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DIGITAL DEVELOPMENT: EMULATING INDIA'S DIGITAL PUBLIC INFRASTRUCTURE TO REACH THE SUSTAINABLE DEVELOPMENT GOALS

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1. INTRODUCTION: ACHIEVING SDGS IN THE DIGITAL ERA

The world is undergoing rapid digital transformation changing the way individuals, markets, and governments interact and operate. Almost every person in the world is covered by mobile cellular networks. Active mobile broadband subscriptions increased from 1.5 billion in 2012 to nearly 7 billion in 2022, providing access to digital services for over 90 percent of the global population.[1] Access to financial accounts also increased significantly within this period – nearly two-thirds of adults owned a bank account in 2021 compared to just over half a decade earlier.[2] Governments have moved many public services and social assistance payments online, and people increasingly use digital payments instead of cash in their daily lives.[3]

The economic and social disruption caused by the COVID-19 pandemic has underscored the need to accelerate this critical transition. The global pandemic set back progress towards the Sustainable Development Goals (SDGs), undermining decades of development efforts. According to the United Nations, in 2020, over 100 million people were pushed back into poverty and hunger; an equivalent of 255 million full-time jobs were lost; and an additional 101 million children and youth fell below the minimum reading proficiency level, wiping out the education gains achieved over the last two decades[4].

The problems faced by developing countries are further compounded by the impact of climate change and the Russia-Ukraine conflict. Combined they have resulted in high food and energy prices and growing debt burden as countries resort to subsidies to mitigate the adverse impact on their populations.[5] Almost one-third of the world's least developed countries are in macroeconomic distress or face a high risk of falling into one.[6] High rates of unemployment, especially among the youth, are preventing countries from reaping the benefits of the demographic dividend.[7] While much has been achieved to improve financial inclusion over the last decade, exclusion of a large section of the poor and vulnerable from mainstream financial services are holding back the transition to economic platforms that could help address the pressing needs of low-income countries, small states, and countries that are fragile and in conflict[8].

There are, however, some positives for policymakers to build on as countries recover from the pandemic and address multiple crises mentioned above. The global pandemic accelerated the use of digital technology in the delivery of government-to-person payments, particularly in previously under-served urban and informal households. By expanding existing targeted approaches, leveraging mobile technology and machine learning, and utilizing digital payment modalities, many countries were able to expand existing programs and implement new interventions to deliver aid to both rural and urban households, cushioning the effects of the pandemic.[9]

Digital public infrastructure (DPI) can help countries accelerate progress towards the SDGs, but some infrastructure matters more than others. As we see in Figure 1, the relative impact of DPI towards the achievement of the goals varies. For example, DPI could have a higher impact on programs to tackle poverty (Goal 1) through strengthened social protection systems and digital inclusion compared to access to clean water and sanitation (Goal 4). However, the "public good" nature of DPI is relevant for the goals through the spillover effect on better targeting and implementation capacity. Once DPI initiatives gain traction in different environments, national policymakers will be better able to draw on case studies to address specific development challenges, for example, shaping policies for climate change and transition to clean energy.

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[1] "Global and Regional Key ICT Indicator Aggregates," International Telecommunications Union, accessed August 27, 2023, https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx.

[2] The World Bank, "The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19," accessed on August 27, 2023, https://www.worldbank.org/en/publication/globalfindex.

[3] "A Digital Payments Revolution in India," The Economist, May 15, 2023, https://www.economist.com/special-report/2023/05/15/a-digital-payments-revolution-in-india.

[4] United Nations, "The Sustainable Development Goals Report 2021," 2021, https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf.

[5] Udaibir Das, Anit Mukherjee, and Medha Prasanna, "Rebooting Development Finance: An Agenda for Reforming Multilateral Development Banks," ORF America, May 2023, https://orfamerica.org/newresearch/finance-mdbs-development-background.

[6] The World Bank, "Global Economic Prospects," June 2023, https://www.worldbank.org/en/publication/global-economic-prospects.

[7] Melis Guven and Raphaela Karlan, "Supporting Africa's Urban Informal Sector: Coordinated Policies and Social Protection at the Core," World Bank, December 2020, https://blogs.worldbank.org/africacan/supporting-africas-urban-informal-sector-coordinated-policies-social-protection-core.

[8] "The Global Findex Database 2021."

[9] Anit Mukherjee et.al., "Digital-First Approach to Emergency Cash Transfers: STEP-KIN in the Democratic Republic of Congo," The World Bank, 2023, https://documents1.worldbank.org/curated/en/099935104272316767/pdf/IDU05debcd9500bf004a580a48b0c6c201068bdc.pdf.

Figure 1. Contribution of DPI Approach to SDGs

Source: Authors' original illustration. For full list of SDGs, see https://sdgs.un.org/goals.

Given the enormity of the challenge to achieve the SDGs in the aftermath of the global pandemic, piecemeal solutions focused on specific goals and targets will not suffice. The paradigm must shift from **"scale what works locally"** to **"design what works at full population scale"**. To do so, countries need to harness the power of DPI to transform their economies and societies. This transformation will be possible if DPI globally is built on the principles of openness and interoperability which will ensure that sectoral objectives determined by the SDGs and targets can be achieved at scale.

Over the last decade, India has created open and interoperable DPI at population scale to address its development objectives. These include providing digital ID, improving financial inclusion, enabling digital payments, transforming health, education and skill development, and envisioning an open network for future urban mobility and digital commerce.[10] On the economic side, further progress in DPI could improve India's productivity in the medium and long term, lifting potential growth above pre-pandemic levels.[11] Taken together, DPI has accelerated India's progress in several of the SDG goals and targets that can serve as a guide for other countries in their own development efforts.[12] We outline India's DPI experience in the next section.

2. INDIA'S DPI EXPERIENCE

India's DPI received a boost during the COVID-19 pandemic demonstrating its power to deliver at population scale. The Direct Benefit Transfer (DBT) platform was used to rapidly provide social assistance both in kind and in cash to over a billion citizens through a complex set of benefits known as the Pradhan Mantri Garib Kalyan Yojana (PMGKY).[13] UPI transactions reached $1 trillion in the 2022-23 financial year, enabling India to overtake China as the country with the highest instant payments.[14] India's vaccination portal Co-Win registered over 1.2 billion individuals and delivered over 2 billion doses within 18 months.[15]

Using digital public goods (DPGs) created and tested during the last decade, new initiatives are currently under way to create a Universal Health Interface (UHI) for health-related transactions and a similar effort in education through the Open Network for Education and Skilling Transactions (ONEST).[16] DPIs and DPGs are both critical as more countries digitize health and education sectors, improve governance, make public service delivery more efficient, and create gainful employment.

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[10] Cristian Alonso et.al., "Stacking up the Benefits: Lessons from India's Digital Journey," IMF Working Paper No. 78, International Monetary Fund, March 2023, https://www.imf.org/en/Publications/WP/Issues/2023/03/31/Stacking-up-the-Benefits-Lessons-from-Indias-Digital-Journey-531692.

[11] Shinya Kotera and TengTeng Xu, "Unleashing India's Growth Potential," IMF Working Paper No. 82,International Monetary Fund, 2023, https://www.imf.org/en/Publications/WP/Issues/2023/04/21/Unleashing-Indias-Growth-Potential-532616.

[12] United Nations, "Sustainable Development Report 2023," accessed August 27, 2023, https://dashboards.sdgindex.org/profiles/india.

[13] Alan Gelb et.al., "Beyond India's Lockdown: PMGKY Benefits During the COVID-19 Crisis and the State of Digital Payments", CGD Policy Paper No.257, Center for Global Development, 2022, https://www.cgdev.org/sites/default/files/beyond-indias-lockdown-pmgky-benefits-during-covid-19-crisis-and-state-digital-payments.pdf

[14] National Payments Corporation of India, "UPI Product Statistics," accessed August 27, 2023, https://www.npci.org.in/what-we-do/upi/product-statistics.

[15] Ministry of Health and Family Welfare, "Co-Win: Winning over COVID-19," Government of India, accessed August 27, 2023, https://www.cowin.gov.in/.

[16] Open Network for Education and Skilling Transactions, "About ONEST," accessed August 27, 2023, https://onest.network/.

What are DPI and DPGs?

As the idea of DPI and DPG has gained currency in recent years, they have been interpreted in different – and often confounding – ways.[17] To delineate ideas, it is important to define the terminology which will help clarify their practical implications for policymakers and practitioners.[18]

Definition of DPI:

Digital public infrastructure (DPI) is a set of shared digital utilities (platforms/networks) powered by interoperable open standards/specifications operated under a set of enabling rules (laws/regulations/policies) providing equal access to individuals and/or institutions addressing sovereignty and control built as a set of digital building blocks to drive innovation, inclusion, and competition at scale having open, transparent, and participatory governance.

Definition of DPG:

Digital public goods (DPGs) are a set of digital assets made freely available possessing their lifecycle and governance in the form of specifications, software, and/or content allowing anyone to build and operate their own DPIs in a faster, cheaper, and interoperable manner.

Looking at the definitions, it can be inferred that existence of a set of relevant DPGs could accelerate the creation of DPI as per the needs of countries and sectors.[19] In the case of India, DPI has been at the heart of the country's digital transformation. While other countries have also undertaken a similar approach, India's experience stands out both for its high scale and scope. Starting in 2009 with the unique biometric ID program, Aadhaar, India has adopted a deliberate and calibrated approach to building DPI under the umbrella mission of what is known as the "India Stack" which is different from the approach followed by countries in Europe, especially X-Road in Estonia.[20]

At the initial stage, India Stack used a combination of different technology building blocks to create a "digital stack" with three layers: identity, payments, and data exchange. It allowed the government, businesses, startups, and developers to build on Aadhaar to construct a digital infrastructure towards presence-less, cashless, and paperless service delivery with user consent (see Figure 2). The different layers are powered by Aadhaar, Unified Payments Interface (UPI), DigiLocker, and Account aggregators that function as data fiduciaries.

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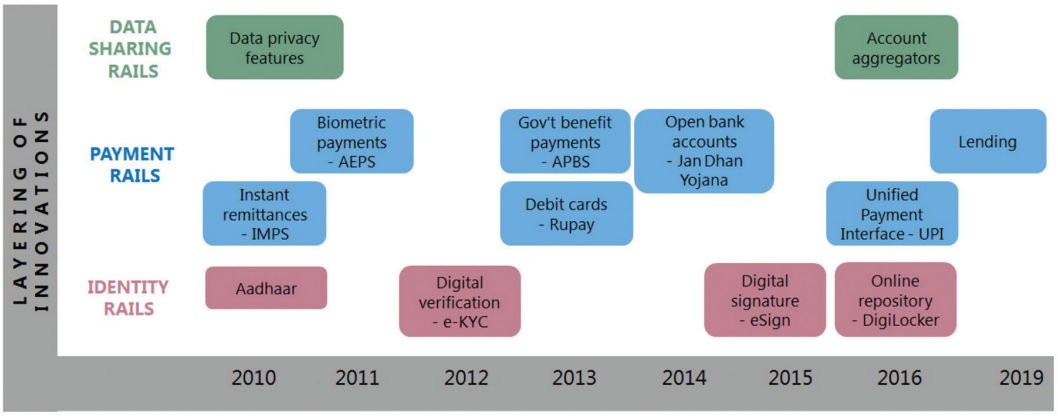
[17] Keyzom Ngodup Massally, Rahul Matthan and Rudra Choudhury, "What is the DPI approach?" Carnegie India, May 2023, https://carnegieindia.org/2023/05/15/what-is-dpi-approach-pub-89721.
[18] Pramod Varma, Presentation at the Global Partnership for Financial Inclusion meeting (January 2023)
[19] Anit Mukherjee and Shankar Maruwada, "Fast-Tracking Development: A Building Blocks Approach for Digital Public Goods," Center for Global Development, September 2021, https://www.cgdev.org/sites/default/files/fast-tracking-development-digital-public-goods.pdf.
[20] Tomicah Tillemann, Ben Gregori, and Jordan Sandman, "The Digital Government Mapping Project: Laying the Foundation for a Digital Decade," New America, September 2020, https://www.newamerica.org/digital-impact-governance-initiative/reports/digital-government-mapping-project/.

Figure 2: India Stack Rails and Associated DPI



Source: Bank of International Settlements, available at: https://www.bis.org/publ/bppdf/bispap106.pdf.

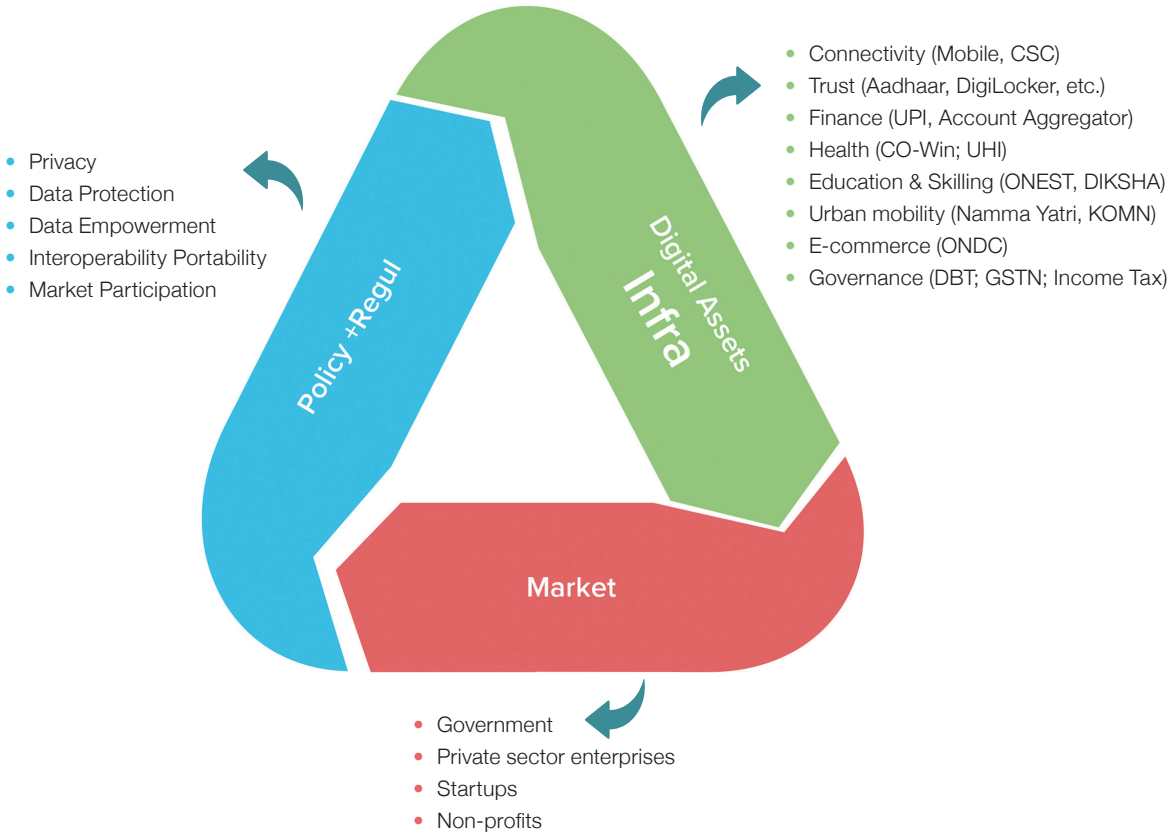
A new paradigm is emerging with the evolution of India's DPI approach designed and implemented at national population scale. The lessons from India's experience can serve as a playbook for other countries keen to create their own. As outlined in Figure 3, successful DPI requires a symbiotic and mutually reinforcing relationship between policy, digital assets, and the market. Enabling a policy framework that fosters data privacy and empowerment, mandates interoperability, and promotes market participation accompanied by public investment in digital assets (such as digital ID, DigiLocker, e-KYC, health ID) has expanded the market for goods and services. Crucially, these transactions happen digitally, using the payments and data exchange layers of the India Stack.

None of the assets are created as platforms. They are built using existing DPGs or through creation of new ones, such as the UPI for digital inclusion, Co-Win for immunization and others related to education, urban transportation, and e-commerce.[21]

Achieving successful adoption of DPIs at a national level depends to a large extent on digitally empowered individuals who create the demand for digitally-enabled services. The supply side involves a large and active community of practitioners (ideators, developers, innovators, financial intermediaries) who contribute to the co-creation of customized digital solutions that cater to their respective country's unique contexts. Along with an enabling policy environment that supports the DPI approach, India's experience shows that it is essential to prioritize capacity building and creation of a network of individuals, organizations, and supporters both in the government system and outside.

[21] Cristian Alonso et.al., "Stacking up the Benefits: Lessons from India's Digital Journey," IMF Working Paper No. 78, International Monetary Fund, March 2023, https://www.imf.org/en/Publications/WP/Issues/2023/03/31/Stacking-up-the-Benefits-Lessons-from-Indias-Digital-Journey-531692.

Figure 3: India's DPI framework



In the context of its wider applicability, the DPI approach is not sequential and deterministic but adaptive and flexible. Countries can choose their starting point given their priorities and goals, current state of digital preparedness, and availability of public resources for initial DPI investment. Moreover, with appropriate design, the government can become a key stakeholder in the DPI ecosystem, thereby setting the rules, supporting market participants, fostering innovation, and guiding the digital transformation towards its overall goal of an equitable and dynamic digital economy.

As we see below, India's DPI approach could find resonance in other countries of the Global South, especially in Africa and Latin America.

3: BUILDING ON INDIA'S DPI APPROACH: THE CASES OF BRAZIL AND THE GAMBIA

Ongoing efforts in Brazil and the Gambia illustrate some examples of how India's DPI experience can be adapted to and adopted by other countries. While the sectoral focus may be different between the two - sustainable bioeconomy and energy transition for Brazil and urban mobility in the Gambia - the approach is similar: empowering and enabling people to participate in the digital economy through protocol-based open networks at population scale.

The Brazil Case: OpenBelem

The global focus on protecting the Amazon rainforest overlooks the fact that most people in Brazil live in large and growing urban centers.[22] As the largest city in greater Amazonia, Bélem is a hub of economic activity in northern Brazil, where products from the Amazon basin have historically been traded in its markets. The OpenBelem vision is to support local commerce based on sustainable livelihoods and foster innovation in the digital economy. The objective is to position Bélem as a digital hub in the Amazon basin with the objective of linking producers to markets – both local and global – through open digital networks with sustainability as the overarching guiding principle.

Despite Brazil's network of technical training institutions, surveys indicate that 94 percent of employees admit to having a skill gap, and nearly two-thirds of them believe that their college education has not adequately equipped them with the necessary skills for their workplaces.[23] Concurrently, in 2022, three out of four employers report difficulty finding the talent they need.[24] This presents both a challenge and an opportunity – namely bridging the skills-jobs gap by creating an open skilling and employment network to reduce information asymmetry, similar to the recently launched Open Network for Education and Skill Transaction (ONEST) in India.[25]

Modeled on India's example of using the Beckn protocol as the underlying network architecture, the OpenBelem Mission has been envisioned by the government of Belem to create a protocol compliant open network to promote skilling and employment opportunities in the initial phase. This would include creating an open-source community of practice, issuing instantly verifiable credentials/ certificates for technical courses, and matching skills with available jobs, including in sustainable and bio-economy sectors. This will lay the foundation for a long-term effort to transform Bélem into a hub of digital innovation in sustainable livelihoods, clean technology, service delivery, and responsible urbanization in the lead up to Brazil's G20 presidency in 2024 and hosting the COP30 in 2025.

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[22] Inter-American Development Bank, "Amazon Cities Forum Launched with IDB Support," August 4, 2023, https://www.iadb.org/en/news/amazon-cities-forum-launched-idb-support.
[23] Udemy, "2019/2020 Skills Gap Report," 2020, https://research.udemy.com/wp-content/uploads/2020/09/Skills-Gap-Report-2019_2020-2021-Rebrand-v2-gs.pdf.
[24] Manpower Group, "Brazil's Talent Shortage," 2022, https://go.manpowergroup.com/hubfs/Talent%20Shortage%202022/MPG_2022_TS_Infographic-Brazil.pdf.
[25] Ishan Patra, "Inside ONEST, A Decentralized Network that Hopes to Shake up the Education Sector", July 27, 2023, https://yourstory.com/2023/07/onest-ondc-beckn-decentralised-network-education-skilling-jobs

The Gambia Case: OpenGambia

Like other countries in West Africa, the Gambia has experienced rapid growth in the adoption of mobile technology over the last decade. While nearly 90 percent of its population has access to cellphones and nearly 70 percent to the Internet through the mobile data network, a lack of trained personnel has been identified as one of the primary barriers affecting the digital transformation and hindering the employment of young people.[26]

To address this, a team of local experts started the Foundation for Open Digital Economy (FoDE) with support from the open-source community of practice in India who provide technical training, reference applications, sandboxes, and other DPGs to create a digital innovation ecosystem in the country. The collaboration has seeded the Open Gambia network (OGa) that will initially focus on urban mobility, a significant challenge given the unorganized nature of the sector. FoDE has formed partnerships with local universities providing comprehensive training on DPGs and DPIs to create local capacity. The foundation is also actively engaged in enabling conversations with local platforms offering their services in the region to join the OGa network.

Expanding the concept of open networks beyond the Gambia to include other countries across West Africa, such as Senegal, Togo, and Nigeria, would have transformative effects on the region's digital landscape. The broader vision is that by adopting similar open network frameworks, these countries can collectively create an interconnected pan-Africa open digital zone, fostering seamless cross-country economic transactions thus promoting digital trust on a regional scale.

4: CONCLUSION

Digital public infrastructure has the potential to accelerate progress towards the SDGs, especially in the countries of the Global South most affected by the pandemic and its aftermath. In this context, India's approach and experience of designing and implementing DPI at large population scale can guide the digital transformation strategies of others.

One key lesson from India's experience is that DPI will drive digital transformation at significant population scale when there is an overarching policy framework that incentivizes both governments and markets to foster an innovation ecosystem to build open and scalable DPGs, that are also global in nature. Countries can adopt and adapt them for their own needs and priorities, thereby creating a global commons to address poverty, combat inequality, and provide opportunity for all.

[26] Papa Yusupha Njie, "Current Status of ICT in the Gambia," International Telecommunications Union, https://www.itu.int/ITU-D/finance/work-cost-tariffs/events/tariff-seminars/Gambia-07/gambia_njie_en.PDF.

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