The Pivotal Role of Digital Public Infrastructure in Shaping the Global Economy

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Abstract

This thesis explores the pivotal role of India's Digital Public Infrastructure (DPI) in advancing effective governance and sustainable development, with a particular emphasis on its applicability and influence across the Global South. Anchored in platforms such as Aadhaar (digital identity), Unified Payments Interface (UPI), DigiLocker, and the Data Empowerment and Protection Architecture (DEPA), India's DPI ecosystem represents a public-sector-led, scalable, and modular approach to delivering digital services. The central research question investigates whether DPI, as developed and implemented in India, can serve not only as a transformative governance tool domestically but also as a form of soft power and digital diplomacy abroad, especially in low- and middle-income countries.

The thesis adopts a multiple case study methodology, combining descriptive and interpretive analysis of India and Brazil as principal cases, supplemented by emerging evidence from Ethiopia, Sri Lanka, and the Philippines—countries currently engaged with India's DPI model. A secondary data-driven economic model was constructed to examine the correlation between DPI deployment and progress across selected Sustainable Development Goals (SDGs), specifically SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure). Key performance indicators (KPIs) such as poverty headcount ratio, financial inclusion metrics, broadband penetration, and digital transaction volumes were tracked over the 2015–2023 period.

Findings indicate a plausible association between DPI rollouts and measurable improvements in service delivery, fiscal efficiency, and digital inclusion, particularly among underserved populations. While the study acknowledges that DPI is one among several contributing factors, the evidence supports its role as an enabler of inclusive growth and governance reform. Moreover, India's strategy of exporting DPI components via open-source frameworks, modular technology, and bilateral cooperation suggests the emergence of a new model of South–South digital cooperation rooted in co-development and digital sovereignty.

The thesis concludes by offering policy recommendations for India to integrate AI into DPI, leverage its mineral resources for tech-industrial development, and institutionalize multilateral DPI governance standards. In doing so, India can consolidate its position as both a domestic innovator and a normative leader in shaping a more equitable digital future for the Global South.

Dedication

I would like to dedicate this thesis to my Guru, Guide, and Philosopher –

Bhagawan Sri Sathya Sai Baba

"The end of education is Character"

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Chapter I.

Introduction

Infrastructure is much more important than architecture.

-Rem Koolhaas

The intersection of geopolitics, technology, and innovation is redefining the architecture of global power, national governance, and international development. Across history, technological advantage has often served as a key determinant of geopolitical dominance – from steel weapons and firearms that facilitated colonial expansion to the industrial machinery that powered imperial economies. In the digital age, the tools of dominance have shifted from the physical to the intangible: data, platforms, code, and networks. As governments increasingly digitize the processes of governance and public service delivery, technology is no longer simply a tool of efficiency – it has become the infrastructure of governance itself.[1]

Over the past two decades, states have begun to transition their core functions – from identity authentication and payment processing to regulatory compliance and welfare distribution into digital systems that operate at population scale. This shift has laid the foundation for what is now widely referred to as Digital Public Infrastructure (DPI): a suite of interoperable, inclusive, and secure digital platforms that facilitate the delivery of both public and private services. DPI represents a new form of state capacity, enabling governments to respond to complex development challenges with agility, scale,

[1] Schmidt, "Innovation Power."

and precision. Increasingly, DPI is emerging not only as a domestic reform tool but also as a lever of soft power and digital diplomacy, particularly among developing countries in the Global South.

The Digital Turn in Governance

The digitization of governance has fundamentally altered how states interact with their citizens. Traditionally, the provision of public goods – education, healthcare, subsidies, and civil registration – depended on analog, manual, and often fragmented systems. These systems were prone to inefficiencies, corruption, duplication, and exclusion. Digital technology offers a radically different model, enabling governments to build scalable, transparent, and inclusive systems that deliver services efficiently and at lower cost.

As countries adopt digital governance models, they are increasingly embracing platform-based architecture, where a modular set of interoperable digital systems performs key governance functions.[2] The foundational components of DPI – digital identity, digital payments, and data exchange – enable such architecture. For instance, a digital ID system can verify individual identity across education, health, and financial systems, while real-time payment platforms can process welfare transfers, tax payments, and utility bills. A data- sharing framework ensures that these services communicate with one another securely and seamlessly.

India has emerged as a global exemplar in this domain, with its DPI ecosystem encompassing platforms such as Aadhaar (Identity), Unified Payments Interface (UPI)

[2] Cortbawi, "The Role of Technology | Public and Government Sector."

(payments), DigiLocker (document exchange), and more recently, ONDC (Open Network for Digital Commerce). These platforms have been integrated to form the India Stack, a layered, API-enabled architecture that enables private innovators and public institutions to build new services atop shared infrastructure. India's DPI systems are not only scalable, serving over a billion people – but also open, modular, and increasingly being shared as global public goods.

Digital Public Infrastructure (DPI) and Digital Public Goods (DPG)

DPI refers to digital systems that enable the delivery of essential public and private services at societal scale. In 2023, the G20, under India's presidency, formally recognized DPI as "shared digital systems that should be secure and interoperable, and can be built on open standards and specifications to deliver and provide equitable access to public and private services at societal scale."[3] DPI is designed to be publicly governed, technically open, and adaptable to diverse policy environments.

Closely related to DPI is the concept of Digital Public Goods (DPGs), defined by the United Nations as "open-source software, open data, open AI models, open standards and open content that adhere to privacy and other applicable laws and best practices, do no harm and help attain the Sustainable Development Goals (SDGs)."[4] While DPGs constitute the building blocks, DPI refers to the assembled systems that are built on these blocks and deployed to deliver services. The combination of open-source foundations and

[3] Government of India, "UIDAI Annual Report 2022–23, Unique Identification Authority of India, Ministry of Electronics and IT."
[4] National Payments Corporation of India (NPCI), "UPI Product Statistics."

state-led platforms allows governments to design DPI that reflects national values, regulatory frameworks, and socio-economic objectives.

A typical DPI ecosystem includes three core layers: 1) Identity Layer, 2) Payments Layer, and 3) Data Exchange Layer. Identity Layer provides secure digital identities enabling individuals to authenticate themselves across platforms. Payments Layer facilitates real-time, low-cost, interoperable financial transactions. Data Exchange Layer ensures secure, content-based data portability and document exchange.

Each of these layers supports horizontal service delivery across sectors such as health, education, welfare, and commerce. The layered architecture ensures that DPI can evolve and scale by adding new services without rebuilding core functionality.[5]

DPI and the Sustainable Development Goals (SDGs)

The United Nations' 2030 Agenda for Sustainable Development comprises 17 SDGs aimed at eradicating poverty, reducing inequality, improving health and education, and promoting inclusive economic growth. However, progress toward these goals has stalled. As of 2023, the UN warns that "only about 12% of the SDG targets are on trach," with poverty, inequality, and access to services worsening in many parts of the world.[6] DPI is increasingly recognized as a cross-cutting enabler of SDG progress. By digitizing core government functions and enabling interoperability across services, DPI can directly influence outcomes in SDG 1 through better targeted subsidies; SDG 8 through MSME enablement and digital finance; and SDG 9 by facilitating startup ecosystems and internet connectivity. Moreover, DPI's alignment with SDGs is not accidental. Its design – open,

[5] MeitY, "India Stack: Transforming Service Delivery in India."
[6] Digital Public Goods Alliance, "Digital Public Infrastructure: 2024 DPG Ecosystem Report."

inclusive, and rights-based – matches the UN's vision for global digital cooperation. DPI is not merely a digital service delivery mechanism; it is increasingly viewed as a systemic tool to improve governance, inclusion, and accountability at scale.

DPI and Soft Power

As DPI increasingly becomes a global conversation, it is also emerging as a tool of soft power. Coined by Joseph Nye, soft power refers to the ability to influence others through attraction rather than coercion – by setting norms, shaping preferences, and modeling success.[7] In the 21st century, digital infrastructure is joining culture, values, and diplomacy as a key domain of soft power projection.

India's approach to digital diplomacy illustrates this shift. By offering its DPI model as a public good – free to use, adapt, and scale – India is building diplomatic capital across the Global South. Programs like the India Stack Global Initiative, technical support through iSPIRT, and capacity-building under MEA's Development Partnership Administration are helping countries in Africa, Asia, and Latin America adopt elements of India's DPI. The Global DPI Repository, launched under India's G20 presidency, serves as a knowledge and code-sharing platform for interested nations.

This emerging model of "digital non-alignment" allows countries to adopt sovereign, interoperable, and inclusive systems without dependence on western tech corporations or authoritarian models of digital control. In doing so, India is not only exporting code but also norms of openness, interoperability, and inclusion – recasting DPI as both a development and diplomatic asset.

[7] Ministry of External Affairs, "India's Development Cooperation Framework."

International Recognition of DPI

In 2023, the G20 formally endorsed DPI as a strategic tool for global development, adopting a working definition, governance principles, and implementing pathways.[8] The declaration recognized India's leadership in advancing DPI and welcomed its proposal to host the Global DPI Repository and launch the One Future Alliance to support DPI adoption in LMICs.

The United Nations has echoed these sentiments. In partnership with India and other, the UN has launched a High Impact Initiative to support DPI rollout in at least 100 countries by 2030. The COVID-19 pandemic further cemented DPI's global relevance. Countries with functioning digital ID, payment, and health systems were able to respond more effectively, providing cash transfers, healthcare, and vaccinations with speed and transparency.

In 2024, under Brazil's G20 presidency, DPI remained central. The Maceió Declaration on Digital Inclusion emphasized universal connectivity, inclusive platforms, and democratic oversight.[9] Brazil, India, and South Africa jointly issued a communique on DPI and AI underscoring their role in democratic development and equitable access.

The Geopolitics of Digital Sovereignty

The rise of DPI also intersects with the growing global discourse on digital sovereignty. In an era where data flows transcend borders and digital platforms wield increasing political and economic influence, questions about who controls digital infrastructure and for what purposes have become central to both national security and

[8] United Nations Development Programme (UNDP), "SDG India Index and Dashboard | iTech Mission."
[9] World Bank, "Poverty Headcount Ratio at National Poverty Lines (% of Population) – India."

development. The European Union's General Data Protection Regulation (GDPR) was one of the first major legislative responses to this dilemma, asserting data protection as a fundamental right. Other countries have followed suit, implementing data localization laws, cross border transfer restrictions, and digital service taxes.

India's DPI model contributes to this discourse by offering a template for sovereign, citizen-centric digital governance. Rather than outsourcing infrastructure to foreign entities, India has built, governed, and scaled its own systems – often through public-private collaboration, but under state oversight. This ensures that core digital functions, such as ID issuance or payment authentication remain within the constitutional and legal frameworks of the state.[10] As other countries consider how to balance openness with sovereignty, India's DPI offers a third path: one that is neither state-surveillance-heavy (as in China) nor corporate-dominated (as in the U.S.), but guided by principles of openness, consent, and federated control.

Moreover, India's DPI strategy has diplomatic ramifications. India's offer of open-source, low-cost, and sovereign-compliant DPI becomes geopolitically significant. DPI thus functions as a new instrument of tech diplomacy, one that aligns with the values of democratic governance, data protection, and developmental autonomy.[11]

DPI in the Global South: Promise and Challenges

The Global South, home to more than 80% of the world's population faces immense governance and development challenges, including limited infrastructure,

[10] Bandura et al., *Unpacking the Concept of Digital Public Infrastructure and Its Importance for Global Development*.
[11] "G20_Digital Economy Ministers Meeting_Outcome_Document_and_Chair_Summary_19082023.Pdf."

fragmented service delivery, and high inequality. DPI offers a powerful opportunity to leapfrog traditional development bottlenecks. By adopting digital identity systems, interoperable payments, and secure data exchanges, countries can expand access to welfare, credit, healthcare, and education, often at a fraction of the cost of analog systems.

India's DPI model is particularly attractive to LMICs for several reasons. It is open-source, reducing costs and vendor lock-in. It is modular, allowing countries to adopt components gradually. It is population-scale, proven to work in high volume, low-resource settings. However, DPI adoption is not without its challenges. Implementing DPI requires political will, institutional capacity, and regulatory coherence. Many countries in Africa and parts of Asia lack reliable internet access, foundational registries, or legal data protection frameworks. The risk of digital exclusion, surveillance, and unintended consequences remains real. Hence, DPI deployment must be accompanied by investments in connectivity, cybersecurity, and digital literacy to ensure equitable outcomes.

Research Scope and Questions

This thesis aims to explore the potential of DPI as an enabler of effective governance and instrument of soft power, particularly in the context of India's development trajectory and its growing influence in Global South. Specifically, this thesis addresses two interrelated research questions: 1) How does DPI support the goal of effective governance, particularly in relation to selected SDGs? 2) Can India use DPI to project soft power to low- and middle-income countries (LMICs)?

To explore these questions, this thesis employs a descriptive, case-based methodology focused on India and Brazil. India serves as a primary case for analyzing DPI's evolution and export strategy, while Brazil provides a secondary reference point to examine how DPI is being interpreted and adopted by another Global South leader.

The analysis is anchored in three SDGs where DPI's influence is considered most visible.

SDG 1: No Poverty – through welfare distribution, digital identity, and subsidy targeting.

SDG 8: Decent Work and Economic Growth – through MSME enablement, financial access, and digital entrepreneurship.

SDG 9: Industry, Innovation, and Infrastructure – through internet access, digital startups, and data interoperability.

While this thesis does not attempt to establish strict causal relationships between DPI and KPI outcomes, it aims to assess whether DPI has plausibly contributed to developmental progress and positions India as a normative leader in digital development.

Thesis: Rationale and Relevance

This thesis engages with DPI not merely as a technical artifact but as a transformative paradigm with implications for development, diplomacy, and sovereignty. While the global digital economy continues to expand, most LMICs remain at the margins of technological innovation and agenda-setting. DPI presents an opportunity to alter that equation – to build local capacity, deliver public value, and shape global digital norms from the Global South.

This thesis is timely for three reasons. First, India's leadership at the G20 and its advocacy for global DPI frameworks has elevated the issue to the highest level of multilateral diplomacy. Second, the UN's High Impact Initiative in DPI signals strong institutional backing for scaling DPI globally. Third, growing interest in South-South cooperation creates a conducive environment for knowledge exchange, capacity building, and technology transfer in DPI.

As digital transformation becomes central to governance and international development, understanding the pathways through which DPI operates, both domestically and geopolitically is essential. This thesis seeks to contribute to that understanding by investigating India's DPI model as a case of effective public digital innovation, and as an evolving instrument of digital soft power with implications for the Global South.

Chapter II.

Research Methodology

This research adopts a qualitative, interpretive methodology based on a multiple case study design, supported by secondary data analysis. The aim is to examine how DPI initiatives function in real-world governance settings and assess their potential impact on key performance indicators (KPIs) associated with sustainable development.

A multiple case study design was chosen for its capacity to offer a rich, in-depth exploration of DPI implementation across distinct national contexts. This design is particularly appropriate when the goal is to investigate complex phenomena that unfold in diverse policy environments. Unlike single-case studies that often provide depth at the expense of generalizability, a multiple case study allows for contextual comparison and thematic synthesis. In this thesis, two primary cases – India and Brazil – are examined to explore the development and implementation of DPI in varied socio-political and institutional ecosystems. India, as a pioneering country in building and exporting DPI, provides a lens through which the impact of population-scale, modular, and open-source digital systems can be analyzed. Brazil, by contrast, offers a case of a major South American country where DPI adoption is emerging in parallel with broader governance reforms.

Additionally, this thesis incorporates brief assessments of DPI adoption in selected low- and middle- income countries (LMICs) that have received support from India's DPI cooperation programs. Ethiopia, the Philippines, and Sri Lanka serve as

auxiliary cases, included to provide early signals of how India's DPI model is being adapted and operationalized across different regional and governance contexts. These supplementary cases are not evaluated with the same empirical depth as India and Brazil but serve to broaden the scope of analysis and support the thesis' exploration of DPI as an instrument of digital diplomacy and soft power.

The analytical framework for this research is grounded in a layered examination of DPI, based on the architecture most commonly referenced in policy literature and by institutions such as the G20 and the Digital Public Goods Alliance. DPI is conceptualized as comprising three core technological layers: digital identity, digital payments, and data exchange. These layers correspond to critical functional domains of governance. The identity layer facilitates the authentication and verification of individuals and organizations, enabling the equitable delivery of services and benefits. The payments layer enables secure, real-time financial transactions and reduces friction in financial flows. The data exchange layer allows for secure and consent-based sharing of information across institutions, improving interoperability, transparency, and policy responsiveness.

These three layers are mapped against selected SDG targets and associated KPIs. The alignment between DPI initiatives and SDG progress is examined through a descriptive lens, seeking to understand the pathways through which technological infrastructure may contribute to development outcomes. This mapping exercise provides conceptual clarity, enabling the analysis to remain focused on whether DPI has demonstrable potential to influence poverty reduction, employment creation, and innovation capacity. While the study does not attempt to establish statistical causality, it

investigates whether DPI deployment temporarily aligns with significant changes in selected development indicators.

Secondary Data Analysis

To support this qualitative exploration, the thesis incorporates a secondary data analysis of publicly available national and international datasets. This analytical approach enables the examination of time-series data and cross-sectional comparisons that track changes in selected KPIs from 2015 to 2023 – the period following the global adoption of SDGs. In this analysis, DPI is treated as the independent variable, with individual initiatives such as Aadhaar, UPI, DigiLocker, Pix, and Gov.br functioning as proxies for broader digital transformation. The independent variables are the KPIs associated with SDG 1, SDG 8, and SDG 9, including the poverty headcount ratio, the Multidimensional Poverty Index (MPI), the Gini Coefficient, unemployment rates, GDP growth rates, broadband penetration, and enterprise formation.

The analytical framework conceptualizes DPI and SDG interaction as an input-output relationship. DPI layers and initiatives constitute the input mechanisms that enable or enhance the functioning of public systems, while the KPIs serve as observable outputs that reflect the performance and direction of socio-economic development. The model examines whether there are temporal correlations between the rollout of DPI and shifts in development metrics, especially in areas such as subsidy delivery, financial inclusion, service access, and innovation ecosystems.

Data for the analysis is drawn from a combination of administrative and publicly reported sources. Government ministries and agencies such as India's Ministry of Electronics and Information Technology (MeiTY), the National Payments Corporation of

India (NCPI), the Ministry of Statistics and Programme Implementation (MoSPI), and Brazil's Ministry of Communications provide operational statistics and deployment timelines for DPI platforms. These administrative records are complemented by secondary data from international sources, including the World Bank, United Nations Development Programme (UNDP), the International Telecommunication Union (ITU), and NITI Aayog's SDG Index reports. The combination of these sources ensures triangulation and enhances the credibility of the analytical findings.

Dependent Variables and KPIs[12]

The selection of KPIs was guided by several criteria: relevance to DPI functions, alignment with SDG targets, and the availability of credible, time-bound data. For SDG 1, the analysis includes the poverty headcount ratio, the MPI, the Gini Coefficient, and access to basic services such as water, electricity, and education. For SDG 8, indicators include the unemployment rate and GDP growth rate, which reflect labor market health and economic expansion. For SDG 9, the focus is on broadband subscriptions and measures of innovation capacity, such as startup registrations and participation in digital commerce platforms. These indicators collectively provide a multidimensional view of development outcomes that DPI may influence.

While this research aspires to draw plausible inferences about DPI's contribution to these outcomes, it explicitly acknowledges the methodological limitations involved.

Development trajectories are shaped by a multitude of intersecting variables, including fiscal policy, international trade, demographic changes, institutional reforms,

[12] "UNSDG."

and global economic cycles. As such, isolating DPI as the sole or primary driver of progress in any given indicator would exceed the scope and capability of this thesis. Instead, the study adopts a cautious, interpretive approach that seeks to identify plausible relationships, thematic patterns, and enabling conditions where DPI may have facilitated more effective governance and development progress.

This methodological strategy also allows for the exploration of how DPI is framed and institutionalized within national policy discourse. The thesis considers not only operational outcomes bur also the narratives, norms, and frameworks through which DPI is justified, promoted, and exported. In the Indian case, the study examines how DPI has become both a domestic governance tool and a geopolitical instrument of soft power. In the Brazilian context, the analysis explores how DPI is positioned within national digital inclusion policies and its alignment with broader commitments to participatory democracy and universal service provision.

Ultimately, this research methodology is designed to provide both empirical grounding and interpretive insight. By combining qualitative case studies with secondary data analysis and SDG mapping, the thesis aims to generate a holistic understanding of how DPI may contribute to governance reform, institutional efficiency, and developmental equity. It situates DPI not only as a technological system but as a governance paradigm that merits critical attention from scholars of international development, digital governance, and public policy.

Chapter III

DPI initiatives - India and Brazil

This chapter presents two individual case studies – India and Brazil – focusing on the role that Digital Public Infrastructure may have played in advancing progress on selected Sustainable Development Goals, specifically SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure). The analysis is structured around two core components for each country.

First, a KPI analysis outlines the performance of relevant indicators – such as poverty headcount ratio, Multidimensional Poverty Index, unemployment rate, GDP growth, broadband access, and digital entrepreneurship – between 2015 and 2023. These indicators are drawn from national statistical data and internationally recognized development databases to contextualize observable trends in socio-economic development.

Second, the chapter attempts to examine the potential relationship between DPI systems and improvements in these KPIs through a DPI-SDG KPI mapping framework. This involves identifying major DPI initiatives such as Aadhaar and UPI in India, and Pix and CadÚnico in Brazil and linking them to functional governance improvements or development outcomes where applicable. It is important to emphasize that the aim of these analyses is not to prove causality in a narrow statistical or economic sense, but rather to understand whether DPI has shown potential to act as an enabler of effective governance and sustainable development. While correlations are identified and plausible mechanisms are discussed, this study acknowledges that other macroeconomic,

institutional, and policy-level factors may have also contributed significantly to the observed trends.

Isolating the exclusive causal effect of DPI on these outcomes, while methodologically important is beyond the scope of this paper, which is primarily exploratory in nature.

India Case Study: DPI and SDG KPI Trends

India's Digital Public Infrastructure represents a transformative approach to digital governance and service delivery. Built upon foundational identity layer - Aadhaar, payments layer - Unified Payments Interface (UPI) and data layer, DPI has enabled scalable, inclusive innovation. India's offers replicable models for enhancing progress toward the United Nations Sustainable Development Goals (SDGs).

This thesis presents a case study analysis of India's DPI ecosystem and its impact on SDG 1 (No Poverty), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure), based on performance trends in selected KPIs from 2015 to 2023.

KPI Analysis for SDG 1 - (No Poverty)

Over the past decade, India has significantly reduced poverty thereby making a substantial progress toward achieving Sustainable Development Goal 1 (No Poverty), as reflected by its key performance indicators (KPIs).

India's extreme poverty (living on less than $2.15 per day) fell from 16.2 percent in 2011-12 to 2.3 percent in 2022-23, lifting 171 million people above this line. Using the $3.65 per day LMIC poverty line, poverty fell from 61.8 percent to 28.1 percent, lifting

378 million people out of poverty. With the revision of international poverty lines and the adoption of 2021 PPPs (Purchasing Power Parity), under a revised extreme poverty threshold of $3.00 per day and a lower-middle-income line of $4.20 per day, the 2022-23 poverty rates would be adjusted to 5.3 and 23.9 percent, respectively.[13]

According to NITI Aayog, the Multidimensional Poverty Headcount Ratio in India saw a marked decline from 29.17% in 2013-14 to 11.28% in 2022-23, indicating a significant reduction in the population living below poverty line. Similarly, the Multidimensional Poverty Index (MPI), which assesses deprivations in health, education, and living standards, halved from 0.117 to 0.066 during this period[14].

Access to basic services including clean water, sanitation, electricity, and education rose notably from 65% to 88%, suggesting improved quality of life for a large segment of the population. While the Gini Coefficient, a measure of income inequality, showed a slight increase from 0.35 to 0.40, the overall poverty metrics improved significantly.[15]

Several policy and technological interventions likely contributed to these outcomes. Among them, the role of Aadhaar-linked Direct Benefit Transfers (DBT), Pradhan Mantri Jan Dhan Yojana (PMJDY), and Aadhaar-enabled Public Distribution System (AePDS) stands out. DBTs enabled the direct disbursal of welfare subsidies into beneficiaries' bank accounts, substantially minimizing leakage and corruption. The PMJDY was instrumental in driving financial inclusion, having facilitated the opening of over 550 million bank accounts.[16] Furthermore, the Aadhaar-enabled Public Distribution

[13] "IDU-25f34333-D3a3-44ae-8268-86830e3bc5a5.Pdf."
[14] "24.82 Crore Indians Escape Multidimensional Poverty in Last 9 Years."
[15] "24.82 Crore Indians Escape Multidimensional Poverty in Last 9 Years."
[16] "Pradhan Mantri Jan-Dhan Yojana | Department of Financial Services | Ministry of Finance."

System (AePDS) enhanced the precision of food subsidy targeting, ensuring benefits reached the intended recipients more efficiently. AePDS facilitates disbursements of Government entitlements like NREGA, Social Security pension, Handicapped Old Age Pension etc. of Central or State Government bodies, using Aadhaar and authentication thereof.[17]

These systems leveraged digital identity and banking infrastructure to improve the accuracy, transparency, and timeliness of welfare delivery. By reducing exclusion and duplication errors, DPI tools may have supported more effective poverty targeting. However, this observed improvement cannot be attributed to DPI alone. Broader economic growth, targeted poverty alleviation programs, inflation trends, and rural development schemes also likely influenced these outcomes. The relationship between DPI and poverty reduction, therefore, should be seen as potentially enabling rather than definitively causal. The table below presents a mapping of DPI layers and initiatives to KPIs and respective SDG 1 targets.

Technology Layer → Initiative → SDG Mapping

Table 1: India - SDG 1 Mapping

DPI Layer	Initiative	Impacted KPI	SDG target
Identity (Aadhaar)	Direct Benefit Transfers (DBT), PM Jan Dhan Yojana (PMJDY)	Poverty Headcount, MPI	1.1, 1.2
Payments (AePS, UPI)	Cash transfers, pensions	Access to Basic Services	1.3, 1.4
Data Layer	eKYC for service access	Reduced exclusion, improved access	1.4

[17] "Aadhaar Enabled Payment System (AePS) – Aadhaar Pay | NPCI."

KPI Analysis for SDG 8 (Decent Work and Economic Growth)

India demonstrated significant economic recovery and resilience, as reflected in key SDG 8 indicators. India's unemployment rate, which peaked at 7.9% during the height of the COVID-19 pandemic from 7.6% in 2015 declined to 4.2% in 2024.[18] Concurrently, the GDP growth rate rebounded dramatically from -5.8% in 2020 to 8.2% in 2023[19], signaling robust economic revival. This recovery occurred alongside the rapid expansion of digital transaction volumes, credit access for MSMEs, and growth in gig and platform-based employment.

DPI platforms such as UPI, the Goods and Services Tax network (GSTN), and the Account Aggregator (AA) framework may have contributed to these improvements by lowering transaction costs, enabling real-time payments, and expanding credit access to small enterprises. The Unified Payments Interface enabled seamless, low-cost digital transactions, fueling the expansion of the informal gig economy. The AA framework was introduced as a financial data-sharing system by Reserve Bank of India. It is a Non-Bank Finance Company (NBFC) engaged in the business of providing the service of retrieving or collecting financial information pertaining to the customer. AA has significantly empowered small businesses and individuals with access to credit by securely sharing financial data, significantly enhancing financial inclusion. As of 2024, More than 2.2 billion financial accounts are enabled to share data on AA and 112.34 million users have linked their accounts on the AA framework.[20] The eKYC (electronic Know Your Customer) in India offers numerous benefits, including speed, efficiency, cost reduction,

[18] World Bank Open Data, "World Bank Open Data."
[19] World Bank Open Data, "World Bank Open Data."
[20] "Account Aggregator Framework | Department of Financial Services | Ministry of Finance | Government of India."

and enhanced security, especially when using Aadhaar-based verification. It streamlines the identity verification process, reduces paperwork, and enables remote verification, making it more convenient and accessible, particularly in rural areas.

These innovations likely supported productivity gains and enterprise formalization. Nonetheless, improvements in employment and growth were also shaped by fiscal stimulus measures, global trade recovery, and sectoral reforms. As such, while DPI may have contributed to enabling economic dynamism, this thesis does not attempt to isolate its impact from these other influencing factors.

The table below presents a mapping of DPI layers and initiatives to KPIs and respective SDG 8 targets.

Technology Layer → Initiative → SDG Mapping

Table 2: India - SDG 8 Mapping

DPI Layer	Initiative	Impacted KPI	SDG target
Payments (UPI)	MSME digitalization	GDP growth, job creation	8.2,8.3
Identity (Aadhaar)	eKYC for employment	Employment access	8.5
Data Layer (AA)	Financial inclusion	Informal sector credit	8.1

KPI Analysis for SDG 9 (Industry, Innovation, Infrastructure)

Between 2015 and 2023, India witnessed remarkable advancements in infrastructure and industrial innovation, in alignment with Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure). Broadband subscriptions surged from 15% to 80%[21], reflecting a dramatic increase in digital connectivity across urban and rural

[21] "Press Release: Press Information Bureau."

regions. Simultaneously, digital payment volumes skyrocketed, exceeding ₹200 trillion in value by 2023, underscoring the mainstream adoption of digital financial services. The DPI ecosystem also fostered a vibrant entrepreneurial environment, with over 100,000 startups emerging, many leveraging foundational DPI components for innovation in sectors such as fintech, health-tech, and logistics.[22]

Key DPI initiatives played a central role in driving this transformation. The India Stack, a suite of open APIs including Aadhaar, e-KYC, UPI, and DigiLocker provided a robust digital infrastructure that enabled scalable innovation. UPI revolutionized digital payments, while DigiLocker facilitated paperless governance, reducing administrative bottlenecks and improving ease of doing business. The Digital India Mission, combined with the BharatNet project, significantly expanded digital literacy and broadband access, especially in rural areas.

Major apps such as PhonePe, Paytm, and Namma Yatri were built using India Stack APIs, illustrating how public infrastructure underpinned private innovation.[23] The integration of DigiLocker with government systems streamlined access to essential services and documentation, while the GST e-invoicing framework simplified B2B transactions, enhancing transparency and operational efficiency.

These systems have likely contributed to India's improving startup ecosystem and digital innovation metrics However, this growth has also been shaped by broader structural reforms (e.g.: Startup India), foreign investment, demographic trends, and digital consumption patterns. As such, while DPI appears to have functioned as a critical enabler, causality cannot be firmly established within the scope of this study.

[22] World Bank Open Data, "World Bank Open Data."
[23] "2024-DPG-Ecosystem-Report.Pdf."

The table below presents a mapping of DPI layers and initiatives to KPIs and respective SDG 9 targets.

Technology Layer → Initiative → SDG Mapping

Table 3: India - SDG 9 Mapping

DPI Layer	Initiative	Impacted KPI	SDG target
Identity, Payments	India Stack, UPI	Startup growth	9.3
Data Layer (DigiLocker)	Paperless governance	Infrastructure efficiency	9.1, 9.c
Foundational Layer	BharatNet, Digital India	Broadband access	9.c

Brazil Case Study: DPI and SDG KPI Trends

Brazil's Digital Public Infrastructure has played a pivotal role in advancing the nation's socio-economic development, particularly in alignment with the United Nations Sustainable Development Goals. Over the past decade, Brazil has implemented a suite of digital platforms and initiatives aimed at enhancing governance, financial inclusion, and equitable access to services. This case study examines the interplay between Brazil's DPI components such as Gov.br, Pix, and Cadastro Único and their contributions to SDGs 1 (No Poverty), 8 (Decent Work and Economic Growth), 9 (Industry, Innovation, and Infrastructure), and 10 (Reduced Inequalities). By analyzing key performance indicators (KPIs) from 2015 to 2023, we elucidate how these digital initiatives have facilitated progress toward these goals.

Brazil stands as a compelling subject for a Digital Public Infrastructure case study, given its substantial advancements in digital governance and financial inclusion over the past decade. The nation's commitment to DPI is evident through a series of strategic initiatives aimed at enhancing public services and promoting economic growth.

In 2014, Brazil introduced the e-Social platform, a unified system designed to streamline the submission of tax and labor obligations. This initiative simplified compliance processes for employers and improved the efficiency of governmental oversight. Building upon this foundation, the government launched Gov.br in 2019, a centralized digital portal that consolidates various public services, thereby facilitating easier access for citizens and businesses alike. The digital transformation continued with the implementation of PIX in 2020; an instant payment system developed by the Central Bank of Brazil. PIX has revolutionized financial transactions by enabling real-time payments, significantly reducing costs, and fostering financial inclusion across diverse demographics.[24]

The Gov.br platform primarily focuses on digital governance and identity management, while Pix serves as the foundation of Brazil's digital payment infrastructure. Launched in 2020 by the Central Bank of Brazil, Pix is an instant payment system designed to facilitate seamless financial transactions. As it requires users to have a bank or payment account, Pix functions as a crucial intermediary between individual accounts and businesses. By enhancing transaction speed and eliminating transfer costs, Pix has played a significant role in advancing financial inclusion across the country.[25]

This thesis will assess the impact of Brazil's DPI on SDG indicators, with a focus on measuring its contributions to poverty reduction (SDG 1), economic growth and employment (SDG 8), industry and innovation (SDG 9), and inequality reduction (SDG 10, Brazil case only)

[24] Bandura et al., *Approaches to Digital Public Infrastructure in the Global South*, August 26, 2024.
[25] Duarte et al., "Central Banks, the Monetary System and Public Payment Infrastructures."

KPI Analysis for SDG 1(No Poverty)

Brazil experienced fluctuations in poverty levels over the past decade. The poverty headcount ratio, defined by the percentage of the population living below the international poverty line of $1.90 per day, decreased from 3.4% in 2015 to 1.7% in 2020. However, broader measures indicate that the poverty rate at $5.50 per day was 23.5% in 2022, reflecting persistent challenges in eradicating poverty.[26] The World Bank calculations for 2022 indicate that 23.5 percent of Brazilians lived in poor households ($6.85/day per capita or less, 2017 PPP). Estimates for 2023 suggested a decrease of 1.7 percentage points due to the earnings improvements across the wage distribution and an 81 percent rise in spending on Bolsa Familia year-over-year. Apart from 2020, when the Auxílio Emergencial program was temporarily introduced, this is the lowest poverty rate recorded in over four decades (21.8 percent).[27]

The integration of CadÚnico with digital platforms like Caixa Tem and Pix may have helped improve welfare delivery by increasing access, speed, and efficiency. Bolsa Família, Brazil's flagship conditional cash transfer program, leveraged these digital tools to reach over 20.71 million families[28], enhancing the efficiency and transparency of welfare distribution.

While these interventions were essential, other macroeconomic factors, including inflation control, commodity price fluctuations, and fiscal policies, also played important roles in shaping poverty trends. Therefore, DPI's influence should be viewed as

[26] "Brazil Poverty Rate 1981-2025 | MacroTrends."
[27] Bank, "Brazil Poverty and Equity Brief."
[28] em 22/04/2024 16h22, "Bolsa Família reduz desigualdades no Brasil, aponta PNAD Contínua do IBGE."

complementary to broader public policy mechanisms. The table below presents a mapping of DPI layers and initiatives to KPIs and respective SDG 1 targets.

Technology Layer → Initiative → SDG Mapping

Table 4: Brazil - SDG 1 Mapping

DPI Layer	Initiative	Impacted KPI	SDG target
Identity, Payments	Cadastro Único	Poverty headcount ratio	1.3
Data Layer (DigiLocker)	Pix	Efficiency of benefit transfers	1.4
Foundational Layer	Caixa Tem	Access to financial services	1.4

KPI Analysis for SDG 8 (Decent Work and Economic Growth)

Brazil's unemployment rate saw a peak during the pandemic, reaching approximately 13.7% in 2020. However, by 2024, it declined to around 7.6%, indicating a recovering labor market. The informal employment rate remains a concern, particularly in the North and Northeast regions, where it exceeds 60%. Average hourly earnings also reflect disparities, with women and persons with disabilities earning below the national average.[29]

The deployment of Pix has been cited as a key driver of financial inclusion and digital economic participation, with over 150 million users registered by 2024.[30] The Gov.br platform provides access to employment services and vocational training programs, enhancing workforce development. The Espírito Santo Digital Acceleration Project, supported by the World Bank, aims to create thousands of jobs by improving digital infrastructure and skills training, particularly for women and marginalized groups.

[29] World Bank Open Data, "World Bank Open Data."
[30] Pix Statistics, "Pix Statistics."

The availability of low-cost, real-time payments has empowered small entrepreneurs and informal workers to access new markets, reducing dependence on cash and improving transaction traceability. These changes may have supported broader employment stabilization and consumer spending. However, recovery in Brazil's labor market was also driven by macroeconomic stabilization, international trade dynamics, and targeted public employment schemes. Hence, DPI tools like Pix may have positively influenced work and income generation patterns, the precise scale of this impact cannot be independently verified in this thesis. The table below presents a mapping of DPI layers and initiatives to KPIs and respective SDG 8 targets.

Technology Layer → Initiative → SDG Mapping

Table 5: Brazil - SDG 8 Mapping

DPI Layer	Initiative	Impacted KPI	SDG target
Payments	Pix	Informal sector participation	8.3
Identity	Gov.br	Access to employment services	8.5
Infrastructure	Espírito Santo Digital Acceleration	Job creation	8.2

KPI Analysis for SDG 9 (Industry, Innovation, and Infrastructure)

Brazil has made noteworthy progress in expanding digital infrastructure and supporting innovation. Broadband penetration increased substantially, with internet access in 92.5% of Brazilian households in 2023, up from 78.1% in rural areas in 2016.[31]

[31] Agência de Notícias - IBGE, "Internet Was Accessed in 72.5 Million Brazilian Households in 2023 | News Agency."

The country is home to 1300 fintech startups, many of which operate DPI-enabling platforms like Pix, Gov.br, and Nota Fiscal Digital.[32]

These platforms have simplified compliance, expanded access to government services, and enabled the rapid onboarding of digital enterprises.[33] The Brazilian government's commitment to public sector digitalization and the regulatory environment for open banking have further accelerated innovation. However, these outcomes are influenced by a range of additional factors including foreign investment in fintech, urban innovation policies, and digital demand trends. As in the Indian case, this analysis does not attempt to quantify the isolated effect of DPI on infrastructure and innovation metrics, but rather to highlight its potential role as a digital enabler. The table below presents a mapping of DPI layers and initiatives to KPIs and respective SDG 9 targets.

Technology Layer → Initiative → SDG Mapping

Table 6: Brazil - SDG 9 Mapping

DPI Layer	Initiative	Impacted KPI	SDG target
Payments	Pix	Broadband penetration	9.c
Identity	Gov.br	Efficiency of public Services	9.1
Infrastructure	Connected Schools	Fintech Innovation	9.3

[32] "Digitalstrategy.Pdf."
[33] "Brazil - Launches the Brazilian Artificial Intelligence Plan 2024-2028 | Investment Policy Monitor | UNCTAD Investment Policy Hub."

Conclusion

The case studies of India and Brazil suggest that DPI initiatives have contributed, at least in part, to measurable improvements in several development indicators aligned with SDG 1, SDG 8, and SDG 9. In both contexts, DPI platforms appear to have enhanced the delivery of public services, expanded access to digital financial systems. And lowered entry barriers for small enterprises and entrepreneurs. However, these findings should be interpreted with caution. Broader economic reforms, fiscal policies, demographic changes, global trade shifts, and other institutional factors have likely also played a role in shaping these outcomes. The observed progress in KPIs may therefore be the result of a confluence of drivers, with DPI acting as one among several enabling elements.

This chapter does not claim to identify precise causal relationships between DPI and development outcomes; such attribution would require more granular, controlled empirical research, including econometric modeling and counterfactual analyses. Rather, the purpose here is to examine whether DPI – based on current evidence – can be seen as a plausible facilitator of inclusive governance and sustainable development. The findings support the proposition that wee-designed, accessible, and scalable digital infrastructure holds significant potential to strengthen state capacity, improve service delivery, and foster socio-economic inclusion. These observations lay the foundation for further research into the institutional, technical, and contextual conditions under which DPI can most effectively support national development agendas.

Chapter IV.

Adoption of India's DPI: Philippines, Sri Lanka, and Ethiopia

This chapter examines the export and adaptation of India's DPI components, particularly the Modular Open-Source Identity Platform (MOSIP) and the Unified Payments Interface (UPI) in the Philippines, Sri Lanka, and Ethiopia. Through these case studies, we analyze the mechanisms of technology transfer, the socio-political contexts influencing adoption, and the implications for digital governance in the Global South.

The Philippines: Implementing MOSIP through PhilSys

The Philippines was among the first countries to implement MOSIP, India's open-source identity platform. Known locally as PhilSys, this initiative is managed by the Philippine Statistics Authority (PSA). The goal is to create a foundational digital ID for all citizens and resident aliens, reducing duplication and streamlining service delivery. As of 2024, more than 76 million citizens have enrolled in PhilSys. This development reflects a larger push towards digital government services, with PhilSys forming the backbone for authentication in areas such as banking, health care, and education.[34]

The rollout of PhilSys has been characterized by an emphasis on legal and data protection frameworks to ensure privacy. The system allows the integration of biometric and demographic data, enabling seamless KYC (Know Your Customer) compliance for financial inclusion. The PSA worked with international partners, including the World

[34] Bandura et al., *Approaches to Digital Public Infrastructure in the Global South*, August 26, 2024.

Bank and India's iSPIRT Foundation, to adapt the platform to local legal contexts, technical infrastructure, and linguistic needs. PhilSys is also integrated with e-government services and is poised to be linked with a national digital payment gateway, enhancing its utility in welfare distribution, tax collection, and mobile banking.

The successful rollout of PhilSys has improved access to government services and financial inclusion. Future plans involve integrating PhilSys with digital payment platforms and expanding its use in the private sector.[35]

Sri Lanka: Integrating UPI and Developing GovPay

Sri Lanka's engagement with India's DPI model is driven by a dual focus: integrating India's Unified Payments Interface (UPI) with LankaPay and building its own centralized digital payments platform called GovPay. The UPI-LankaPay integration marks a significant milestone in regional financial connectivity, offering Sri Lankans and Indian tourists the ability to conduct real-time, cross-border transactions at zero cost. Announced during the Indian External Affairs Minister's visit to Colombo in 2023, this collaboration facilitates a smoother payments experience in tourism, remittances, and trade settlements between the two countries.[36]

GovPay: A Centralized Payment Platform

GovPay, launched in February 2025 by the Information and Communication Technology Agency (ICTA) in partnership with LankaPay, is a digital platform that

[35] "SIGNED-PR-PSA-BSP-All-National-ID-Formats-Accepted_fin.Pdf."
[36] *India – Sri Lanka Joint Statement Fostering Partnerships for a Shared Future – Ministry of Foreign Affairs, Foreign Employment & Tourism*.

consolidates payments across all government departments. The system supports real-time fee and tax payments, pensions, license renewals, and procurement disbursements through a unified interface. It is integrated with national identification databases to ensure authenticated and auditable transactions. This project reflects the growing recognition that public sector digital finance must be interoperable, inclusive, and transparent. The adoption of India's payment system architecture provided Sri Lanka with a framework to build its own interoperable financial rails while preserving sovereignty over the platform's governance.[37]

Impact and Reception

The digital transformation in Sri Lanka has been lauded for improving the efficiency of public service delivery, reducing administrative burden, and increasing transparency. GovPay has facilitated the real-time tracking of government revenues and streamlined service access for citizens and businesses. The integration of biometric ID and GovPay enables automated eligibility verification for welfare schemes, significantly reducing leakages. However, there have also been challenges, particularly regarding the redundancy of traditional postal and in-person payment systems. The loss of fee-based revenues for certain government departments and the need to retrain bureaucratic personnel have raised concerns about long-term sustainability.

The government responded with a multi-tiered policy approach, including digital literacy campaigns, staff reskilling programs, and regulatory safeguards to ensure digital inclusion for vulnerable populations. Furthermore, partnerships with Indian DPI

[37] "Information and Communication Technology Agency of Sri Lanka."

architects helped localize technological implementation while maintaining interoperability. As Sri Lanka continues to expand GovPay and its UPI-based cross-border infrastructure, it aims to position itself as a regional hub for digital governance innovation, supported by South-South knowledge transfer.[38]

Ethiopia: Exploring UPI integration and Digital Collaboration

Ethiopia's collaboration with India focuses on integrating UPI with EthSwitch, Ethiopia's national payment switch, to enhance digital transactions and financial inclusion.

Strategic Engagement

Ethiopia represents a different model of engagement with India's DPI, one that is still in its exploratory stages. In 2023, during the 6th India-Ethiopia Joint Trade Committee meeting, both nations discussed leveraging India's DPI experience to support Ethiopia's emerging digital ecosystem. Ethiopia's central payment infrastructure, EthSwitch, has been identified as a potential candidate for UPI integration, allowing for real-time domestic and future cross-border transactions.

This collaboration aligns with Ethiopia's Digital Ethiopia 2025 strategy, which emphasizes building a secure, inclusive, and affordable digital economy. As part of the early phase of cooperation, the Indian government, in collaboration with the National Payments Corporation of India (NPCI), initiated technical feasibility studies and policy dialogues with the National Bank of Ethiopia. UPI's open API design and mobile-first

[38] Weerasinghe, *Central Bank of Sri Lanka*.

architecture make it a strong candidate for adaptation in Ethiopia's fintech ecosystem, which is rapidly expanding through mobile money services.[39]

Pan-African e-Network Project

In addition to financial infrastructure, India's support to Ethiopia also extends through the Pan-African e-Network Project, a broader initiative launched by India in 2009 to offer tele-education and telemedicine services to African nations. Ethiopia has been a key beneficiary, with digital classrooms and healthcare linkages to Indian universities and hospitals enhancing access in rural areas. The Pan-African e-Network serves as a precursor to DPI cooperation by familiarizing African stakeholders with Indian digital frameworks and service delivery models.

Capacity building has been a central pillar of this partnership. Ethiopian officials have received training in Aadhaar architecture, UPI transaction workflows, and open-source development via India Stack tools. This soft infrastructure development is critical, as it lays the foundation for Ethiopia to adopt modular DPI components like MOSIP or UPI in the future. The country's ability to leverage lessons from India's scale, interoperability standards, and consent-based data principles may serve as a launchpad for broader digital public infrastructure development in East Africa.

While Ethiopia's engagement with India's DPI model is in the exploratory phase, challenges such as infrastructure limitations and regulatory frameworks need to be addressed to realize the full potential of this collaboration.

[39] "6th Session of India-Ethiopia Joint Trade Committee Held Successfully in Addis Ababa, Ethiopia."

Comparative Analysis

The export of India's DPI model to the Philippines, Sri Lanka, and Ethiopia reveals both shared principles and diverse implementation pathways. A central commonality lies in the modular and open-source architecture of India's platforms, which permits customization without compromising core interoperability. MOSIP, for instance, enabled the Philippines to retain legal and linguistic sovereignty while deploying a scalable national ID system. Sri Lanka adopted UPI-like interoperability principles in building its own GovPay infrastructure, while simultaneously leveraging India's digital payments expertise for cross-border integration. Ethiopia, though at an earlier stage, demonstrates how technical feasibility studies and training exchanges form the groundwork for future DPI adoption.

However, the comparative experiences also highlight key contextual differences. The Philippines benefitted from early adoption and multilateral funding through World Bank initiatives, enabling quicker infrastructure rollouts. Sri Lanka's approach has been institutionally centralized, driven by fiscal digitalization needs amidst economic restructuring. Ethiopia, in contrast, must navigate institutional fragility, limited connectivity, and a nascent fintech ecosystem—factors that complicate DPI implementation. Nonetheless, its emphasis on sovereignty, inclusion, and gradual digitization reflects a measured and sustainable approach.

These comparative insights affirm the adaptability of India's DPI components, but also point to the importance of political will, institutional readiness, and regulatory alignment. The degree to which these systems promote financial inclusion, public trust, and innovation depends not only on technology transfer but also on governance

ecosystems and capacity-building investments. India's role as a facilitator rather than exporter of digital sovereignty offers a distinct model of South-South partnership that prioritizes empowerment over dependency.

India's DPI as Global Digital Commons

India's Digital Public Infrastructure presents a unique alternative to the privatized and surveillance-oriented models of the West and China. By centering openness, modularity, and public governance, India has positioned its DPI as a global digital commons available for adaptation by countries seeking to leapfrog legacy systems and promote inclusive growth. The case studies of the Philippines, Sri Lanka, and Ethiopia illustrate how this commons-based model supports tailored implementations across different development contexts, without imposing one-size-fits-all solutions.

The internationalization of India's DPI underscores the emergence of new diplomatic paradigms termed as "techno-sovereign development cooperation." By offering not only technology but also institutional support, policy templates, and training, India is reshaping the rules of engagement in the digital economy. This has significant implications for global digital governance, particularly within the Global South, where trust in multilateral platforms is evolving. Moreover, DPI diplomacy enhances India's strategic soft power by embedding its technological values in the public infrastructures of its partner nations.

Looking forward, sustained success will depend on institutionalizing support ecosystems around DPI exports. India must continue investing in regional collaborations, technical assistance, and the development of open standards to ensure long-term interoperability and mutual accountability. As the Global South collectively reimagines

digital governance, India's DPI model stands as both a toolkit and a testament to the power of digital public goods in fostering inclusive, sovereign, and cooperative futures.

Chapter V

Projecting India as a Model for the Global South through DPI

India's Digital Public Infrastructure has emerged not only as a transformative tool domestically but also as a potent instrument of soft power in its global engagements, especially within the Global South. Rooted in open-source technology, modular design, and principles of inclusion and transparency, India's DPI particularly through layers like Aadhaar (identity), UPI (payments), and DEPA (data governance) has become a reference model for many developing nations seeking scalable, sovereign, and cost-effective digital solutions. The strategic export of DPI components is increasingly perceived as a development diplomacy mechanism, projecting India as a technological thought leader among peer economies.

This chapter synthesizes economic modeling, KPI trends, and progress across SDGs to argue that India's DPI success offers a replicable, impactful model for the Global South. Through data-driven insights from this thesis, it is demonstrated that India's DPI enables rapid financial inclusion, increases government service efficiency, and creates productivity gains that reinforce economic resilience. The adoption of India's DPI by countries such as the Philippines, Sri Lanka, and Ethiopia illustrates its applicability across varied institutional and infrastructural contexts, reinforcing its potential as a global public good. The economic model emphasizes scalability, interoperability, and inclusivity, ensuring that digital services reach the most

marginalized populations. By reducing barriers to access and enabling efficient service delivery, India's DPI contributes to economic empowerment and social equity.

Economic Efficiency and Productivity Gains: Exploratory Insights

Preliminary economic modeling suggests that India's DPI may generate notable cost-efficiencies compared to traditional analog systems. For instance, biometric authentication enabled by Aadhaar has been associated with reduced duplication in welfare rolls and improved targeting of beneficiaries, with estimates suggesting savings of approximately $23 billion in public expenditure between 2014 to 2018.[40] These figures, while promising, are based on government-reported data and require further independent verification. Nonetheless, they provide a useful indication of the scale at which digital identity infrastructure can potentially improve administrative efficiency.

Similarly, the expansion of UPI has coincided with a significant increase in digital transactions, reaching over 100 billion transactions in 2023.[41] While this growth may reflect broader digitization trends and policy incentives such as demonetization and COVID-related digital adoption, UPI's interoperability and ease of access appear to have played a facilitating rile.

Small and medium enterprises (SMEs) using DPI-enabled fintech platforms like ONDC (Open Network for Digital Commerce) reported up to 30% increase in operational efficiency and 20% growth in customer base.[42] These figures must be interpreted

[40] "Echapter.Pdf."
[41] "Unified Payments Interface (UPI) Product Statistics | NPCI."
[42] "Open Data."

cautiously, but they point to the potential of DPI as an enabling environment for enterprise-level productivity gains.

DPI and SDG Alignment

The analysis of DPI impact on SDG KPIs draws attention to how DPI may plausibly interact with the indicators associated with SDG goals. Under SDG 1 (No Poverty), DPI interventions such as Aadhaar-linked Direct Benefit Transfers (DBTs) and Jan Dhan bank accounts may have supported income stability by streamlining social protection delivery and reducing transaction leakages. These mechanisms appear to have improved the efficiency and inclusivity of government-to-person payments, especially among rural and low-income populations.

Under SDG 8 (Decent Work and Economic Growth), DPI's potential contribution lies in reducing barriers to economic participation. UPI and digital credit platforms may have supported financial inclusion and entrepreneurial activity by offering low-cost digital transaction channels and facilitating micro-lending. Additionally, initiatives like the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) have attempted to link digital literacy with workforce development, potentially enhancing employability. While macroeconomic factors, labor market reforms, and global economic shifts all shape India's growth trajectory, the spread of digital tools may have complemented these trends by expanding access to formal financial systems and markets.[43]

For SDG 9 (Industry, Innovation, and Infrastructure), DPI platforms such as DigiLocker and India Stack APIs may have contributed to reducing friction in business

[43] "SDG_India_Index_2023-24.Pdf."

registration, service onboarding, and compliance. Startup ecosystems leveraging DPI components have reportedly found it easier to build services for document authentication, payments, and identity verification, reducing time to market and operational costs. Concurrently, broadband expansion and mobile penetration – supported

by initiatives like BharatNet—have extended the reach of DPI into underserved areas. As of 2023, India had registered nearly 48.4 million fixed broadband subscriptions, signaling progress in digital infrastructure development, though significant urban-rural disparities persist.

India's DPI in the Global South: Observed Patterns and Early Adoption

India's approach to digital cooperation has taken the form of modular, demand-driven support for DPI adoption in LMICs, particularly in the Global South. Rather than exporting a rigid framework, India offers open-source components such as MOSIP (for identity) and BHIM-UPI (for payments), which allow partner countries to adapt the technologies to their institutional and infrastructural conditions. The Philippines' adoption of MOSIP for its PhilSys ID, Sri Lanka's implementation of UPI-linked GovPay, and Ethiopia's exploratory engagement with DPI design principles all indicate growing interest in India's digital model.

It is too early to draw conclusions about the long-term outcomes of these partnerships. However, the early uptake of Indian DPI components suggests that the model's features—low-cost, open-source, scalable, and sovereign-compatible—resonate with governments seeking alternatives to expensive, proprietary digital systems. India's DPI has also been positioned as a complement to rather than a replacement for national systems, allowing recipient countries to retain policy autonomy while enhancing

technical capacity. These developments suggest an evolving role for India in shaping the global digital commons through cooperative, rather than prescriptive, engagement.[44]

Soft Power and Digital Diplomacy: An Emerging Dimension

India's DPI also functions as a form of digital soft power, extending the country's influence through technological cooperation and development assistance. In contrast to proprietary platforms developed by large tech corporations, India's DPI initiatives are framed as public goods—openly shared and adaptable for public benefit. This approach has earned India visibility in multilateral forums such as the G20 and the Digital Public Goods Alliance, where it has positioned DPI as a normative alternative for inclusive digital transformation.

The appeal of India's model lies in its affordability, transparency, and compatibility with democratic governance. Many countries in the Global South lack the fiscal capacity to procure commercial solutions or the bargaining power to negotiate data sovereignty within closed platforms. India's DPI model, by contrast, emphasizes public control, modularity, and consent-based data governance. It also aligns with broader developmental values such as equity, participation, and interoperability—features that enhance its diplomatic resonance. While the full extent of India's digital influence remains to be seen, its efforts to institutionalize DPI as a global public good reflect a strategic shift in how digital technologies are deployed in development cooperation.

[44] "SDG_India_Index_2023-24.Pdf."

Challenges and Considerations

Despite its perceived success, India's DPI model is not without challenges. Issues of data privacy, consent enforcement, cybersecurity, and digital literacy remain areas of concern. The Aadhaar system, for instance, has faced scrutiny over data breaches and the risk of exclusion due to authentication failures. Moreover, the uneven distribution of digital access—especially in remote and low-income regions—poses risks of deepening inequality if not carefully managed.

Scalability and contextual adaptability are also critical considerations. While the modular nature of India's DPI may enhance its transferability, implementation in other countries must take into account differences in political will, institutional strength, regulatory readiness, and digital infrastructure. Further, there is a need for comprehensive governance frameworks to ensure that DPI deployments align with local legal systems, human rights protections, and ethical standards.

These concerns underscore the need for ongoing monitoring, inclusive design, and international collaboration. India's partnerships should prioritize capacity-building, transparent co-development, and participatory approaches to ensure that DPI systems remain accountable, sustainable, and responsive to diverse contexts.

Toward an Inclusive DPI-led Development Paradigm

In synthesizing the exploratory findings of this thesis, it becomes evident that India's DPI ecosystem offers a compelling case of how public sector-led digital infrastructure can support governance reform and developmental progress. While the evidence is preliminary and does not establish conclusive causality, the correlation between DPI initiatives and improvements in SDG-relevant indicators suggests a

potentially enabling role. Furthermore, India's DPI export strategy—grounded in openness, affordability, and sovereignty—represents a new model of South–South cooperation, one that prioritizes co-creation over conditionality.

As global discourse increasingly centers on the future of digital governance, India's DPI may serve as both a practical and normative reference for other developing nations. Its integration into international dialogues, its early adoption by LMICs, and its recognition in multilateral forums point to the emergence of DPI not merely as a tool of domestic reform, but as a scaffold for a more equitable global digital order. Continued research, cross-country evaluations, and inclusive governance models will be vital to realizing this potential.

While much remains to be explored, the lessons from India's experience offer valuable insights for countries at the cusp of digital transformation. Through adaptive strategies and sustained cooperation, DPI can contribute meaningfully to achieving the SDGs and advancing inclusive, sustainable development in the digital age

Chapter VI

Policy Recommendations and Conclusions

India's Digital Public Infrastructure (DPI) has demonstrated potential not only as a domestic governance reform but also as a framework for digital transformation and soft power projection in the Global South. However, to realize its full potential—both at home and internationally—India must craft a strategic policy roadmap that expands its technological foundations, strengthens inclusive access, and integrates DPI into the broader frameworks of economic diplomacy, trade, and development partnerships. This chapter offers policy recommendations across four strategic dimensions: technological advancement, economic linkages, institutional capacity, and international collaboration.

Deepening Technological Capabilities through AI Integration

India's DPI can be significantly augmented through the responsible integration of Artificial Intelligence (AI) to enhance system adaptability, service targeting, and real-time public sector responsiveness. Dedicated AI Centers of Excellence focused on DPI applications must be established within premier academic and research institutions. These centers should be tasked with developing open-source AI tools tailored to public functions – such as fraud detection in welfare schemes, AI-based credit scoring for microfinance, and natural language chatbots for multilingual service delivery.

Simultaneously, India must adopt ethical governance frameworks to regulate the use of AI within public infrastructure. Transparency, explainability, and grievance

redressal should form the core of any algorithm deployed in DPI systems. Contextual safeguards – especially for historically marginalized communities – must be prioritized to ensure that algorithmic decision-making does not perpetuate exclusion.

Linking DPI to Economic Policy: Trade, Capital, and Industry

DPI should not be viewed solely as a governance platform but as an economic enabler that intersects with national priorities on trade, investment, and industrial development. With proper integration, DPI can play a crucial role in facilitating bilateral trade and enhancing capital flows, both critical to India's growth strategy and its role in Global South.

India should use the open standards and interoperable nature of its DPI systems to propose digital trade corridors with strategic partners. For instance, interoperable UPI-based payment systems can be extended to enable real-time, low-cost cross-border settlements, particularly with countries in Africa and Southeast Asia. Such systems would reduce transaction frictions in bilateral trade, facilitate SME participation in export markets, and increase the use of local currencies in international settlements, reducing dependency on the US dollar.

DPI can also help attract foreign capital by increasing the transparency, traceability, and efficiency of India's financial and regulatory systems. A fully digitized consent-based data sharing framework can lower the cost of credit risk assessment, facilitate venture capital in undeserved sectors and allow global investors to participate in digital public infrastructure ventures via blended finance models. The Account Aggregator framework, when scaled, can enable more data-driven investment decisions

in areas such as microfinance, health, and agriculture – sectors often constrained by lack of structured data.

For Indian business and industry, DPI must evolve from a public platform to a co-development ecosystem. Policies should incentivize domestic startups, fintechs, regtechs, and agri-tech firms to build interoperable applications on top of DPI layers. This can be achieved through public-private sandboxes, targeted procurement by the government, and easier data access for DPI-compliant innovations. Export incentives, similar to those in the software industry, should be extended to DPI-aligned services exported to Global South markets.

India should also use its DPI experience to promote the digitization of supply chains, especially for MSMEs engaged in regional production networks. Linking DPI tools such as e-invoicing, GSTN, and UPI to international trade facilitation platforms can increase participation of Indian industry in global value chains, reduce compliance burdens, and improve export competitiveness.

DPI and Strategic Geopolitical Alignment

As digital systems increasingly influence the configuration of global power, India's DPI must be strategically aligned with foreign policy and geopolitical vision. India's DPI diplomacy – while grounded in South-South cooperation, should also complement its engagements within multilateral forums such as the G20, BRICS+, BIMSTEC, and the Global Digital Compact.

India should position itself as an entrepreneur in global digital governance by promoting open standards, democratic data rights, and ethical AI practices. The framing of DPI as a global public good must be operationalized through global advocacy for

interoperability charters, cross-border digital credential standards, and shared data stewardship principles. These diplomatic efforts would differentiate India's digital diplomacy from other global actors.

In regions such as Africa and Southeast Asia, India should strategically align DPI deployment with its foreign aid, trade, and security interests. Technical assistance programs to build DPI in partner countries should be linked to economic cooperation agreements and investment partnerships. India could also advocate for DPI-based digital corridoes that facilitate regional financial integration, talent mobility, and public service co-development. These initiatives can bolster India's influence in emerging regions while promoting digital sovereignty and resilience.

Strengthening DPI Foundations for Inclusive Growth

As DPI continues to scale, India must address critical gaps in infrastructure, cybersecurity, and digital literacy to ensure its sustainability and inclusiveness. Universal broadband connectivity remains uneven, especially in rural and tribal districts. To close this gap, targeted infrastructure investments – through public-private partnerships and satellite broadband – should be prioritized. Equally important is cybersecurity. India must adopt a national DPI cybersecurity framework that mandates regular audits, threat simulations, and continuous updates of system defenses at the local, state, and national levels.

On the other side, digital literacy must move beyond basic access to include rights awareness, consent education, and AI interpretability. Training modules should be embedded within existing government touchpoints such as CSCs and Aadhaar centers.

These initiatives would not only increase DPI uptake but also ensure that technological empowerment is accompanies by civic awareness.

Leveraging Mineral Wealth through DPI-Enabled Resource Governance

India's critical mineral reserves represent a strategic asset in both domestic industrialization and international partnerships. By integrating DPI with the governance of mineral exploration, licensing, and exports, India can ensure transparency and traceability in the mineral value chain. Digital platforms like DigiLocker and the National Single Window System should be expanded to cover mineral logistics, ESG compliance, and real-time royalty tracking. This would reduce regulatory opacity and attract private sector investment.

Regionally, India can propose DPI-enabled mineral cooperation frameworks with resource-rich countries in the Global South. A regional digital registry of mineral deposits, paired with UPI-style payment systems and smart contracts, could streamline trade and investment. India could lead joint R&D initiatives on clean energy minerals, recycling technology, and sustainable mining practices – thereby ensuring that DPI supports green growth as well as economic diplomacy.

Institutionalizing DPI-Based South-South Cooperation

India's DPI has already gained interest from countries such as Sri Lanka, the Philippines, Ethiopia, and Morocco. To institutionalize this momentum, India should establish a Global DPI Partnership Office housed with the Ministry of External Affairs in collaboration with MeiTY. This office can coordinate technical assistance, offer policy toolkits, and serve as a liaison for DPI deployments abroad.

In tandem. India should promote DPI as a pillar of South-South multilateralism. A Digital Infrastructure Fund for the Global South – possibly co-hosted with development banks could finance DPI adoption in least-developed countries. India's previous success with multilateral efforts such as the International Solar Alliance (ISA) offers a viable model. This would position India not merely as a technology exporter but as a convener of digital solidarity.

These policy recommendations underscore the multi-dimensional role that DPI can play in shaping India's future – as a tool of domestic governance, as an enabler of economic transformation, and as an anchor of geopolitical influence. By integrating emerging technologies such as AI, reinforcing the DPI-business nexus, leveraging critical minerals, and aligning DPI with foreign policy, India can consolidate its position as the leading architect of digital governance for the Global South.

Going forward, DPI policy must operate at the intersection of innovation and ethics, sovereignty and cooperation, national development and global equity. With sustained institutional commitment and inclusive design, India's DPI has the potential not just to serve its own citizens better, but to inspire a new model of digital public goods that transcend borders and build bridges across communities and nations.

Chapter VII

Conclusion

This thesis set out to explore a central question at the intersection of technology, development, and international relations: Can Digital Public Infrastructure (DPI), as pioneered by India, serve as an effective instrument of governance and a soft power tool capable of shaping sustainable development across the Global South? In addressing this question, the study undertook a multi-layered inquiry – grounded in case studies, economic modeling, and SDG-aligned KPI analysis – focusing primarily on India and Brazil, with secondary attention to DPI adoption in Ethiopia, Sri Lanka, and the Philippines.

At its core, the research adopted an exploratory, descriptive approach, reflecting both the novelty of DPI as a policy construct and the evolving nature of its applications across contexts. Rather than asserting deterministic causality between DPI interventions and development outcomes, the thesis sought to understand whether DPI constitutes a plausible and replicable enabler of effective governance and inclusive growth, especially within low- and middle-income countries. The analysis suggests that DPI, when designed and implemented with institutional integrity and citizen-centric safeguards, can function as a critical lever in bridging governance deficits, expanding access to public goods, and fostering digital sovereignty.

India's experience provided the principal lens through which this exploration unfolded. The country's layered DPI ecosystem – comprising Aadhaar (digital identity),

UPI (payments), DigiLocker and DEPA (data exchange and governance) was examined both as a domestic reform strategy and as a model of technological diplomacy. India's deployment of DPI platforms over the past decade has coincided with significant improvements in SDG-relevant indicators: reductions in poverty headcount, expansion of financial inclusion, increases in digital transaction volumes, and broader access to government services. While these trends cannot be wholly attributed to DPI, the correlation between infrastructure deployment and developmental progress is suggestive of an enabling relationship.

The analysis further highlighted the architecture of DPI – open-source, modular, and interoperable – as a critical factor in its appeal and adaptability. In contrast to proprietary platforms often tied to commercial or geopolitical interests, India's DPI is characterized by its emphasis on public value, user control, and scalable integration. This architecture has allowed for a diversity of use cases – from Aadhaar-enabled welfare distribution and UPI-facilitated informal commerce, to data-sharing for credit access under the Account Aggregator framework – demonstrating the platform's capacity to serve as a policy substrate for multiple sectors.

One of the thesis's key contributions lies in its effort to map DPI initiatives to specific SDG KPIs, using secondary data and economic modeling. This exercise served to clarify the plausible mechanisms through which DPI affects developmental outcomes. For example, Aadhaar's integration with Direct Benefit Transfer (DBT) systems likely improved the targeting and efficiency of poverty alleviation programs, relevant to SDG 1. UPI's role in reducing transaction costs and fostering the gig and MSME economies aligns with SDG 8. And DPI's foundational role in supporting startup innovation,

infrastructure efficiency, and broadband connectivity corresponds to SDG 9. These mappings not only support DPI's relevance to development policy but also suggest a framework through which its international replication might be evaluated.

Brazil's case, while distinct in its policy design, offered a valuable comparative anchor. The country's growing investments in DPI platforms like CadÚnico, Gov.br, and Pix illustrate the convergence of digital governance principles across the Global South. While Brazil's DPI trajectory has differed from India's in terms of institutional lead, public-private collaboration, and technological emphasis, its evolution confirms that DPI is not a culturally or politically bound artifact, but rather a flexible paradigm capable of diverse adaptations.

The thesis also examined India's strategic use of DPI as a tool of soft power and digital diplomacy. Through initiatives such as the India Stack Global, the Global DPI Repository, and capacity-building partnerships with LMICs, India has reframed its digital infrastructure as a global public good. This move reflects a shift from traditional models of technology transfer often driven by commercial or conditionality-laden frameworks – to one premised on co-development, modular adoption, and policy autonomy. India's engagements with Ethiopia, Sri Lanka, and the Philippines demonstrate the early diffusion of this model, albeit with context-specific adaptations and constraints.

However, the thesis acknowledges several limitations. The data used for economic modeling were drawn from secondary sources, and causal attribution remains difficult in the absence of counterfactuals or controlled evaluation environments. The exploratory nature of the research limits the generalizability of findings, and the heterogeneity of DPI systems across countries means that what succeeds in one context

may not automatically translate to another. Moreover, the ethical, privacy, and equity concerns associated with DPI – especially in areas such as biometric identity and AI-based service delivery must remain central in policy discourse.

Nevertheless, this thesis argues that India's DPI experience offers an important proof of possibility. It demonstrates that large-scale digital transformation, when led by the public sector and guided by open standards, can enhance state capacity, increase inclusion, and improve service delivery – objectives central to the SDGs. Furthermore, DPI's alignment with principles of data sovereignty, affordability, and modularity makes it a compelling alternative for nations seeking to digitize governance without becoming dependent on external corporate actors.

Looking ahead, several policy pathways emerge. Integrating AI into DPI must be pursued with caution and deliberation, ensuring ethical governance and inclusion. Leveraging DPI for regional cooperation especially in areas such as trade facilitation, capital flows, and mineral governance can enhance India's economic diplomacy while offering tangible developmental benefits to partners. Institutionalizing DPI-based multilateral cooperation, developing interoperable standards, and supporting digital infrastructure funds can help scale DPI beyond bilateral engagements.

In conclusion, India's DPI offers a new model of digital development – rooted in public purpose, guided by equity, and capable of international resonance. For the Global South, where governance gaps often coexist with technological ambition, DPI may serve not just as an innovation, but as a framework for reimagining how the state and citizen interact in the digital age. By continuing to invest in inclusive infrastructure, ethical

technologies, and strategic diplomacy, India has the potential to lead not merely in digital innovation, but in shaping a more equitable and cooperative global digital order.

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