwanda faced an almost unimaginable task: rebuild a shattered nation from the ruins of one of the late 20th century's most devastating genocides. As the country stabilized, its leaders began to look outward—to a world rapidly being reshaped by digital technologies—and inward, to the constraints of a small, landlocked economy with few natural resources. The solution they arrived at was both ambitious and pragmatic: Rwanda would transform itself into a knowledge-driven state, powered by data and connectivity, anchored in a commitment to good governance, institutional coherence, and long-term planning.

The country's Vision 2020 document—later retitled Vision 2050--put digital modernization at the center of the country's development strategy. In the words of **Vision 2050**, launched in 2015: "To become a developed economy, Rwanda will focus on building a knowledge-intensive economy; one in which the production, distribution and use of knowledge are the main drivers of growth, wealth-creation, and employment for all industries."

Over the next two decades, this vision expressed itself in a series of initiatives and institutional choices:

- A nationwide **3,000**-km fiber backbone and 4G LTE network rollout that reached all 30 districts;
- Successive National ICT (NICI) Plans and the SMART Rwanda Master Plan, which introduced a whole-of-government framework for digitizing public services and integrating data systems;
- The creation of the Rwanda Information Society Authority (RISA), tasked with coordinating and implementing ICT policy, consolidating fragmented digital projects, and ensuring interoperability and standards across government;
- The launch of Irembo, Rwanda's national e-services platform, which now offers over 150 public services from birth certificates to business registrations;
- And the early adoption of DHIS2 as the backbone of the country's health information system, replacing siloed and paper-heavy reporting with a unified national platform.

These early steps were not conceived as a unified framework—certainly not as Digital Public Infrastructure (DPI) in the modern sense. But they shared a consistent logic: build public digital foundations, ensure good governance and clear accountability, and reduce dependence on foreign vendors. That logic would come to define Rwanda's approach to digital transformation.

By the late 2010s, three broader dynamics converged to push Rwanda toward a more coherent DPI strategy, and toward deeper engagement with digital public goods.

A Desire to Foster Local Innovation and Entrepreneurship

Rwanda increasingly saw itself not only as a consumer of technology but as an emerging hub for regional innovation. Institutions like Carnegie Mellon University–Africa, Kigali Innovation City, the tech incubator Norrsken, and a growing constellation of Rwandan software firms signaled that the country wanted to cultivate its own digital economy. Officials began speaking of Rwanda as an "**innovation hub**" and "**a leader in pioneering** technology and innovation on the continent."

A Growing Emphasis on Digital Sovereignty

Rwandan officials repeatedly expressed concern about becoming dependent on foreign technology providers—particularly in strategic domains like payments and health information. In interviews and policy documents, they pointed to earlier experiences with proprietary systems: high license fees, slow change cycles, and change requests that had to be routed through overseas vendors.

In this context, DPGs were particularly appealing. Several officials emphasized that the value of DPGs lay not just in cost savings or flexibility, but in their alignment with Rwanda's goal of owning and governing its core digital systems. As Sharon Umunyana, Director of Rwanda's Center for Digital Public Infrastructure (CDPI), summarized it: the goal is to "remove reliance on private vendors and proprietary solutions," replacing them instead with "local systems managed by local people."

COVID-19 as a Turning Point

The pandemic became a moment of reckoning—and validation. DHIS2, already widely adopted as Rwanda's national health management information system, suddenly became the nerve center of the national response—one of the most successful in Africa. Existing dashboards were repurposed overnight; new ones were built in days. District-level outbreak reports became actionable within hours rather than weeks.

"DHIS2 was critical," in the fight against COVID, said Noella Bigirimana, Deputy Director General of the Rwanda Biomedical Centre. "We leveraged it for contact-tracing, diagnosis and keeping track of vaccination and treatment."

By August 2022, Rwanda had fully vaccinated around **77%** of its population (10.4 million) against COVID-19 and given at least one dose to over **81%** (10.9 million) placing it among the top performers in the WHO Africa region. DHIS2's electronic immunization registry and its integration with the national ID system were often cited as key factors. In addition, Rwanda's data-driven approach to **testing** was also lauded, with DHIS2--and other tools--enabling it to target nearly half its population and conduct more than 5.8 million tests during the pandemic (or around 6207 daily).

COVID thus demonstrated that investments in data governance and public digital systems were not technocratic indulgences—they were instruments of resilience.

The DPI Center

In February 2025, these threads came together in the establishment of a Center for Digital Public Infrastructure (CDPI), located within Rwanda Information Society Authority (RISA). Announced at the Inclusive Fintech Forum in Kigali, the Center was conceived as a coordinating hub: consolidating earlier digital reforms, reducing fragmentation, and ensuring that Rwanda's digital systems—across health, payments, education, and service delivery—rested on coherent public foundations.

At the launch, RISA CEO Innocent Bagamba Muhizi **stated**: "Digital infrastructure is the backbone of digital economies; it unlocks opportunities for financial inclusion, enables seamless digital identity systems, and powers secure and efficient payment infrastructures. With this Center, we aim to create scalable and people-centric solutions that will benefit Rwanda, Africa, and the global community."

DPGs have been central to Rwanda's DPI strategy, offering the prospects of greater customization, enhanced local control and sovereignty, and a chance to build up domestic technical capacity. With all these goals in mind, Rwanda has deployed three DPGs:

- **DHIS2**, for health information
- **Mojaloop,** for interoperable payments through a unified switch
- **GovStack** digital services modules, especially CMS (minimal implementation)

This case study focuses on the first two: DHIS2 and Mojaloop.

Implementation

DHIS2 — Rwanda's Long Digital Health Journey

Early Adoption and Ambition

Rwanda began adopting DHIS2 in 2012 (following a pilot in 2011), motivated by frustrations familiar across low- and middle-income countries: fragmented vertical reporting systems, inconsistent data quality, and slow decision cycles. Routine data on HIV, TB, malaria, maternal and child health, and other programs were scattered across paper registers and parallel databases. The Ministry of Health, supported by the Rwanda Biomedical Centre (RBC), saw DHIS2 as a way to harmonize and streamline health reporting and ensure data quality across the health system.

The decision was made to implement one national DHIS2 instance, with a single data dictionary and standardized reporting workflows. By around 2012, the DHIS2-based Rwanda HMIS (often referred to as R-HMIS) was rolled out nationwide, covering more than 700 public health facilities. Evaluations in the years that followed showed substantial gains: completeness of monthly reports **rose** from 88% to 95%, and **timeliness** improved from around 60% in the paper era to over 90% in key districts.

Embedding DHIS2 within existing systems and workflows demanded painstaking work harmonizing indicators, breaking down silos, and training thousands of health workers. But the ambition was clear from the start: to build what Dr. Semakula Muhammed, Permanent Secretary at Rwanda's Ministry of Health, called "the central system for the health care sector" in Rwanda.

To support this, Rwanda invested not just in software, but in people and institutions. A local HISP Rwanda team was set up to configure and maintain DHIS2. At district and facility levels, biostatisticians and data managers were appointed, forming a pyramid where each level supported the one below.

Building a Culture of Data Use

Perhaps the most significant shift was not technical but cultural. Rwanda deliberately embedded DHIS2 into routine governance. District health teams reviewed DHIS2 dashboards regularly; performance against key indicators was discussed in supervision meetings; and health data figured in performance contracts for district officials.

Data moved from being a reporting burden to being a managerial tool, and DHIS2 was at the heart of that shift to evidence-driven policymaking. As Dr. Muhammed put it: "Whatever we're doing, it's based on evidence. Every decision we are taking in the health sector—that's the contribution of DHIS2."

This culture allowed Rwanda to tackle chronic gaps. When DHIS2 data showed lagging antenatal care visits or pockets of low facility-based deliveries, the ministry could quickly deploy targeted outreach or staff reinforcements. Over time, disparities between districts narrowed, and national indicators—such as maternal mortality or immunization coverage—improved significantly, even on relatively modest health budgets.

One emblematic example of this culture in practice was the way DHIS2-based data began to shape frontline action. Nearly all health centers developed mechanisms to identify children who had missed vaccines, and digital data from DHIS2/e-Tracker made it far easier to generate accurate defaulter lists. District supervisors reported using these lists to plan targeted outreach and guide supportive supervision, closing gaps that previously went unnoticed. **One study** found that more than two-thirds of district teams said they relied on DHIS2-derived data during supervisory visits, and 92% had a data monitoring improvement plan in place—evidence that data had become embedded not just in reporting, but in the everyday management of immunization services.

COVID-19: DHIS2 Comes of Age

When COVID-19 hit in 2020, DHIS2 became Rwanda's national control panel. Rather than procuring a new proprietary system, Rwanda chose to extend its existing infrastructure. New DHIS2 modules were configured for case reporting, lab results, quarantine monitoring, and—most crucially—vaccination tracking and digital certificates.

One of the most striking innovations was the integration between DHIS2 and Rwanda's national ID system (NIDA). Health workers at vaccination sites could enter a citizen's national ID number, and the system automatically pulled in demographic details, in some cases (notably during Covid) cutting registration time by an estimated **90%**. Errors from misspelled names or incorrect dates of birth dropped sharply. Each vaccination record was linked to a secure digital certificate with a QR code, accessible online or via SMS, enabling citizens to retrieve and verify their vaccination status easily.

By mid-2022, Rwanda was among the best performing countries in the WHO Africa Region when it came to both testing and vaccination—and data was central to this effort. Rwanda conducted over **5.5 million** COVID-19 tests by June 2022, one of the highest per-capita testing rates in sub-Saharan Africa.

As the WHO noted in its 2023 **case study**, "Rwanda is an excellent example of a government leveraging its pre-pandemic investment in digital health systems to respond quickly and at scale." This ability to adapt existing infrastructure—rather than scramble to procure new tools—was central to Rwanda's reputation as one of the continent's most effective COVID-19 responders.

Innovation on Top of DHIS2

Rwanda's approach to DHIS2 has not been simply to use the software, but to extend it. In the process, it has leveraged one of the key strengths and potentials of open-source, modular DPG solutions.

One prominent example is a **malaria early-warning module** developed on top of the open-source platform. By combining climate data—rainfall, temperature and wetlands information—with routine DHIS2 malaria case records, developers created predictive risk models that anticipate outbreaks several weeks in advance. These risk indicators are fed directly into DHIS2 dashboards, giving district teams advance warning to plan bed-net distribution, indoor residual spraying and community mobilization. Early project reports highlight improved preparedness and more timely responses in pilot districts.

These collaborations were also global, and Rwanda increasingly became an active participant in a wider DHIS2 innovation ecosystem. In addition to its malaria and climate-health work, Rwanda developed two climate-risk and geospatial models that integrated into DHIS2 are now used internationally. Rwandan developers and MOH staff presented these tools at a DHIS2 Annual Conference in Oslo and participated in global working groups on analytics and interoperability. These exchanges strengthened Rwanda's technical capacity while shaping shared public-goods components used far beyond its borders. In turn, Rwanda emerged not just as an implementer of DHIS2, but as a recognized co-developer within the global DPG community.

Finally, Rwanda has also become a regional exporter of DHIS2 expertise. HISP Rwanda and RBC have contributed tools, training and troubleshooting support to neighboring countries through the HISP Africa network. Rwanda's COVID vaccination configuration—particularly its ID integration and SMS reminder workflows—has been showcased in international webinars as a model for other countries.

Together, these innovations mark Rwanda not just as a user of DHIS2, but as a contributor to its global ecosystem.

Mojaloop — Rewiring a National Payments System

If DHIS2 is a story of long-term institutional investment, Mojaloop is a story of decisive reform in a fast-moving market.

The Problem: A Concentrated and Siloed Payments Landscape

Through the 2010s, Rwanda's digital payments ecosystem was constrained by a familiar pattern: mobile money dominated by a near-monopoly provider, limited interoperability, and high fees. Mobile money was widespread—millions of Rwandans held wallets—but they largely lived inside walled gardens. A user on one mobile network could not easily send money to users on another, or directly to a bank; MFIs

and SACCOS[8] were often disconnected entirely. Where interoperability existed, it was usually through bilateral integrations: one-off connections between banks and mobile operators. These links were expensive to build, complex to maintain, and their fees were often passed on to users. Each integration came with its own fees and technical difficulties, and the costs were passed on to users. One RSwitch official noted in an interview that a simple transfer of around US$50 could incur fees close to roughly US$1.50. This undermined one of the key potential benefits of mobile money, which was to facilitate internal remittances, especially for urban wage laborers to send money to families in rural areas.

Meanwhile, network effects were growing. One leading mobile-money operator had negotiated many bilateral integrations with banks and other platforms, placing it in a de-facto central role in the market. Regulators at the National Bank of Rwanda (BNR) expressed concern that fragmented bilateral links were creating market concentration risks and could distort competition—one of the motivations behind the push for a new instant-payments switch. Senior officials had long warned that such dominance could slow progress toward the "**cash-lite**" economy envisioned in Rwanda's financial-sector agenda. In addition, there were concerns that this type of market concentration would undermine financial inclusion, another key motivation for the new unified payments switch.

The Decision to Build a National Switch

In 2018, BNR adopted the Rwanda National Payment System Framework, which explicitly called for an all-to-all interoperable retail payments system that would replace costly bilateral links with a shared national switch. This directive became the foundation for Rwanda's National Digital Payment System (RNDPS), designed to eliminate fragmentation, reduce transaction costs, and accelerate financial inclusion. Initial implementation of the instant payment system (branded eKash) relied on a proprietary technology stack. But as Rwanda looked ahead, policymakers concluded that relying on a single vendor would re-create the very dependency they wanted to avoid. When the opportunity arose to upgrade to Mojaloop, an open-source DPG, it aligned neatly with Rwanda's sovereignty and innovation goals.

Several considerations made Mojaloop attractive:

- It avoided vendor lock-in and recurring license fees.
- It offered open APIs and a growing global community of implementers.
- It allowed Rwanda to "jump ahead" technologically by reusing proven building blocks.
- It promised lower long-term integration costs for banks, MFIs, and fintechs.

Sharon Umunyana, Director of Rwanda's Center for DPI (CDPI), who played a key role in the transition to Mojaloop, summed up the value proposition this way: "By building on Mojaloop we basically skipped ahead by two years." A rough estimate derived from this timeline suggests savings of at least $1.08 million (based on a 15-person team working over 24 months).

Implementation: The Hard Work of Onboarding a Nation

Rolling out a national switch was as much a social, political, and organizational challenge as a technical one. Rwanda faced two simultaneous problems. First, how to integrate a new real-time payments architecture into a live financial ecosystem without breaking existing flows. Second, how to persuade dozens of institutions—banks, mobile money operators, MFIs, SACCOs, and fintechs—to adopt it.

On the technical side, Rwanda adopted a phased migration strategy, in which both systems—the old bilateral arrangements and a centralized Mojaloop-based switch--ran side by side. In addition, use cases were introduced gradually, beginning with P2P and later following with P2B transfers. Instead of a big-bang cutover, there has therefore been a transition period with the old and new systems existing side by side as Mojaloop demonstrated reliability and settlement accuracy.

This approach was only feasible because of local technical capacity. RSwitch's engineers, together with the Kigali-based software firm WiredIn, implemented

[8] Savings and Credit Cooperatives: member-owned financial cooperatives that provide savings accounts, small loans, and basic financial services, especially in rural or low-income areas.

the Mojaloop microservice architecture using containerized services, event-driven messaging, scheme rules engines, merchant-payment modules, and integration with BNR's real-time settlement platform. Alain Kajangwe, CEO of WiredIN, described the need to create "an adapter or a connector" between existing arrangements and the new system as one of the major tasks faced by his team.

On the institutional side, Rwanda appointed RSwitch—newly repositioned as a majority state-owned but bank-supported entity—to serve as scheme manager and implementer. That structure helped reassure participants that the system would be run as a neutral, quasi-public utility rather than as a competitor.

The harder task was onboarding. Every institution had to connect, test APIs, align settlement rules, upgrade internal systems, and update customer-facing channels. The process of transitioning was a whole-of-society and whole-of-economy effort. As Jean Jacques Kajuga, COO of RSwitch, recalled:

This is a product that has to be sold. Someone needs to speak to banks, guide them through integration. The go-to-market strategy also involves consumers. There was awareness raising and education for the consumer. There were mass retail advertising campaigns: SMS campaigns, events to get people together.

He added that the broader citizen-mobilization effort was integrated into Rwanda's Car Free Day, a nationwide initiative held twice a month when major roads are closed to vehicles and citizens gather for sports, wellness activities, and community engagement. With large groups already assembled in public spaces, Car Free Day created an opportunity for the payments team to reach local communities directly. "There was a mass campaign, and there's more to come," Kajuga said.

Political will and regulatory clarity were also essential, as was aligning incentives. Large incumbents—especially dominant mobile-money operators—expressed concerns about how interoperability might affect existing revenue models, and smaller MFIs and SACCOs flagged integration costs and technical capacity as barriers. The National Bank of Rwanda (BNR) and RSwitch marshalled a mix of regulatory signals, technical workshops, sandbox testing and capacity-building to bring institutions onboard. Participation in the national switch was encouraged through the licensing framework and supported by low or subsidized integration fees.

The strategy broadly worked—though challenges remain. Over time, mobile-money operators joined first, followed by banks, MFIs, SACCOs and early fintechs. By late 2022—roughly eight months after go-live—eKash had processed about **1.1 million instant transfers** worth RWF 6.4 billion (≈US $5.7 million), with an average transaction size of just US $4–5, indicating use for everyday person-to-person transfers rather than only high-value payments. By 2023, virtually all major banks had connected, enabling wallet-to-bank and bank-to-wallet transfers, and roughly 20% of eligible mobile-money P2P transactions were flowing through the IPS.

Full migration of all flows to Mojaloop is still underway. Mobile network operators continue to route some transactions through older channels, partly to maintain business continuity during the transition. Several high-volume use cases—merchant payments, government-to-person transfers, bulk payments, and utility bill payments—are still being integrated, and stakeholders expect volumes to rise sharply once these come online, improving the long-term financial sustainability of the switch.

Challenges remain—particularly around cost-recovery, pricing, and aligning ecosystem incentives. The long-term sustainability of the integrated switch also remains to be ascertained. Nonetheless, the core infrastructure is in place, functional, and evolving. Rwanda has built an integrated instant-payments system, backed by a broad coalition committed to its success. Perhaps most remarkably, it has succeeded in reverse-engineering a private, siloed landscape into an interoperable, publicly governed payments backbone.

Results and Reflections

Rwanda's experience with DHIS2 and Mojaloop demonstrates how DPGs can reinforce a broader national strategy that predates the current global conversation about DPI. DHIS2 delivered visible gains in data quality, reporting timeliness, and evidence-based decisionmaking beginning in 2012, helping Rwanda improve key health indicators even on constrained budgets. Mojaloop, though newer and still scaling, has already begun dismantling a fragmented, high-cost payments landscape by offering a neutral, interoperable switch that lowers integration barriers for banks, MFIs, SACCOs, and mobile-money providers.

Together, the two systems illustrate what DPGs can do when aligned with strong political commitment, coherent institutions, and a national vision organized around data-driven development.

A key lesson is the importance of local capacity—both technical and managerial—as a precondition for realizing the gains DPGs promise. Rwanda's DHIS2 journey benefitted from early investments in HISP Rwanda, a health intelligence unit at RBC, and district-level data officers who embedded digital data into daily routines. That capacity allowed the country not only to configure and maintain DHIS2 but also to extend it: building predictive malaria and climate-health tools, piloting geospatial dashboards, and contributing modules back to the global DHIS2 ecosystem. Mojaloop likewise depended on domestic capability. Firms like WiredIn created adapters and connectors to integrate legacy systems, while RSwitch engineers configured a containerized, microservices-based architecture. These examples show that DPGs are not turnkey solutions; they are catalysts whose value emerges only when local institutions have the skills and discretion to adapt, govern, and extend them.

The Rwanda case also underscores that DPG reform is as much political, social and organizational as it is technical. DHIS2 succeeded because it was embedded in a culture of performance management—weekly dashboard reviews, quarterly supervision cycles, and high-level accountability structures. Mojaloop advanced because policymakers aligned incentives across a complex payments ecosystem: combining regulatory pressure, subsidized integration fees, consumer-awareness campaigns, and whole-of-government coordination through RSwitch and the National Bank of Rwanda. Even community structures like Umuganda were mobilized as part of the onboarding strategy. These approaches reflect a central insight: interoperability is not only a technical outcome but a political project requiring trust, incentive alignment, and sustained institutional effort.

Finally, Rwanda's trajectory highlights both the promise and the unresolved questions of DPG-based DPI. The health sector offers strong evidence of tangible improvements and growing national ownership, and Rwanda has become a recognized contributor to the global DHIS2 community. Mojaloop has laid the foundation for a more inclusive and competitive payments ecosystem, but long-term sustainability—pricing, volume growth, scheme governance, and shift from legacy channels—remains a work in progress. The broader significance of Rwanda's story lies in its strategic choice: to build public digital systems that reduce dependency, strengthen domestic capability, and unlock local innovation. Its experience suggests that when DPGs are embedded within coherent institutions and aligned with national development goals, they can become powerful instruments for sovereignty, resilience, and long-term digital transformation.

WiredIn: A Young Rwandan Firm Steps In

One of the most striking parts of the Mojaloop story in Rwanda is the role of **WiredIn**, a Kigali-based software company founded by young engineers. WiredIn became the primary local implementation partner for Mojaloop. Its team helped customize core modules, integrate Mojaloop with RSwitch's existing systems and the central bank's settlement infrastructure, adapt the fraud-monitoring stack, and build onboarding flows and APIs for participating financial institutions.

The spillover effects were significant. Rwanda not only gained an interoperable payments system; it also cultivated a domestic engineering team fluent in modern payment architectures—microservices, container orchestration, high-throughput transaction processing—that had previously been the preserve of big global vendors. WiredIn has since expanded its engineering team, acquired new clients, and is working with the government of South Sudan (via the Bank of Sudan) to implement its own Mojaloop-based payments switch—all evidence of DPGs can build local capacity, help foster domestic innovation, and contribute to a nation's regional influence. As Alain Kajangwe, CEO of WiredIN, put it: "We grew with the project. The technology demanded that we become world-class."

Appendix: Country Case Studies

From Paywalls to Public Goods: How the Philippines is using DPGs to Reclaim Technological Autonomy

Introduction

It may be forgotten now, but before M-Pesa in Kenya, the Philippines was a pioneer in digital payments. In 2000, the country launched Smart Money, the world's first electronic cash card linked to a mobile phone. By the 2010s growth of the digital payments ecosystem had stalled, however. A USAID project helped to strengthen interoperability among different payments systems, but the underlying technology of the main national instant payments network, run by a consortium of banks atop the ATM switch, was obsolete and ill-suited for expansion.

In 2017, the consortium signed a reported 10-year, $200 million deal with **Vocalink**, a proprietary system later acquired by Mastercard. Though improving financial inclusion was a driving ambition, per-transaction fees as high as 3 pesos made it unusable for rural banks, small financial institutions, and low-value micropayments. Vocalink's infrastructure lacked the flexibility to add crucial use cases like merchant payments (P2M) or debit pulls, and its monolithic architecture made upgrades nearly impossible. Mastercard, as the owner, also had a direct conflict of interest: enabling low-cost, account-to-account instant payments would directly threaten its lucrative card business.

"We got a deal that appears to be disadvantageous to the sector," said Vicente Catudio, an expert who had worked on digital payments in the Philippines with USAID and other organizations since the 2000s. "Vocalink was too expensive and it wasn't supporting most of the payment use cases in our country."
The Bangko Sentral ng Pilipinas, the central bank, recognized the problem but was unable to compel the consortium to break with Vocalink. Rather than create a direct, government-owned rival, as the Brazilian central bank had done with its Pix system, the bank issued a draft regulation – a preceding step toward the issuance of an official regulation – authorizing a multiple clearing switch operator setup, opening the door to private-sector competitors.

One of those competitors was a venture-backed startup called Abli Payments Technologies co-founded by Catudio. The firm built a payments switch using Mojaloop, a digital public good. "Mojaloop was the perfect solution," Catudio recalled. "We didn't have to build a new switch from scratch, or get a license from anyone, and it was up to the standards that the Central Bank had authorized."

The Abli team took Mojaloop and atop it began adding services, features, and an applications marketplace for third-party developers. To bolster security, they added Tazama, an anti-fraud DPG. They spoke with the rural bank and community bank associations to understand which applications they would want included. Each transaction would cost at the most 50 centavos – about one US penny. The creators estimated the total cost of building and maintaining the system to be $10-$11 million, 95 percent less than the Vocalink contract.

Abli launched in 2025, targeting rural banks, thrift banks, microfinance institutions, and cooperatives. The immediate goal was to address the market failure; the larger ambition was to become a cornerstone of digital public infrastructure in the Philippines, enabling instant, virtually-free transactions across society, whether for merchants, banks, government, or people.

The story of Abli was emblematic of the Philippines' journey toward building national Digital Public Infrastructure (DPI). It was fundamentally a story about technological sovereignty, characterized not by the top-down, idealistic pursuit of a coherent DPI strategy, but rather a pragmatic, bottom-up reaction to a long and painful history with proprietary technology vendors. Across critical government functions, from civil registration to national payments, the government found itself locked into exorbitant and inflexible contracts that stifled innovation, drained public funds, and ceded strategic control to external corporations.

In the Philippines, we have been reliant on vendors and suppliers. They own the technology and we simply subscribe to it. So in the event that there are unfavorable changes we feel helpless and just have to absorb the additional costs

– Johannes Paulus Acuña

To address this problem, in the late 2010s and early 2020s, different agencies began testing and deploying interoperable, open digital public goods for core national infrastructure. The rapid adoption of the digital identity platform PhilSys, built atop MOSIP, was followed by pilots for civil registration (OpenCRVS), social protection systems (OpenG2P and OpenSPP), and instant payments (Mojaloop).

Implementation

The Foundation: PhilSys

The foundational move began with the Philippine Identification System (PhilSys). In 2018, a working group from the National Economic and Development Authority and other agencies, with assistance from the World Bank, traveled to India to study Aadhar, its national digital ID system. Impressed, the group returned home and helped draft legislation that mandated an aggressive timeline for the Philippines to adopt its own system. The group recommended the Modular Open-Source Identity Platform (MOSIP), which was modeled after Aadhar and would afford the government control over the source code.

To mitigate the risk of being dependent on a single vendor, the government decoupled the procurement for implementing MOSIP into four separate contracts: registration kits, a biometric deduplication system, card printing, and a systems integrator (SI). Since MOSIP was new and few firms were familiar with it, only one bidder emerged for the crucial SI contract.

The Philippines Statistics Authority (PSA) was responsible for implementing the system and registering the Filipino population of 116 million – no simple task, given the country was a large archipelago. The PSA had MOSIP installed on a sandbox, when the COVID-19 pandemic hit. The government declared a "State of Calamity", leading to nationwide quarantines. At the same time, the government accelerated the roll-out of digital ID, with the goal of using it to deliver social protection payments to those whose livelihoods were threatened.

Armed with 5,000 registration kits, teams of five deployed around the country to register citizens. The government exempted the teams from quarantine restrictions, enabling them to set up registration centers in public gathering places like malls, town halls, and airports. After that, the teams went house-to-house. MOSIP had an offline registration feature that enabled the teams to sign people up in areas that lacked internet connectivity. "We had to cross rivers, lakes, and seas to get to people," recalled Mendoza. "We even set up registration kits in motorized tricycles – so literally mobile registration centers."

In one year, the PSA registered 50 million Filipinos. It registered an additional 22 million the next year. This rapid pace generated a bottleneck. The post office, which printed the physical ID cards, could not keep up with the number of registrations, so people had to wait months or even years to receive the ID card they were promised, producing negative publicity and public frustration. The flexibility of the DPG provided a crucial, if partial, solution: the government was able to create and issue an "e-Phil PDF" as a temporary digital credential, an enhancement built on top of the open MOSIP platform.

By 2025, the PSA had registered 92 million people, nearly the entire population eligible for a national ID. The task now was to integrate the system with government and private sector services. The Department of Information and Communications Technology (DICT) stepped in to play a larger, synthesizing role. It partnered with the PSA to manage the national authentication APIs for PhilSys, with the ambition of making the system the central authentication provider for the entire economy. As of late 2025, the DICT was working to compel both banks and different government agencies to adopt the platform in lieu of their existing authentication systems.

In order to facilitate this effort, the DICT spearheaded the creation of a piece of legislation, the e-Governance Act, which was signed into law on September 5, 2025. The act mandated the creation of shared, interoperable, citizen-centered government systems, creating a legal impetus for agencies to integrate with PhilSys. Beyond that, the law was perceived as a powerful driver for steering the Philippines' DPI away from siloed, proprietary solutions toward interoperable DPGs. "The law does not explicitly mention 'digital public goods', but read it and you see that it screams 'DPGs,'" said Acuña.

The "Open" Pilots: OpenG2P, OpenSPP and OpenCRVS

By 2025 other DPG adoptions were underway in different parts of the government. Unlike PhilSys, which was a large, greenfield project, these cases were developed as pilots aimed at modernizing and improving certain government services and functions. Internal champions in different agencies undertook them with the aim of ultimately replacing legacy proprietary systems.

At the Department of Social Welfare and Development (DSWD), Assistant Secretary Johannes Paulus Acuña, a vocal DPG advocate, drove the adoption of two platforms for improving the department's social assistance programs. The first was OpenG2P, a DPG designed to streamline the delivery of social benefits and payments. The department successfully piloted the system in 2023 for the "Assistance to Individuals in Crisis Situations" (AICS) program, finding that it streamlined the beneficiary onboarding as a requirement for the delivery of cash grants and vouchers to those affected by natural disasters and other emergencies. The second was OpenSPP, a more comprehensive social protection information system that the department was pursuing to manage its flagship "4Ps" conditional cash transfer program, which served some 4.4 million households each year. Both platforms were scheduled to go live in 2026.

Beyond the Department, Acuña sought to demonstrate the value of using DPGs to other agencies in the government. "Our approach is to implement first and then tell the narrative of the value of DPGs," he explained. "So after we use these systems and crunch the numbers on how much money, effort, and time we saved, then we will go to others in the government and say, 'we're using DPGs, and here are the specific benefits we're gaining.'"

After its experience with MOSIP, the PSA began exploring a DPG to improve its civil registration system. While the national civil registry database, as well as the issuance of birth, death, and marriage certificates, operated under a costly public-private partnership with the US technology firm Unisys, the actual registration of citizens was performed by some 1,600 local PSA offices. Each of these offices used their own software to collect and upload that data, creating compatibility issues and unnecessary costs.

In 2023, the PSA commissioned the creators of OpenCRVS, a civil registration DPG, to carry out a proof of concept and present the results at a national convention attended by all the country's civil registration officers. After hiring a developer and forming a small internal team to manage the system, the PSA, in 2025, piloted OpenCRVS in 87 civil registration offices. A full-scale rollout was planned to begin in 2026. "It's a free, good, standardized tool that every office can use," said a development bank partner with extensive experience in the Philippines. "It will help make sure data is interoperable and uploaded in a timely way, and it will especially benefit the local governments that have less capacity and resources."

The Philippine DPG Ecosystem (circa late 2025)

DPG	Primary Use Case	Lead Agency / Entity	Implementation Model	Status (Late 2025)
MOSIP	Foundational Digital ID	Philippine Statistics Authority (PSA)	**Greenfield** Building a new foundational system from scratch.	Deployed; 92M registered. Integration in progress.
Mojaloop	Instant Payments Switch	Abli (Venture-backed company)	**Market Gap-Filling** A private-sector competitor introduced to challenge a proprietary incumbent.	Launched 2024; onboarding rural banks.
OpenCRVS	Civil Registration	Philippine Statistics Authority (PSA)	**Dual-Track Modernization** Piloting an open-source alternative alongside a legacy system.	Pilot in 87 local government offices; scaling in 2026.
OpenSPP / OpenG2P	Social Protection & Payments	Dept. of Social Welfare & Development (DSWD)	**Champion-Led Innovation** Agency-level adoption driven by an internal champion.	Pilots complete; full rollout planned for 2026.

Results and Reflections

There is clear momentum in the Philippines' DPG journey. For the various government leaders adopting DPGs, the value proposition has been about not just cost savings, but a reclamation of ownership and control over the country's digital transformation.

Philsys, likely the fastest rollout of a digital ID system by a large country, brought immediate economic value to citizens, bringing 8.3 million previously unbanked Filipinos into the formal financial system. The Mojaloop-based Abli switch is projected to operate at 95% lower cost than the incumbent Vocalink contract, creating a low-cost on-ramp for hundreds of rural banks. And forthcoming data from the OpenG2P and OpenSPP pilots at the Department of Social Welfare and Development will show greater efficiency and less leakage in delivering assistance payments to beneficiaries.

But the primary value for the Philippines has been strategic. It has been about escaping the "paywall culture" where every API call or feature change comes with a new fee. According to Acuña, DPGs would enable leaders like him to "flip the script" on vendors and suppliers, starting the conversation not with "what do you have for me?" but with "this is the open platform we are using; how can you add value on top of it?"

Realizing the autonomy that open source systems afford, however, depends on having the in-house capacity to operate those systems. Otherwise, digital public goods are not necessarily a panacea for vendor lock-in. The PhilSys project is the key exhibit: by rushing procurement and receiving only one bid for a systems integrator, the government effectively swapped proprietary software lock-in for implementation partner lock-in. By having access to the documentation and source code the PSA had built some capacity, but it still lacked the skilled personnel needed to manage the complex MOSIP system internally. The government once again found itself dependent on an external partner.

Building capacity was no easy feat. Officials cited inflexible government rules that limited the ability to quickly hire new personnel, pay salaries at levels attractive to talented technologists, or make strategic decisions. Overhauling those rules was an unlikely prospect, but one senior official mused that a system like PhilSys could have been operated by a Government Operated and Controlled Corporation, a hybrid entity that would have the personnel flexibility of a private company but still be under government authority.

Acuña, in the Department of Social Welfare and Development, was seeking to strengthen his in-house capacity through strategic partnerships with universities, startups, and other agencies to build a local community of practice around open source technologies. And unlike PhilSys, the OpenCRVS implementation in the PSA proceeded gradually, driven by an internal team able to modify the platform to specification and roll it out without relying on an external vendor.

The question now is whether the Philippines will continue the momentum. The e-Governance Act provides the top-down license and legal framework to compel this interoperability. That may create the impetus for turning a collection of isolated, champion-led pilots into the foundation of a truly integrated and sovereign digital state based on DPGs.

Appendix: Country Case Studies

The Tunduk Story: How Kyrgyzstan Built a Digital Nation on an Open-Source Backbone

Introduction

In 2018, Nuria Kutnaeva was asked by Prime Minister Sapar Isakov to leave her post overseeing the anti-corruption division of Kyrgyzstan's Security Council and to lead a new state enterprise. The goal of the new institution was to drive the government-wide adoption of Tunduk, an interoperable data exchange platform built on X-Road, a DPG developed in Estonia.

"Tunduk" referred to the circular opening at the apex of a traditional yurt – a well-known symbol of unity and home that was fitting for a system designed to unite disparate government databases under a single, secure framework. The government had acquired the system in 2016, yet after two years few agencies had actually implemented it.

Kutnaeva was an appropriate choice to lead the Tunduk State Enterprise, as Tunduk was envisioned as an anticorruption instrument. In 2015, Kyrgyzstan ranked 123 out of 168 countries assessed in Transparency International's Corruption Perceptions Index. Citizens and businesses seeking government services had to deliver paper applications and certificates to ministries and agencies. Processing was opaque and officials often demanded bribes in order to fulfill requests.

With leaders in the government feeling rising public pressure to act, digitization emerged as a key way to bring about transparency and standardization and limit the opportunities for rent-seeking. The president's office had convened a small working group composed of government officials and technical experts from civil society and the private sector to recommend an interoperable data exchange solution.

Two leading options emerged. One was a system built by a foreign vendor. Aziz Soltobaev, a government advisor and technical expert who sat on the working group, recalled that it was interoperable and affordable, but it used cryptography standards that were out of step with most of the world and, most importantly, the source code was proprietary. That raised alarms about strategic dependence and the potential existence of back doors that would leave data vulnerable.

The second solution was X-Road. "It was good technically and open source and it really checked the box for digital resiliency," said Soltobaev. "We could see all the source code and manage and control the data." And despite being open source, the platform was secure. "I remember literally sitting down with security officials who were concerned about it being open source and going through the code and explaining why it was secure," said Soltobaev.

Kyrgyzstan adopted the X-Road software and christened the platform Tunduk. The government had made a conscious and strategic choice to build its foundational government data platform on open-source software and open standards. This approach was seen as the way to ensure digital sovereignty, prevent vendor lock-in, and maintain control over the nation's data and development path.

The concept of a unified digital government platform was a compelling one for Kyrgyzstan, but its promise remained largely theoretical until 2018. The real turning point came with the official establishment and launch of the Tunduk State Enterprise. Under the strategic direction and leadership of Kutnaeva, the enterprise began the essential work of transitioning this theoretical DPG into a functioning cornerstone of the nation's DPI. This launch marked the start of the difficult yet critical process of adoption—moving from mere existence to widespread, practical use by government agencies and, eventually, citizens. Only then could Kyrgyzstan truly begin to experience and realize the tangible benefits—such as increased efficiency, reduced corruption, and improved service delivery—that this foundational digital backbone was designed to afford the country.

Implementation

Adopting the Foundation

Tunduk's primary function was to serve as the foundational data exchange layer for all government databases and services. In addition, it was the gateway to the national identity system and civil registry, via the Unified Identification and Authentication System (ESI), a single-entry point for citizens and businesses to access state e-services portals. Authentication was performed securely using a citizen's national ID card or a cloud-based electronic signature. This architecture eliminated the need for citizens to manage multiple usernames and passwords for different government services and to apply for and receive repeated civil status certificates (e.g., for birth, marriage, or death) without ever visiting a government office.

For this all to work, government agencies had to adopt the platform and connect their databases. The core challenge was not technical. As part of the transfer of the X-Road technology from Estonia, that country's e-Governance Academy had conducted extensive training for at least 260 Kyrgyz civil servants, IT specialists, developers, and lawyers in the technical, legal, and managerial aspects of the platform. This international support, along with aid from other partners like the EU, UN, and Korea, had helped build in-house capacity.

Rather, public agencies resisted adopting the new platform. The establishment of a new Tunduk State Enterprise was a crucial and strategic step. Had an existing ministry been in charge of implementing Tunduk, then other ministries might have felt they could ignore it, Kutnaeva recalled. But the Tunduk State Enterprise was a new entity that reported directly to the Prime Minister's Office, imbuing it with the high-level authority needed to enforce compliance across the entire government.

In order to fully leverage the "top-down" mandate provided by the highest levels of government, Kutnaeva's team embarked on the critical task of formalizing their vision. They drafted a special action plan that was endorsed by both the Prime Minister's Office and the President's Office. The plan officially directed that all public agencies and government bodies connect to the Tunduk system.

This was not merely a suggestion but an order, explicitly designed to dismantle the fragmented and inefficient digital landscape that had plagued the government for years. Kutnaeva recalled the previous state of affairs as a "zoo" of disconnected, proprietary systems. This "zoo" was characterized by different agencies operating on isolated, incompatible IT architectures, built using a confusing array of different programming languages and standards. This pervasive incompatibility made inter-agency data exchange slow, unreliable, and often impossible, creating significant bottlenecks in public service delivery and hindering unified governance. The Tunduk mandate was the necessary political and technical hammer to unify these disparate systems into a single, cohesive, and interoperable digital backbone.

At the same time, the team waged a "bottom-up" campaign to demonstrate the value of the platform and persuade the IT staff within agencies to start using it. Kutnaeva's team was small – at the start, just around 10 "enthusiasts", as she called them, who worked without pay for the first six months of their tenure while the enterprise was being established. To prove the concept, they secured a quick win, using Tunduk to connect the database of the state procurement portal with that of the tax service and obviating the need for a paper certificate.

Armed with that demonstration case, the team delivered hundreds of presentations and engaged in extensive outreach across all levels of government - from IT staff to ministers, deputy ministers, and other senior officials. The team encountered persistent resistance from officials who were not ready to share data: for many, the process was new and unclear,

raising concerns and reluctance to embrace changes, recalled Kutnaeva. The most difficult agencies to persuade were not those with no technology, but those that already had a proprietary solution and were locked into existing vendor contracts.

The persistence of the Tunduk implementation team proved instrumental in overcoming initial resistance and bureaucratic hurdles. As a result of this concerted effort, the Tunduk platform saw a steadily growing adoption rate across the public sector. The successful rollout and impact of the Tunduk system did not go unnoticed on the international stage. In May 2019, just over a year after the establishment of the Tunduk Tunduk State Enterprise, the project received an award from the Republic of Estonia's e-Governance Academy, a globally respected authority in digital state-building. This accolade celebrated the country's timely and effective implementation of the Tunduk platform, acknowledging its transformative potential for public service delivery and governance.

Expansion and Scaling

The 2020 COVID-19 pandemic served as an unprecedented stress test for Kyrgyzstan's public services. The sudden imposition of national lockdowns and social distancing measures rendered traditional, in-person service delivery impossible. This crisis, however, also acted as a powerful accelerant for the operationalization of the Tunduk platform. Almost overnight, Tunduk was repurposed from a tool of administrative efficiency into an essential lifeline for crisis management and social protection. The Tunduk State Enterprise rapidly deployed specific emergency services, including an "electronic permission for a vehicle to move around the city of Bishkek" during the state of emergency and a "system to support the activities of medical professionals".

The platform's most critical function during this period was as the backbone for digital social protection. Tunduk became the only viable mechanism for the Ministry of Labour and Social Development to manage the surge in assistance requests. For instance, an electronic application for citizens to apply for food assistance was launched directly on the Tunduk portal. This service was instrumental in the government's effort to identify and support vulnerable populations with basic food staples.

The platform's success was not in isolation; it demonstrated the value of an interoperable ecosystem. To identify families in need, Tunduk functioned as the secure data pipeline. A citizen application via the Tunduk portal would be routed to the Ministry of Labour, which in turn interoperated with the "Sanarip Aimak" (Digital Aimak) platform, a system used by local governments that provided up-to-date data needed to verify vulnerability and eligibility for aid. This multi-platform mechanism—Tunduk for access, Sanarip Aimak for verification—was a clear demonstration of a mature digital government architecture forged under crisis.

Leveraging the widespread adoption and validation forced by the pandemic, the government's post-2020 strategy shifted to scaling the citizen-facing components of Tunduk. The primary vehicle for this was the Tunduk mobile application, a one-stop portal designed to consolidate all government interactions into a single, authenticated interface. The app's user base was built upon the foundation of the Unified Identification System (ESI), the single-entry point for all state services, which counted 1.5 million registered users. The primary "pull factor" for this registration was a free, cloud-based electronic signature, which was required to access services and grew to 2.45 million issued signatures by August 2025.

This authenticated user base enabled a massive expansion of the platform's service catalog. While 60 services were available in the initial post-2020 phase, by August 2024, the Tunduk portal offered 165 distinct public services. Engagement data showed a shift from simple registration to active use: in the first six months of 2024 alone, the portal's services were used more than 2 million times.

The app's definitive feature, however, was its function as a legally valid digital document wallet. By digitizing the most essential, high-frequency-use credentials—like the national ID and driver's license—and giving them full legal equivalency, the state created an immediate, high-value "pull factor" that compelled citizens to register with the ESI. With a captured and authenticated user base of 1.5 million, the government could then successfully "push" new, lower-frequency services (such as benefit applications or vaccination records) to an existing and engaged audience. By early 2025, this digital wallet was populated with at least 10 key digital documents, effectively replacing a citizen's physical wallet.

At the same time, Tunduk evolved from a Government-to-Government (G2G) tool into a true Government-to-Business (G2B) and public-private digital public

infrastructure. As early as January 2020, 16 of the country's 25 commercial banks were already connected to the Tunduk system. Initially, this was for simple use cases like identity verification for know-your-customer (KYC) requirements.

However, this integration with financial services providers deepened significantly. One example was the "My O!" mobile app, a private-sector financial services and e-wallet application that integrated Tunduk's open API to allow its users to access their official digital documents and a range of government services directly within the private-sector app. This and other commercial tie-ins demonstrated Tunduk's role as a "platform of platforms," where the state provided the foundational infrastructure for private sector innovation.

This public-private integration also expanded into the legal-technical sector. Notaries were granted access to the State Registration Service's Unified Population Register (UPR) via the Tunduk platform to securely verify customer identities. As of late 2025, this arrangement was being formalized and expanded; the Ministry of Justice was tasked with developing a complete electronic notary system to be integrated with Tunduk for verifying the validity of digital powers of attorney. Furthermore, a new system for issuing remote "apostilles"—a form of international document certification—was being launched and would be integrated with the Tunduk platform for automatic data exchange.

These integrations were part of a deliberate, state-led industrial policy to create a domestic fintech market. Tunduk (as the DPI) provided the two essential foundational layers: (1) universal, state-backed digital identity (the ESI) and (2) a secure, universal data exchange layer (the Tunduk platform). Building on this foundation, the National Bank of the Kyrgyz Republic approved "Recommendations for Implementation of Unified API Standards" in September 2025. These standards explicitly included a "Payment Initiation API Standard" and an "Open API Standard". Following this, the central bank and the World Bank held a workshop for payment system participants to develop fintech services. This sequence revealed a sophisticated strategy: the state built the DPI, and the central bank was now using it to mandate open banking standards, creating the technical and regulatory conditions for a private fintech ecosystem to flourish.

Results and Reflections

Metrics showed the government-wide adoption and use of Tunduk. In 2018, the system processed 363,000 data exchange transactions. In 2024, it processed 3.5 billion transactions, and 37 different state agencies provided services through the platform. The Tunduk mobile was downloaded 2.85 million times in 2024. As of mid-2025, the Tunduk State Enterprise reported that 185 institutions, both public and commercial, were using the platform.

Tunduk produced direct cost savings for both citizens and the state. The government estimated that by eliminating the need to physically apply for and collect documents, the platform saved citizens a total of 21 million hours and 1.7 billion soms (around $19 million) in 2024. The government's own cost-savings from the platform for 2024 were an estimated 1.2 billion soms ($13.7 million). None of those estimates included the money saved from eliminating petty corruption in the issuance of state documents.

There was qualitative evidence that the system strengthened the social contract between the public and the government. The existence of a secure and transparent interoperability platform made the persistence of data silos a visible and quantifiable governance failure, rather than an accepted technical limitation. The public began to expect greater efficiency and transparency from the government, as evidenced by reports of citizens questioning agencies that still issued paper certificates when Tunduk was available.

For policymakers, the primary value of using a DPG rather than a proprietary solution was sovereignty. In a turbulent geopolitical region, relying on a proprietary, foreign-controlled system was a strategic liability. By using an open-source digital public good, the government retained full control over its data and was not reliant on an external vendor. It built up its own in-house technical capacity, affording it the flexibility to make feature changes and develop the platform.

This emphasis on sovereignty did not mean isolation, however. The Kyrgyz government leveraged international partnerships to finance implementation, build local technical capacity, and de-risk the adoption of a new technology. "A big reason X-Road was appealing as a solution was that it was the tried and tested global solution with a whole community and network behind it," recalled Soltobaev.

A key, and perhaps unplanned, benefit was the effect Tunduk had on the private sector. By providing open APIs for public services, Tunduk helped spur commercial innovation and market competition. Commercial banks, e-wallets, and cellular companies began competing to integrate state services—like paying taxes, checking social assistance payments, or buying insurance—directly into their own private-sector apps via Tunduk. This entrepreneurial activity demonstrated how a public platform could facilitate private sector growth.

Ultimately, the story of Tunduk in Kyrgyzstan demonstrated that DPI implementation was less about the technology itself and more about politics and institutional design. Though the technical experts advising the highest levels of government were enthusiastic about X-Road, it was the political imperative to maintain national sovereignty that was the decisive factor. And it took both strong and sustained political will emanating from the president's and prime minister's offices, as well as a dedicated implementation unit to overcome cultural and bureaucratic resistance to adopting a system that would compel transparency and interoperability.

By choosing an open-source DPG, Kyrgyzstan did more than just solve an immediate problem; it charted a new course for its national development. The ambition to reduce corruption and avoid vendor lock-in has produced a foundational public utility that has also unlocked private-sector innovation. The Tunduk platform has become the backbone for both a more transparent state and a more dynamic digital economy, proving that DPGs are not merely a low-cost procurement option, but a strategic investment in a nation's sovereignty and development.


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Building Open Digital States: Country Case Studies on the Impact of DPGs for DPI

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