The Case for Investing in Digital Public Infrastructure

How businesses and governments can work together to build digital foundations that benefit everyone. **by Bhaskar Chakravorti**

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India, a country frequently called out for poor physical infrastructure, has experienced a radical transformation in the digital space. Most notably, a digital payments revolution has reshaped the universe of informal transactions that make up 85% of its economy. In January 2023 alone, eight billion such transactions, worth nearly $200 billion, were carried out involving 300 million people and 50 million merchants — remarkable for a country that used cash for 90% of transactions a few years ago.

The engine of this change has been infrastructure — "digital public infrastructure" (DPI), i.e. rails on which easy-to-use digital products and services can be built to benefit entire populations. This idea isn't confined to India. It could quietly remake entire economies through digital means in both the developing and developed world.

At its simplest, DPI can be understood as an intermediate layer in the digital ecosystem. It sits atop a physical layer (including connectivity, devices, servers, data centers, routers, etc.), and supports an apps layer (information solutions to different verticals, e-commerce, cash transfers, remote education, telehealth, etc.). DPI acts as a connective platform layer, offering registries for the unique ID of people, payments infrastructure, data exchange, consent networks, and so forth. Its uses range from offering services — from mobile payments to verifying health records — at massive scale, to deploying "smart" technologies to close the widening gap between national commitments to environmental and development goals and present realities. DPI even plays a key role in *au courant* applications, like training generative AI algorithms on open access data.

Estimates of the value DPI can create are impressive:

- Digital ID alone can unlock economic value equivalent to 3–13% of GDP, with an average 6% improvement for emerging economies.
- DPI can enable essential emergency payments: Of 166 governments that launched cash-transfer programs through the pandemic, those with some stage of DPI reached an average of 51%, while those without reached only 16% of their populations. DPI frees time and enhances productivity: Estonia's X-Road, a secure data exchange infrastructure that streamlines citizen-government engagement through a single portal shared across different government functions, saves Estonians

an estimated 820 years of working time every year and approximately 2% of GDP.

The word "public" in DPI itself is deceptive. Governments and policymakers, investors, tech companies, international organizations, civil society groups, entrepreneurs, and independent programmers all have roles to play. While responsibility for DPI defaults to government, business may be in a position to step up in numerous settings. After all, in building the digital ecosystem's physical layer and providing services, businesses have taken the lead. These private sector products can be leveraged for public use thereby making them most convenient for adoption and providing the quickest, cost-effective solutions.

Unfortunately, discussion of DPI is siloed and the key actors across the public and private sectors are driven by different incentives. Policymakers want to make public services widely accessible. Political decision-makers want favorable feedback in elections. The private sector wants an attractive business case.

This lack of alignment means all parties could miss out on jumpstarting DPI. Here's how to bring them together and get them aligned on a common framework that gets the right stakeholders working on the right projects.

Attributes of Ideal DPI

To achieve its intended objectives, DPI ought to encompass several desirable attributes. I propose eight:

Enabling Sustainable Development Goals: One of the strongest arguments for DPI is as accelerant to sustainable development. From applications in agriculture, education, healthcare, and financial access,

it can be leveraged for advancing every SDG, as demonstrated by this SDG Digital Investment framework.

Inclusive: A Digital Planet analysis of the state of digital inclusion finds a persistent digital divide across socioeconomic, gender, and geographic fault lines. DPI benefits from internet access, and partial availability of DPI risks worsening societal inequalities. In 2022, 2.7 billion people lacked internet access, 259 million fewer women than men using the Internet, and two-thirds of the world's school-age children were without internet at home. DPI must be able to function despite these divides and eventually help in bridging them.

Citizen-centric: It is essential to ensure that the usage context does not become a barrier to availing of DPI's benefits. India's Gramvaani's interactive voice response system for rural areas with limited connectivity and Haqdarshaq's 'assisted-tech' model that deploys field agents who work with local communities, offer examples of human-centered design applied to digital services.

Trustworthy: DPI must give users confidence that the system is working in their best interests: authenticating identity, enabling reliable services, keeping user data private and secure, and ensuring that users are shielded from misinformation or harmful content.

Supportive of innovation: Once the investments in DPI are in place, the additional costs of experimentation, collaboration, coding, and launching apps decline, leading to more innovative activity. This ensures a flow of new services, efficiencies, and cost reductions.

Interoperable: Well-functioning DPI — built on open standards, code, and data access, with privacy and cyber protections — leverage common assets for multiple uses. For example, India's Universal

Payment Interface offers a single interface for seamless and account-to-account interoperability for any regulated payments provider.

Resilient: The adaptability of DPI in a fast-moving crisis response is critical. In Ukraine, the "Diia" app, which was used pre-war for Covid vaccination certificates and construction permits, was re-deployed post-war to display remote-job listings, for cash payouts for citizens, and for math classes for children missing school in a war.

Politically viable: Regardless of provider, DPI requires the support of politically significant stakeholders; otherwise, it raises alarms when it scales or is hobbled by over-regulation. Even India's unique identification system, Aadhaar, that has currently enrolled 99.9% of its massive population risked being scrapped after the original sponsoring party lost elections in 2014.

Barriers to funding and building DPI

Getting to DPI that meets the eight attributes requires overcoming many barriers: legacy infrastructure, a digital divide, insufficient funding, limited technical capabilities, underdeveloped digital regulations, insufficient political will, coordination challenges among key participants, users' skepticism about provider motivations, and more.

Who is best positioned to take on these barriers? If traditional infrastructure were the model, the natural winner would be governments, responsible for over 80% of the investment. But DPI is different.

For one, governments aren't the natural stewards of infrastructure that experiences constant innovation, while also nurturing startups and tech talent. Government decision-making and funding cycles are

often misaligned with technology development cycles. On top of that, because citizens have no options other than their governments for public services, there isn't a robust tradition of thinking of citizens as customers. As a result, it is not surprising that only 13% of government tech projects succeed, according to the Standish Group, and many citizens find government services hard to navigate. Moreover, with freedoms on the internet in steady decline worldwide, there are concerns about giving governments access to citizen data and enabling state overreach. In many countries, government-led approaches could risk undermining the innovation, trustworthiness and citizen-centricity attributes.

The private sector, on the other hand, already offers products that can be re-deployed. For example, M-PESA from Kenya's Safaricom has spread from mobile payments to enabling inclusive access to other services, such as energy and consumer products, through other businesses, such as M-KOPA. Alternatively, Meta-owned WhatsApp became the de facto platform for remote schooling in India through the pandemic, despite the country's public investments in DPI.

But there are downsides here, too. For one, tech companies have amassed market power and recover their investments by charging for access to proprietary systems, monetizing access to user data, and prioritizing the most commercially attractive segments and products. This risks undermining multiple attributes: inclusiveness, trustworthiness, and detracting from accelerating the SDGs — and potentially even political viability as they lock horns with regulators.

There's a final stumbling block that neither party seems well-poised to address: while some DPI services can be offered with workarounds to users without internet access, eventually the gap will need to be closed. Doing so won't be cheap: A 2020 ITU study estimates

that achieving universal broadband connectivity by 2030 would cost $428 billion. Governments are debt-laden across the developing world, and the private sector will need to see strategic benefits or revenue opportunities before stepping in to fill the void — and government guarantees could help provide incentives to businesses.

Providing DPI: Coordinated Approach

On balance, there is no escaping the need for coordination across multiple parties as no single lead player is poised to provide the perfect solution. Reframing DPI as "Digital Public-Private Infrastructure" offers some promise.

Public-private partnership (PPP) will be key to wider deployment of DPI; they benefit from business resources, financial discipline, risk management systems, and innovation capacity and pair them with the government's population-wide service objectives, longer-term horizons, and risk-mitigation capacity. Nevertheless, there tend to be partner mismatches. Governments aren't good at risk management systems, and for businesses, project failures can have a significant negative impact on financials. Guaranteed markets can also dull innovative capacity.

Allocation of risk, alignment of incentives, and market discipline is key for PPP's to succeed. Beyond this, PPPs for DPI can be enhanced by applying several additional levers.

Leveraging digital public goods and open-source products as inputs. A way to cut the costs of DPI is to deploy digital public goods (DPGs), defined as "open-source software, open data, open AI models, open standards and open content" with privacy and applicable laws and other best practices. Interoperable technologies reused for multiple purposes lower costs and create opportunities for adaptation to citizen-centric needs. For example, consider, DIVOC, used to generate secure and

verifiable vaccination certificates in countries as different as Sri Lanka, Jamaica, and Indonesia.

Forging expert collaboration.

Given the complexities of DPI, there is a need for collaborations across specialists with deep expertise. Consider the collaboration between MOSIP, a digital identity system, and OpenG2P, a government benefits transfer system, which built trustworthy DPI by combining expertise and enabling inclusion by scaling-up efficiently.

Focusing investments on beachhead applications.

One of the daunting aspects of launching DPI is that the scope is wide, with risky upfront investments. In some cases, it is better to launch with narrower high-priority applications and replicate across geographies. For examples of two such beachheads, consider DHIS2 that provides healthcare systems across over 100 countries covering 2.3 billion people, while the Giga initiative aims to connect every school to the internet.

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The DPI models that inspired a new generation of rollout arose during periods of acute need; crises can cause many barriers to tumble at once. Estonia, emerging from the breakup of the Soviet Union, needed to quickly establish cost-effective and reliable public services from scratch and turned to technology. India, on the other hand, had a deeply inefficient legacy to overcome: myriad identification and payments methods for food rations, cooking gas, or banking, all vulnerable to petty corruption and exclusion — a unique ID was much needed. In Ukraine, war made digital connections a lifeline for citizens. Across the world, the pandemic created a need for government-to-citizen transfers, tracing vaccination status, and tracking the effectiveness of public health measures. A private product, such as WhatsApp, was an indispensable easy-to-use tool for migrants with little else that was constant in their lives and was the go-to platform for many services.

Nandan Nilekani, the visionary behind India's DPI transformation, has observed, "DPI doesn't require deep pockets. It needs deep conviction." No question, in the absence of crises, countries around the world will need to develop that deep conviction. They may also need many pockets to reach into, as DPI will require partnerships. UNDP's administrator, Achim Steiner describes DPI as the 21st century's equivalent of "railways and roads and bridges."

We must avoid the Big Dig models typical of those 19th and 20th century versions of infrastructure, but we must also get away from the Big Tech or Big State models that have produced or controlled the digital ecosystems of the past. For DPI to be successfully deployed across the world, catalytic donors, governments, and businesses must come together in deep conviction and in innovative models of collaboration.

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Bhaskar Chakravorti is the Dean of Global Business at The Fletcher School at Tufts University and founding Executive Director of Fletcher's Institute for Business in the Global Context. He is the author of *The Slow Pace of Fast Change*.