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NITI Aayog

NITI Frontier Tech Hub

DPI@2047 for Viksit Bharat

A Strategic Roadmap to Enable Non-linear Inclusive Socio-economic Growth

April 2026

Disclaimer

This roadmap has been prepared by NITI Frontier Tech Hub (FTH) in consultation with experts and stakeholders. The data used is from secondary sources. Any references to specific organisations, products, services or technologies does not attribute to endorsement but are only for illustrative purposes.

Acknowledgement

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Message

India's aspiration to realise a Viksit Bharat by 2047 necessitates development pathways that are at once inclusive, scalable, and capable of delivering broad-based gains in productivity across the economy. Over the past decade, Digital Public Infrastructure has demonstrated the transformative potential of shared digital foundations in expanding access, enhancing service delivery, deepening inclusion, and catalysing innovation at population scale. The next phase of this journey must move decisively beyond foundational inclusion towards enabling livelihoods, strengthening human capabilities, and unlocking new engines of growth across sectors and regions.

The NITI Frontier Tech Hub roadmap presents a timely and well-considered framework to guide this national endeavour. Its emphasis on a problem-led and ecosystem-driven approach is particularly apposite, with States and districts envisaged as central to contextual adoption, and with technology, data, and artificial intelligence harnessed to expand opportunity for citizens, farmers, workers, and enterprises alike. If pursued with clarity of purpose, close coordination, and sustained commitment, this roadmap holds the promise of fostering a more resilient, productive, and inclusive digital economy, while further consolidating India's standing as a global leader in public-purpose digital transformation.

SUMAN K. BERY
Vice Chairman
NITI Aayog

Foreword

India's aspiration of becoming a **Viksit Bharat by 2047** requires new approaches that can deliver growth at both scale and speed while ensuring inclusion across society.

Over the past decade, India's pioneering **Digital Public Infrastructure (DPI)** —anchored in Aadhaar's foundational digital identity for over 1.3 billion people, **UPI**'s explosive adoption driving billions of seamless transactions monthly, and interoperable platforms for inclusive banking and payments — has proven the power of open, shared digital building blocks. These systems have revolutionized service delivery, dramatically expanded financial and economic participation, unleashed innovation, and built unprecedented state capacity, earning global recognition as a model for the world.

The NITI Frontier Tech Hub roadmap on DPI @2047, marks the vital next chapter in our DPI journey. Building on these hard-won lessons, the focus now shifts from foundational inclusion to unlocking broad-based economic opportunity and higher productivity. By deepening DPI's reach into critical sectors, MSMEs should be empowered with seamless access to markets, credit, and digital tools; uplift farmer livelihoods through data-driven agriculture and fair value chains; strengthen human capabilities via transformed education and health systems; and expand affordable credit and economic participation for millions more.

Achieving these sectoral transformations requires breaking structural barriers that have long constrained India's potential — low productivity, fragmented markets, and unequal access — while harnessing the full potential of emerging technologies, especially artificial intelligence, to accelerate innovation, personalize services, and amplify impact.

None of this will happen in silos. Success demands coordinated execution across government, industry, academia, and civil society; robust institutional frameworks that prioritize trust, security, privacy, and interoperability; and a vibrant ecosystem where public and private innovators collaborate to build upon open DPI rails.

As we march toward 2047 — the centenary of our independence — India's DPI approach stands as a powerful, proven foundation for inclusive, resilient, and sustainable growth. It positions us not just to meet our national aspirations, but to offer the world a replicable pathway for equitable digital transformation.

I am confident this roadmap will serve as an inspiring and practical guide for policymakers, innovators, entrepreneurs, development partners, and all stakeholders united in the shared mission to realize the promise of a truly Viksit Bharat.

S. Krishnan
Secretary, MeitY

Foreword

The India we seek to build by 2047 must be one where opportunity is not constrained by geography, language, income or institutional complexity. It must be an India where a small entrepreneur can access markets with confidence, where a farmer can make informed decisions with timely intelligence, where a student can learn in ways that truly empower and where families are better protected from vulnerability. Technology, in this vision, is not an end in itself; it is an instrument for widening human possibility.

Incremental progress will not be sufficient for the scale of India's aspirations. We must think in terms of systems that multiply impact, institutions that enable innovation and digital foundations that create compounding value across sectors. Data must become more usable and trusted, Artificial intelligence must become more accessible and relevant to India's realities and Digital ecosystems must strengthen human capacity, deepen trust and expand opportunity across the country.

The path ahead must remain rooted in India's federal strength and social diversity. The future of India will be shaped not only in national capitals, but in States, districts, towns and villages where development is experienced in everyday life. Our progress will depend on enabling local ecosystems, empowering States to lead with context and ownership and ensuring that innovation responds to the lived realities of citizens.

As India steps into this next phase, we have the opportunity to offer the world not merely a model of digital advancement, but a model of development that is open, inclusive and anchored in public purpose. Our responsibility is therefore larger than building digital systems; it is to build trust, expand agency and lay the foundations of enduring prosperity. If we act with ambition, collaboration and clarity of purpose, India can shape a future in which growth is not only faster, but fairer; not only more innovative, but deeply human.

Nidhi Chhibber
CEO, NITI Aayog

Foreword

Having built one of the world's most successful Digital Public Infrastructure (DPI) ecosystems over the past fifteen years—driving financial inclusion at population scale, reducing welfare leakages, and making UPI the global benchmark for real-time payments—India must now take the next decisive leap.

The next phase of India's digital transformation must move beyond financial inclusion toward livelihood-led, productivity-driven growth. The **NITI Frontier Tech Hub roadmap—DPI@2047 for Viksit Bharat**—sets out this strategic direction through DPI 2.0 (2025–2035).

It identifies eight high-impact sectoral transformations to address structural bottlenecks facing lower- and middle-income citizens and enterprises—expanding market access and job discovery for MSMEs, improving farmer livelihoods, enabling learner-centric education and universal health coverage, and strengthening systemic enablers such as access to credit, decentralised energy markets, and benefits that reliably reach citizens.

Delivering these outcomes will require coordinated, ecosystem-driven execution. The roadmap therefore highlights four critical enablers: aggregating demand through district-level programs, scaling technology entrepreneurship, leveraging artificial intelligence through DPI, and deploying cross-sector strategic unlocks such as data sharing, expanded digital transactions, democratizing AI and enhanced human capacity.

Together, these actions can ignite the "hockey-stick" effect of DPI 2.0—unlocking non-linear growth that transforms every district into an engine of opportunity and every citizen into a participant in India's prosperity.

In essence, this roadmap charts India's journey from welfare to wealth creation—leveraging DPI not just to deliver services, but to unlock productivity, entrepreneurship, and inclusive prosperity at population scale.

Debjani Ghosh
Distinguished Fellow,
NITI Aayog

How to Read this Roadmap

This document presents a strategic roadmap for India to realise the vision of Viksit Bharat 2047 using Digital Public Infrastructure (DPI) approach. It outlines a set of strategic execution recommendations to enable systemic shift towards non-linear growth across sectors using DPI approach.

The objective of this document is not to prescribe a fixed blueprint or provide a detailed implementation plan. Instead, it recommends an actionable strategic direction for the way forward to create the next generation of shared digital infrastructure and activate market innovation for inclusive prosperity.

The Roadmap is structured into 4 sections:

i) Context Setting has Chapter 1 outlining learnings from India's DPI journey so far and Chapter 2 articulating Why DPI approach is essential to Viksit Bharat.

ii) Roadmap has Chapter 3 defining a two phase approach - DPI 2.0 and DPI 3.0 and Target Sectoral transformations as part of DPI 2.0 scope.

iii) Execution Strategy for DPI 2.0 in Chapter 4 defines the four key imperatives required with Chapter 5 explaining one of these imperatives - Cross-Sector Strategic Unlocks in detail. Chapter 6 defines ways of enabling sectoral transformations.

iv) Call to Action has Chapter 7 recommending a set of concrete actions to initiate the execution of DPI 2.0.

Reading Guide

Time	Focus	Purpose
15 minutes	Executive Summary	The Strategic Core: Get the key insights, strategic highlights and action direction. Ideal for Ministers and senior leadership.
30 minutes	Executive Summary and Recommended Action Plan (Chapter 7)	The Execution Roadmap: Understand the strategic execution roadmap and immediate next steps. Ideal for Ministerial Secretaries.
60 minutes	Full Report	The Detail: Deep-dive into the detailed recommendations across priority sectors. Ideal for detailed understanding of What and Why. Suggested for implementation teams and domain experts.

Table of Content

Executive Summary

Viksit Bharat by 2047 - India has set itself an audacious goal to become a $30 trillion economy with a per capita income of $18,000 by 2047. It is a vision of a truly inclusive, resilient, and globally competitive society. In the last 15 years, India has laid the foundation with improved citizen welfare and financial inclusion at scale using the Digital Public Infrastructure (DPI) approach. India has to leverage the exponential growth advantage of DPI approach to now take the next leap moving from welfare to inclusive prosperity - to become a high-income, high-opportunity, and high-capability society.

Learnings from DPI 1.0 for Viksit Bharat Roadmap

The country's journey so far, which can be termed DPI 1.0, has enabled an explosion of new services, inclusion, and economic activity that was previously unimaginable. The result is a growth trajectory that is non-linear, rapidly accelerating as more people and businesses are onboarded onto this digital infrastructure. The learnings from this journey - forged in both success and challenge - must guide our strategy for a Viksit Bharat.

Following summarizes the key lessons from the journey so far:

User and Ecosystem Centric Design	Strategic and Agile Implementation
A Problem-First Approach	Empowered Institutional Setup
Citizen-centric Design	Government as an Enabler
A Minimalist Shared Capability	Mission-Based Programs
A Compelling Value Proposition	A Shift from "Project" to "Product" Mindset

Roadmap

A two-phase approach is recommended as part of the DPI 2047 roadmap, to ensure that a broadbased capable society is established as a foundation allowing a compounding effect towards inclusive prosperity.

DPI 2.0
Realising Aspirations
2025-2035

Empowering livelihoods at scale, to achieve mass inclusion necessary to build a broad base of capable citizens.

DPI 3.0
Achieving Prosperity
2035-2047

Enabling compounding effect by fostering innovation at grassroots level for sustained, high-value local economic growth.

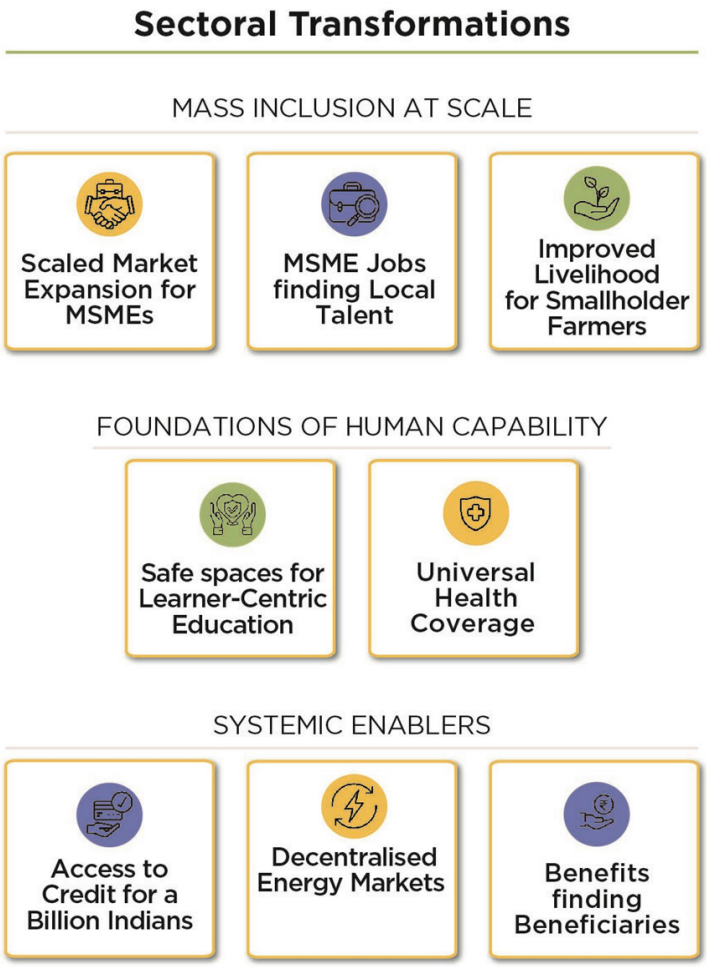
This document focuses on DPI 2.0 - expanding on its scope, execution strategy and action plan.
The **DPI 2.0 Scope**, consists of **eight sectoral transformations**, recommended based on their potential to remove structural bottlenecks constraining the growth of the lower and middle income groups.

Mass Inclusion at Scale

1. **Scaled Market Expansion for MSMEs** through access to market intelligence, widening market linkages, and simplifying compliance.
2. **MSME Jobs finding Local Talent** by making them digitally visible with the aim to make job fulfillment a low cost, high trust transaction.
3. **Improved Livelihood for Smallholder Farmers** by enabling access to advisory services, market linkages and credit.

Foundations of Human Capability

4. **Safe Spaces for Learner-Centric Education** empowering students, teachers and administrators, towards realising the NEP's vision by enabling equitable access to learning materials in local languages and continuous learning pathways.
5. **Universal Health Coverage** to ensure that a single health crisis doesn't erase a family's progress toward financial stability irrespective of their financial status.



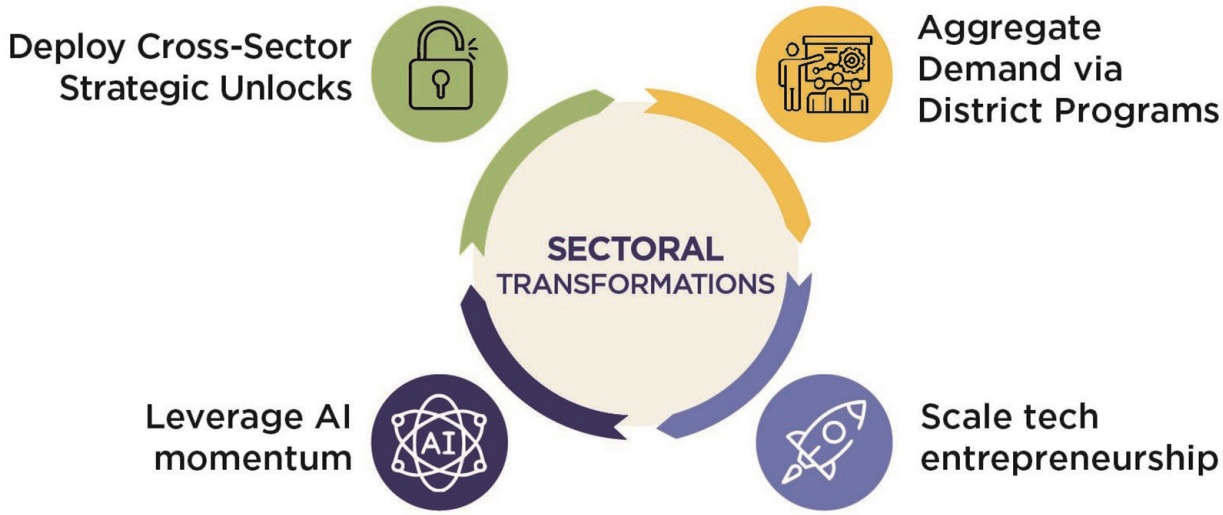
Systemic Enablers

6. **Access to Credit for a Billion Indians** by maximizing the utilization of monetizable assets for microcredits.
7. **Decentralized Energy Markets** enabling effective utilization of renewable sources towards unmet and growing energy needs.
8. **Benefits finding Beneficiaries** ensuring timely and inclusive access to social benefits for all eligible citizens.

Execution Strategy for DPI 2.0

Achieving multi-sector transformation at this scale demands a radical focus on accelerated transformation and the intentional growth of entirely new digital ecosystems. The DPI approach is necessary but not sufficient, as India currently lacks a sufficient local ecosystem of entrepreneurs and businesses ready to meet the new digital demand. We recommend execution strategy as four interconnected critical imperatives with DPI approach as the overall foundation to drive the sectoral transformations of DPI 2.0 roadmap.

DPI 2.0 EXECUTION STRATEGY
(with DPI Approach as its foundation)



#1 Aggregate Demand via District Programs: Achieving the compounding effect of DPI 2.0 requires establishing strong, self-sustaining local economies as the foundation. Linking the DPI roadmap to district-level development goals, via decentralized district programs, ensures that solutions are hyper-localized with the adoption and usage being driven at the grassroots. The district programs are envisaged as a mechanism to aggregate demand for DPI-based solutions which acts as a single largest incentive for tech entrepreneurs, providing a secure pipeline of work.

#2 Scale Tech Entrepreneurship: India must dramatically expand its base of technology entrepreneurs who can deliver DPI-aligned products and services. The goal is to build a distributed innovation engine through incubators and accelerators, mission-focused R&D and the relevant policy and regulation. It

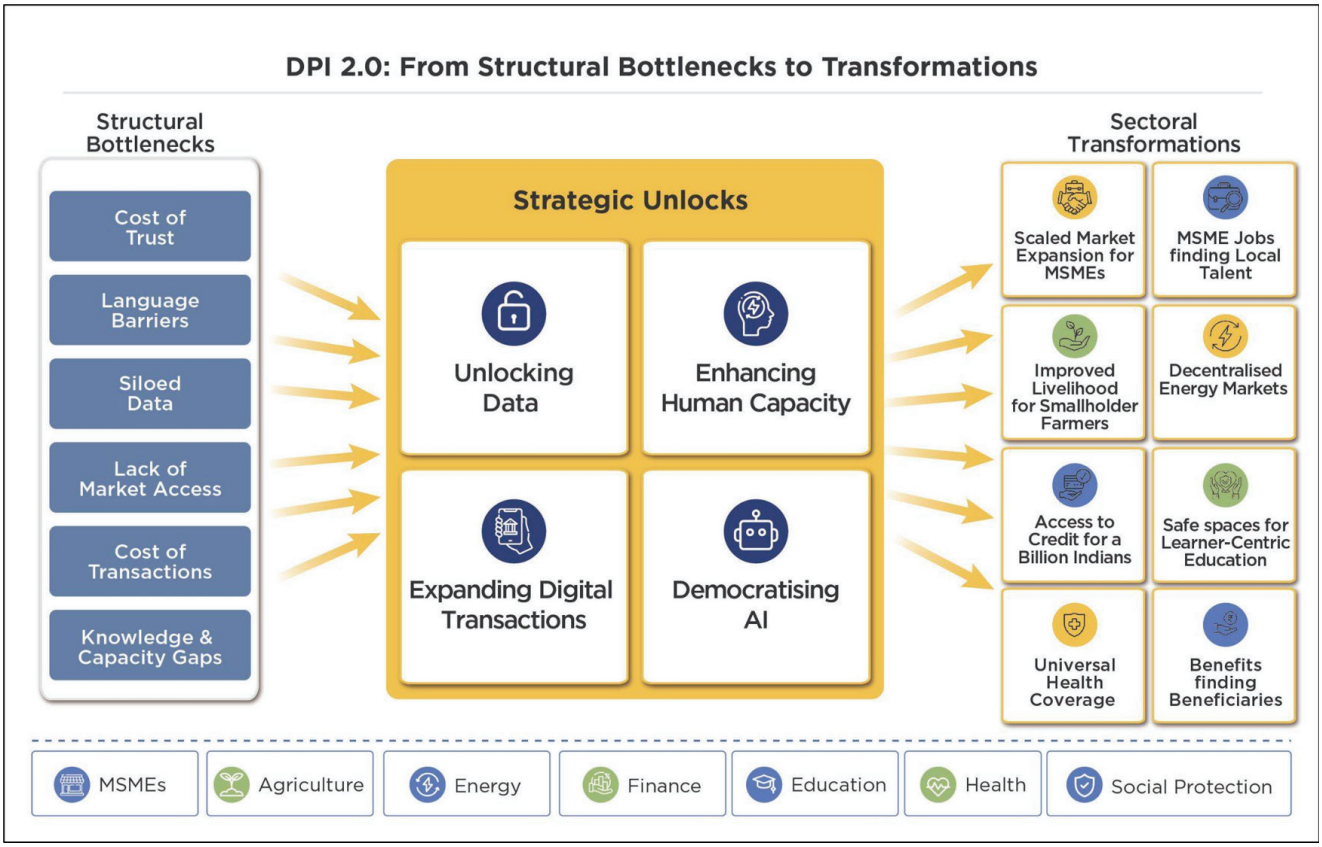
ensures that every sector and district has access to capable suppliers, developers, and innovators who can respond to the aggregated demand.

#3 Leverage AI Momentum: Artificial Intelligence is the most significant productivity engine in human history, offering the potential to solve complex, deeply rooted systemic problems that inhibit inclusive growth. Enabling the use of AI through the DPI approach—making it accessible to every entrepreneur and beneficial to every citizen—can create a momentum of exponential order.

Implementing the above recommended execution strategy will address the structural bottlenecks and result in the DPI 2.0 sectoral transformations at speed and scale.

#4 Deploy Cross-Sectoral Strategic Unlocks: A cross-sectoral approach to address common structural bottlenecks is essential to achieve transformations at speed and scale. We recommend following strategic unlocks:

- **Unlocking Data -** Enable insights and credential proofs in a low-cost & high-trust manner.
- **Democratizing AI -** Ensure AI is accessible to all citizens and enterprises for predictive intelligence, personalised guidance, removing digital and language barriers.
- **Enhancing Human Capacity -** Remove barriers to knowledge & expertise.
- **Expanding Digital Transactions -** Unbundle demand and supply through open networks and digital enablement of entities.



Call To Action

India stands at a once-in-a-generation inflection point. India's DPI initiatives are already contributing nearly 1% of GDP and could reach 4% by 2030[44]. We recommend actioning DPI 2.0 as articulated in the execution strategy on an immediate basis to get the momentum going for the journey to Viksit Bharat. We recommend following four actions to achieve that:

#1: Decentralized State-led execution: We recommend DPI 2.0 to be executed through decentralised state led initiatives with Government of India and NITI Aayog acting as catalysts.

#2: Adopt Collaborative 2-year Iterative cycles of Transformations: DPI as a design approach is still unevenly understood across the ecosystem. As States embark on the uncharted journey of DPI 2.0 sectoral transformations, it is important to create the momentum in an iterative way so that we can figure out exemplar pathways - solutions and replicable models - and build ecosystem capacity before focusing on scaling them across states.

#3 First cycle (2026-2027) focus on MSME and Agriculture: For the initial cycle (2026-2027), we suggest focusing on 3 sectoral transformations in MSME and Agriculture with six champion States/UTs implementing lighthouse pilots in the first year and at least 5 additional States/UTs rollouts in the second year for each of the proven transformations. MeitY and NITI Aayog should constitute an institutionalized setup to support it, including an expert advisory group, engaging DPI expert organizations and global partners.

#4 Establish a neutral ecosystem body for global engagement: Using the learnings from global partner engagement in state-led transformations in 2026-27, India should consider establishing a globally focused initiative in 2027. It is recommended to be housed in a neutral body in collaboration with global partners that will spearhead India's global engagement on DPI fostering a global community of collaboration on DPI and AI for public good. A global DPI event can be planned for the launch of this initiative.

Achieving Viksit Bharat by 2047 is more than an aspiration; it is a strategic imperative that rests on our ability to transform the economy into a high-productivity engine. Leveraging the exponential growth advantage of DPI approach, India must now take the next leap of livelihood-led growth. The mission now is to act with speed and synergy and leverage our proven digital leadership to achieve a truly inclusive, resilient, and globally competitive society where growth is holistic and beneficial to all.

I. CONTEXT SETTING

Chapter 01
Learnings from India's DPI Journey So Far

In the last 15 years, India has laid the foundation for our ambition of becoming a developed nation by 2047. However, this journey has not been without its challenges. As we chart our path forward, it is vital to reflect on the lived experience - both its impact and lessons learned - to develop an effective and actionable strategy.

Unlocking Non-Linear Growth: The Combinatorial Impact of DPI

In 2011, a staggering 65% of Indian adults lacked access to a formal bank account[2], limiting their participation in the formal economy. Meanwhile, welfare programs were plagued by leakages of 35-40%[3], failing to reach those most in need. India's journey of DPI approach began with the launch of the Aadhaar program with the objective to plug leakages in the social benefits. By providing a unique digital identity to over 1.39 billion residents, Aadhaar enabled instant, paperless identity verification (e-KYC). This single innovation drastically reduced the cost of customer acquisition, laying the groundwork for unprecedented financial inclusion and mobile penetration.

DPI contributed 0.9% to India's GDP in 2022, projected to rise to 4.2% by 2030[1]

The First Wave of Combinatorial Impact: Jan Dhan and Mobile The Pradhan Mantri Jan Dhan Yojana (PMJDY), a mission to drive inclusive financial inclusion, leveraged Aadhaar's e-KYC and zero balance accounts policy to great effect. By eliminating traditional barriers, banks and fintechs were able to open over 50 crore PMJDY accounts by 2023, a 3.4-fold increase since 2015[4]. This was a non-linear leap: India achieved 80% bank account penetration in just eight years, a feat the Bank for International Settlements (BIS) estimated would have taken 47 years[5].

In parallel, the Department of Telecommunications' (DoT) approval of Aadhaar-based e-KYC in 2016 catalyzed a revolution in the telecom sector. This move enabled rapid, low-cost customer onboarding, making it economically viable for operators to pursue a massive subscriber base. As a result, households' ownership of mobiles in India surged to 85% by May 2025[6]. This was a critical step, as mobile phones became the primary gateway to financial services and the digital economy for millions of rural Indians.

MOBILE PENETRATION

15 to 85.5%
Increase in mobile ownership in households from 2014 to 2025[7]

₹308 to ₹9.34 per GB
Internet data costs have fallen sharply from 2014 to 2022[8]

Powering the Economy: UPI and JAM The JAM Trinity (Jan Dhan, Aadhaar, Mobile) became the backbone of India's digital transformation. Leveraging this trio, the Direct Benefit Transfer (DBT) mission created the world's largest government-to-person (G2P) payment infrastructure, significantly plugging social benefit leakages.

IMPROVED WELFARE DELIVERY

₹43.95 lakh crore
Cumulative amount transferred through DBT[9]

₹3.48 lakh crore
Saved through leakage prevention with DBT[10]

$4.5 billion
Into the bank accounts during COVID pandemic[11]

However, the most explosive growth was unleashed by the Unified Payments Interface (UPI). Launched in 2016, UPI transformed India from a cash-dominated society into the global leader in digital payments within just six years. This was more than a new payment method; it was a powerful catalyst for inclusion. The sight of street vendors and small shop owners using UPI QR codes became commonplace, bringing millions of micro-entrepreneurs into the formal economy. This massive inclusion was fueled by the JAM Trinity and innovative regulation by the RBI allowing non-finance tech players to drive UPI payments through their apps. It resulted in the creation of an ecosystem of over 600 banks and 80 apps[12] innovating on top of a shared, open infrastructure.

FINANCIAL INCLUSION @ SCALE

80%
Bank account ownership in 6 years as opposed to the projected 47[13]

35.3% to 85.1%
Rise in small ticket loans between 2018 and 2022[14]

12.5 Billion
Trxns/month becoming world leader in digital payments globally within 6 years[15]

Unlocking New Sectors: GST, FASTag, and Account Aggregator The combinatorial effect extended beyond payments. Initiatives like GST (Goods and Services Tax) and FASTag, both launched in 2017, created a unified national market. They streamlined logistics, reduced border wait times, and brought more micro, small, and medium enterprises (MSMEs) into the formal economy. This was made possible by the solutions provided by market players, including banks and fintech, leveraging Aadhaar, GSTN and NETC as digital shared infrastructure. Building on this momentum, the Account Aggregator (AA) framework, enabled by the RBI in 2021, unlocked a new wave of fintech innovation with lenders now disbursing micro-loans in minutes without collateral. By using alternative data from UPI and GSTN, fintechs could accurately assess risk and offer small, economically viable loans, democratizing access to credit for millions.

From 5 lakh MSMEs registered under GST in FY 2017-18 they grew to 1.5 crore in December 2024[16]

The Hockey-Stick Effect The true power of India's DPI approach lies not just in its individual components— shared digital capabilities, market innovation, or mission-mode programs—but also in their synergistic interaction. By removing barriers and drastically lowering the cost of transactions, DPI approach has enabled an explosion of new services, inclusion, and economic activity that was previously unimaginable. This is the essence of non-linear growth. The result is a growth trajectory that is not incremental, but rather a "hockey stick" curve, rapidly accelerating as more people and businesses are onboarded onto this digital infrastructure.

DPI enabled startups created over $100 billion in market value[17]

This dynamic has been highlighted by the International Monetary Fund, which notes that India's digital journey demonstrates the value of a design approach centred on shared digital building blocks and ecosystem-wide innovation, generating outsized benefits as adoption deepens and broadens[18].

DPI touching the lives of common people:

Lakshmi amma used to spend a day each month traveling to the tehsil office and still miss her pension. After Aadhaar-linked DBT, the money lands directly in her bank account. An SMS confirms credit; her grandson withdraws nearby when needed. No middlemen, no travel, just predictable cash on time.

Rafi, a food cart owner, used to lose customers who didn't have change. He printed a UPI QR and started accepting payments from any app—₹32, ₹85, whatever. Settlements show up instantly, and he tracks daily totals in his phone. Fewer cash-outs, faster service, and repeat customers who now order ahead and pay on pickup.

Meena runs a two-loom weaving unit. Banks kept asking for paper statements and months of proofs. Through AA, she shared read-only access—her bank transactions and GST trail—straight from the source, with consent and the option to revoke later. That trustworthy data trail unlocked a small working-capital loan, so she bought yarn in bulk and took a larger order with confidence.

Strategic Lessons for the Viksit Bharat Roadmap

The learnings from our DPI journey - forged in both success and challenge - are non-negotiable and must guide our strategy for a Viksit Bharat.

The design of the initiative must keep the end user and ecosystem in mind.

1. **A Problem-First Approach, not a Technology-First One:** India's most successful DPI initiatives—from Aadhaar to UPI—were built to solve a specific, large-scale problem. We must avoid the "technology looking for a problem" trap and instead focus resources on solving real challenges for citizens.

> **Aadhaar was designed to curb welfare leakages, not merely as a tech solution. Its minimalist design later enabled innovations like e-KYC, telecom authentication**

2. **Citizen-centric Design for True Inclusion at Scale:** DPI based solutions must be rooted in existing user behaviours, offering intuitive shifts that make adoption effortless. Due to India's vast diversity, this requires a multi-modal interface approach, patient innovation, smart incentives and a long-term commitment. The behaviour change cannot be drastic. UPI's success is a prime example: scanning a QR code was an accessible shift that led to mass adoption. UPI also enabled feature phone and voice based solutions.
3. **A Minimalist Shared Capability for Maximum Innovation:** A digital shared capability should be a minimal, population scale building block that lowers friction and increases trust. This approach fosters private sector competition and unlocks long-term value far beyond the initial use case, as demonstrated by UPI through a minimalist payments protocol.

4. **A Compelling Value Proposition is the only Driver of Adoption:** A DPI initiative's success hinges on creating value for all stakeholders: government, businesses, and citizens. To achieve impact at scale, it needs to meet market economics and result in business growth for businesses. The JAM Trinity's success was a direct result of this multi-stakeholder value creation. Building the technology "plumbing" without a strong "pull" factor for everyone turns a great idea into a stagnant project.

The design needs to be supported by a strategic and agile implementation.

1. **Empowered Institutional Setup is Essential:** Successful DPI initiatives require independent institutions with clear mandate, leadership with ecosystem representation and team with relevant experience. NPCI is an independent section 8 company with the board including public and private banks. Initially UIDAI was set up as a special body with the right mix of public and private sector talent. In fact for the long term setup - UIDAI did consider the model of setting up two entities - a Regulatory body (like RBI) and an Operating body (like NPCI).
2. **Government as an Enabler:** The government's primary role is to create an enabling environment via policy, incentives and aggregated demand. The objective should be to harness private sector innovation strength to evolve technology, enable diverse solutions and drive ground adoption. DPI approach does not mean that all the initiatives including the shared infrastructure needs to be operated by the government. We have already seen multiple models - Government owned (Aadhaar, DBT); Government regulated/Public-Private operated shared capabilities (UPI - RBI/NPCI); Government regulated/Private sector operated shared capabilities (Account Aggregator - RBI/Sahamati).

> **UPI's success lies in being a living product, not a one-time project, with continuos innovation and ecosystem support, making india a global leader in real-time payments**

3. **Mission-Based Programs Drive Adoption:** To achieve impact, specific outcome-oriented programs like DBT and PMJDY must be set up to drive creation and adoption of diverse solutions which leverage existing shared capabilities.
4. **A Shift from "Project" to "Product" Mindset:** Unlike a traditional project with a start and end, a DPI initiative is a living "product" that requires continuous evolution based on user needs and feedback. UPI and GST initiatives evolved needs, solutions and shared infrastructure over a period of time. This mindset is essential for long-term relevance and sustainability.

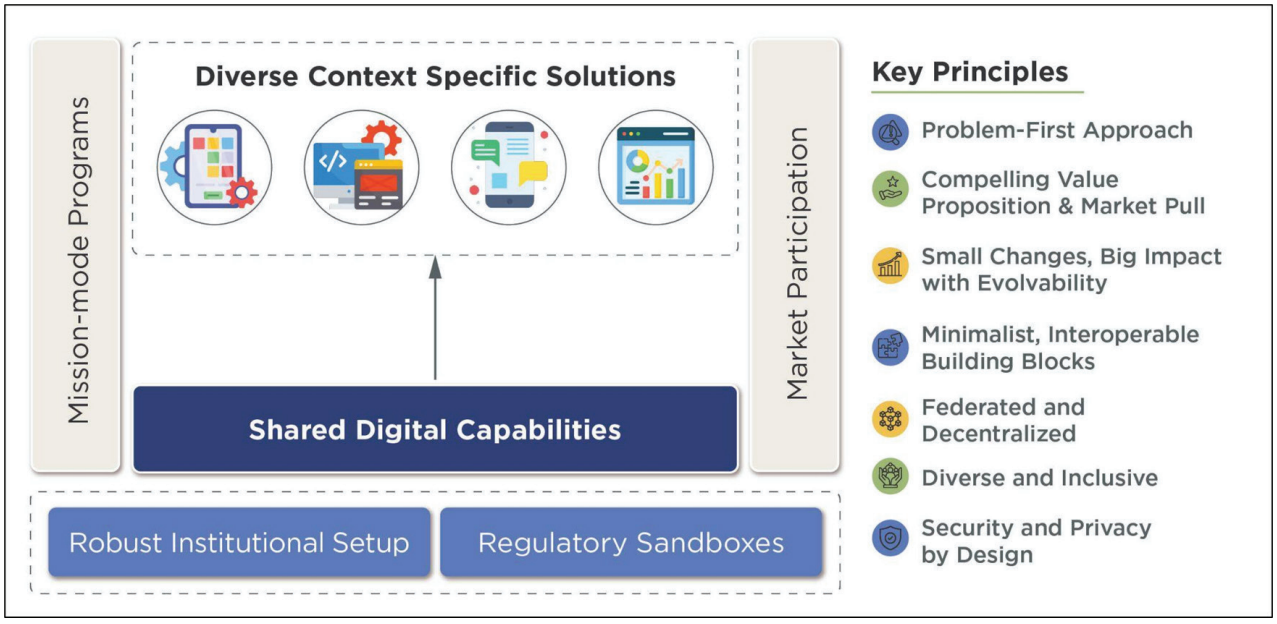
Chapter 02

DPI Approach: The Engine for a Developed India by 2047

Building on the lessons of our DPI journey, this chapter defines the DPI approach and explains why it is the essential engine for a developed India.

DPI Approach - Core Architecture and Principles[19]

DPI is a design approach to enable non-linear socio-economic development at scale by leveraging technology and market innovation across government, non-profit and private organisations. It prioritizes on creating a level playing field for players of all sizes to innovate and enable diverse inclusive solutions and services to citizens. The approach recommends addressing structural challenges including transaction cost, productivity and market expansion.



The core architecture consists of **five key enablers** as its strategic architecture:

1. **Shared Digital Capabilities:** Minimalist population scale building blocks that can power diverse solutions across sectors. Building blocks can be - running shared systems, open standards, specifications or protocols.
2. **Robust Institutional Setup:** To ensure continuity, trust, and effective governance. This includes a legal and institutional framework to drive adoption; ecosystem facilitation; and participatory governance.
3. **Market Participation:** A vibrant ecosystem of public, private players of all sizes enabling competitive innovation and diverse inclusive citizen-centric solutions. Shared digital capabilities and policies have to ensure players of all types and sizes can participate.

4. **Regulatory Sandboxes:** Offer safe, rapid experimentation zones to test and refine new ideas while managing risks.
5. **Mission-Mode Programs:** Driving adoption and usage to achieve well-defined outcomes and impact at scale.

The architecture is proposed to be implemented using the following **design principles:**

1. **Problem-First Approach:** Start with the real and root needs of individuals and businesses, ensuring meaningful problems are solved rather than creating technology in search of a use.
2. **Compelling Value Proposition:** Success requires meeting market economics and creating value for all key stakeholders (citizens, businesses, and government). The DPI must act as a strong "pull" factor to drive business growth and user adoption.
3. **Evolvable - Small Changes, Big Impact:** Design solutions that require minimal shifts in user behavior—a "+1 change"—to ensure rapid adoption and broad scale. Crucially, a DPI initiative must be treated not as a fixed project but as a living product that evolves continuously based on user needs and feedback for its long-term relevance and sustainability.
4. **Minimalist, Interoperable Building Blocks:** Build lean, reusable components that can power multiple, diverse solutions across sectors and contexts.
5. **Federated and Decentralized:** Provide autonomy for different players while ensuring seamless interoperability and cohesion across the ecosystem.
6. **Diverse and Inclusive:** Enable user choice and ensure equitable access, so every individual and business can participate and benefit.
7. **Security and Privacy by Design:** Embed trust at every level by safeguarding privacy and security from the start, strengthening public confidence in the system.

These principles guide not only how DPI approach is implemented, but also how the initiative evolves, ensuring that it remains relevant, equitable, and trusted over time.

The Exponential Advantage: Why DPI is Essential for Viksit Bharat

Achieving the ambitious goal of a developed India by 2047 will not be a story of linear progress. It requires an engine of exponential, non-linear growth. The DPI approach, with its specific architecture and principles, is that engine. It is uniquely positioned to drive this transformation by fundamentally changing how our economy functions.

Economics of Shared Digital Infrastructures - a report by University College London (UCL) Institute for Innovation and Public Purpose and Bennett Institute for Public Policy at Cambridge University clearly explains the economic value of DPI. It notes *"DPI enables a fundamental shift from fragmented digitalisation towards shared infrastructure that underpins both public and private services... built with reusable, modular components that scale across government and society. This approach reduces duplication, enhances efficiency and creates network effects that drive economic value*[20]*".*

Activates Competitive Innovation

By building minimalist, shared capabilities, the DPI approach lowers the barrier to entry for innovators. As seen in UPI, a small startup can compete and beat a large company as it no longer needs to spend years of time and significant capital. Instead, it can build directly on top of the shared digital infrastructure, focusing its energy on creating novel services for citizens.

Builds Self-Propelling Ecosystems

DPI approach triggers and sustains a self-propelling ecosystem. By enabling shared capabilities, it creates a powerful "pull factor" where the value proposition for joining the participating ecosystem is so compelling that adoption becomes market-driven, not government-mandated. The more participants—from citizens to private businesses—who join the ecosystem, the greater the opportunities become for

everyone. This shift from a project with a linear timeline to an expanding ecosystem is a key driver of DPI's exponential advantage.

Boosts Total Factor Productivity (TFP) A prosperous nation is defined by its overall economic efficiency, measured by Total Factor Productivity (TFP). TFP is a measure of an economy's ability to generate income from inputs (labour and capital) —to do more with less. The TFP growth is primarily driven by five factors - Innovation, market efficiency, public infrastructure, workforce productivity and public institutions.

By 2030, finance related DPI could boost low-and middle-income countries' combined GDP to $19.2 trillion, up to three years faster than expected[21]

DPI as a design approach enables TFP growth factors to activate productivity-led economic growth. DPI approach is foundationally rooted in the TFP growth factors. It leverages technology, innovation and institutional setup to create a level playing field for innovators with the focus to address structural challenges including transaction cost, productivity and market expansion.

DPI approach allows the entire economy to produce more from the same resources in an accelerated manner. For more on how DPI approach enables TFP growth, refer to *Appendix B*.

Ensures Inclusive Growth at Scale

The principles of problem-first, citizen-centric design and inclusivity are not just ideals; they are economic strategies. By building solutions that are easy to use and relevant to the needs of every citizen, DPI ensures that the benefits of this non-linear growth are shared widely. This is critical because a developed nation is defined not just by its wealth but by the equitable distribution of that wealth and opportunity.

The DPI approach, therefore, is the strategic imperative that will enable India to fulfill its vision of a developed nation by 2047.

II. ROADMAP

Chapter 03

DPI@2047: The Roadmap to Prosperity

Viksit Bharat by 2047 - India has set itself an audacious goal to become a $30 trillion economy with a per capita income of $18,000 by 2047. This ambition is not just about economic targets. It is a vision of a truly inclusive, resilient, and globally competitive society where growth is holistic and beneficial to all.

This vision mandates a collective advancement, where prosperity is shared by all the sections of society, not just concentrated among the wealthy. This future is characterized by dynamic local economies, and the entrenched disparity between rural and urban areas being fully removed through shared growth. This is a vision where innovation is democratized and no citizen is excluded from the progress.

Such an aspiration cannot be met through incremental reforms or linear growth. **India must unlock non-linear, productivity-driven growth** while ensuring that the gains of progress are shared inclusively across all regions and communities.

Two-Phased Approach: DPI 2.0 and DPI 3.0

The country's journey so far, which can be termed as DPI 1.0, has laid the foundation for citizen welfare and financial inclusion at population scale. India has, in many ways, already become a digital society. Over a billion people now use digital identity, hundreds of millions make payments digitally every month, and welfare delivery, commerce, and citizen services increasingly flow through digital channels.

On this foundation, India must now take the next leap to move from welfare to inclusive prosperity - become a high-income, high-opportunity, and high-capability society. This requires a phased approach:

DPI 2.0
Realising Aspirations
2025-2035

Empowering livelihoods at scale, to achieve mass inclusion necessary to build a broad base of capable citizens.

DPI 3.0
Achieving Prosperity
2035-2047

Enabling compounding effect by fostering innovation at grassroots level for sustained, high-value local economic growth.

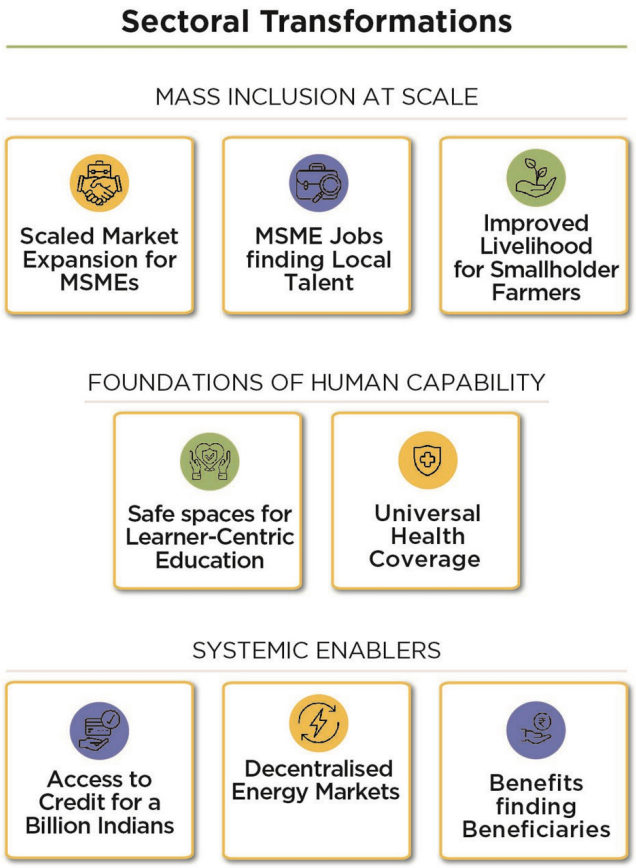
The proposed phased approach ensures that a broadbased capable society is established as a foundation in the next decade, via DPI 2.0, before embarking on the DPI 3.0 journey towards inclusive prosperity.

The subsequent section and chapters in this document focuses on DPI 2.0 - expanding on its scope, execution strategy and action plan.

DPI 2.0 Scope: Target Sectoral Transformations

It is recommended that the DPI 2.0 should focus on areas which have the potential to remove structural bottlenecks constraining the access and growth of the lower and middle income groups.

Following **eight sectoral transformations** have been proposed to translate the DPI 2.0 goal of livelihood empowerment at scale into a measurable roadmap:



Mass Inclusion at scale potential of informal sectors to drive employment and business growth:

1. **Scaled Market Expansion for MSMEs** through access to market intelligence, widening market linkages, and simplifying compliance. It aims to help MSMEs formalize and grow-addressing current challenges of complex compliance processes, limited market visibility and reach. It will help MSMEs to move beyond survival-driven local trade towards predictable participation in regional and global value chains - expanding revenues and growth at scale.
2. **MSME Jobs finding Local Talent** by making them digitally visible with the aim to make job fulfillment a low cost, high trust transaction. Today, the MSMEs struggle to fulfill their job vacancies as the local talent is unable to find these jobs due to reliance on traditional informal channels like intermediaries, posters and word of mouth. By enabling workers access to nearby employment opportunities, MSMEs will be able to fill positions faster - resulting in growth of local economies.
3. **Improved Livelihood for Smallholder Farmers** by enabling access to advisory services, market linkages and credit. This will help farmers to manage unpredictable weather, pest infestations, improve yields and get better prices for their produce. The aim is to raise income for millions of smallholder farmers and higher food production; transforming the agriculture sector to tackle three interconnected problems - poverty, unemployment and food security.

Strengthening Foundations of Human Capability ensuring citizens have skills and well-being necessary to participate in the economy:

4. **Safe Spaces for Learner-Centric Education** empowering students, teachers and administrators, towards realising the NEP's vision by enabling equitable access to learning materials in local languages and continuous learning pathways. The aim is to enable upward mobility for learners, particularly rural and first-generation population, by reducing learning inequities caused by language barriers, limited access to teachers, mentors and learning resources.
5. **Universal Health Coverage** to ensure that a single health crisis doesn't erase a family's progress toward financial stability irrespective of their financial status. DPI 2.0 recommends strengthening the Ayushman Bharat Digital Mission (ABDM).

Ensuring Systemic Enablers are available to all:

6. **Access to Credit for a Billion Indians** by maximizing the utilization of monetizable assets for microcredits. Today, large volumes of individually owned assets remain illiquid or unusable due to significant transaction cost and friction in loan processing with extensive paperwork. The aim is to democratise access to credit for small enterprises, farmers, and low-income households to realize their needs and aspirations.
7. **Decentralized Energy Markets** enabling effective utilization of renewable sources towards unmet and growing energy needs. By allowing households and enterprises to produce and sell power, it reduces energy costs, creates new income streams through local entrepreneurship.
8. **Benefits finding Beneficiaries** ensuring timely and inclusive access to social benefits for all eligible citizens. Currently, applicants struggle due to high cost and friction of discovery and application resulting in eligible beneficiaries left out while a significant portion of benefits remain unutilised. The aim is to remove the burden of discovery and application significantly and strengthen DBT efforts in ensuring social benefits achieve its full impact for the target population.

Together, these transformations provide the necessary growth potential across India's diverse social and economic contexts to achieve the DPI 2.0 goal.

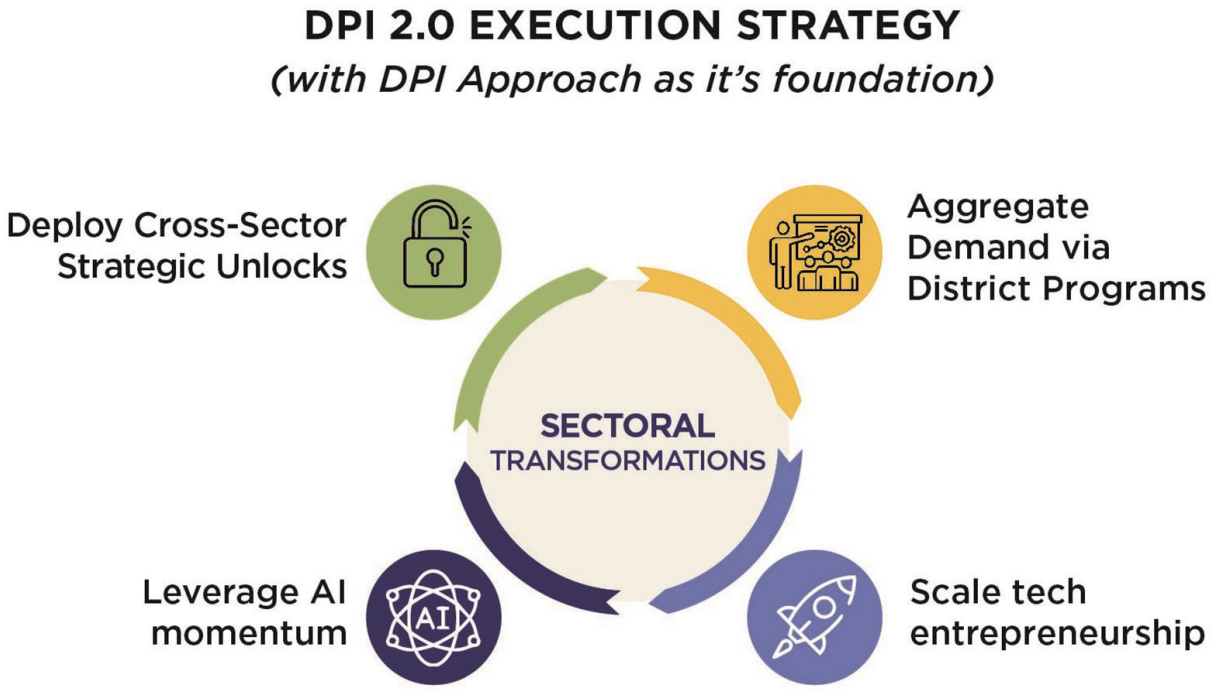
Delivering these transformations will require a coherent execution strategy for DPI 2.0 as detailed in the next chapter.

III. EXECUTION STRATEGY FOR DPI 2.0

Chapter 04
The Four Key Imperatives

The window for achieving DPI 2.0 transformations is just a decade. Achieving multi-sector growth at this scale demands a radical focus on accelerated transformations and the intentional growth of entirely new digital ecosystems. The DPI approach is necessary but not sufficient, as India currently lacks a sufficient local ecosystem of entrepreneurs and businesses ready to meet the new digital demand.

To translate the DPI 2.0 into a national reality, we recommend driving the sectoral transformations through four interconnected critical imperatives with DPI approach as the overall foundation. They establish the essential conditions—market capacity, decentralized accelerated adoption, and AI amplification—to achieve the sectoral transformations.



1: Aggregate Demand via District Programs

Achieving the compounding effect of DPI 2.0 requires establishing strong, self-sustaining local economies as the foundation. India's vastness and extreme contextual diversity—where a single state rivals a continent and many of our 780+ districts are comparable in scale and diversity to small or mid-size nations—mean that a centralized approach is insufficient.

Therefore, we recommend executing the DPI roadmap through decentralized, district-level programs. This ensures that adoption and usage are driven at the grassroots, where needs and contexts vary most. District-level programs will engage the local ecosystem—local government, users, civil societies, industry consortiums, local businesses, and tech entrepreneurs—to aggregate socio-economic transaction needs and enable contextual solutions.

These programs serve two critical functions:

1. **Local Adoption:** Linking the DPI roadmap to district-level development goals ensures that solutions are hyper-localized and contextually relevant. This is essential for converting inclusion into active usage.
2. **Demand Aggregation (Market Pull):** These district programs aggregate demand for DPI-based solutions. This decentralized, predictable demand acts as the single largest incentive for tech entrepreneurs, providing a secure pipeline of work. This process intentionally drives immediate adoption and helps grow tech entrepreneurs and MSMEs at the local level.

2: Scale Tech Entrepreneurship

One of the key enablers of DPI approach is market participation. However, the current scale of the tech entrepreneurs in India is insufficient to meet the DPI 2.0 goal. To achieve this, India will need to dramatically expand its base of technology entrepreneurs who can deliver DPI-aligned products and services. The goal is to build a distributed innovation engine that ensures every sector and district has access to capable suppliers, developers, and innovators who can respond to the aggregated demand.

This involves activating the capacity lever through the following actions:

1. **Acceleration and Incubation:** Leverage existing incubators and accelerators to explicitly focus on DPI-based solutions. This dedicated support is necessary to rapidly scale up supply capacity to meet the aggregated demand emanating from district-based programs.
2. **Mission-Focused R&D:** Direct R&D capacity toward solving the specific, mission-critical problems of DPI 2.0. Towards this, create innovation clusters by actively directing R&D setups (in academia and the private sector) to ensure that research outputs are localized, immediately relevant, and fed directly into the market.
3. **Policy and Regulation:** Implementing specific policy and regulatory changes to procurement and standards that favor rapid, competitive growth among these new, local market entrants.

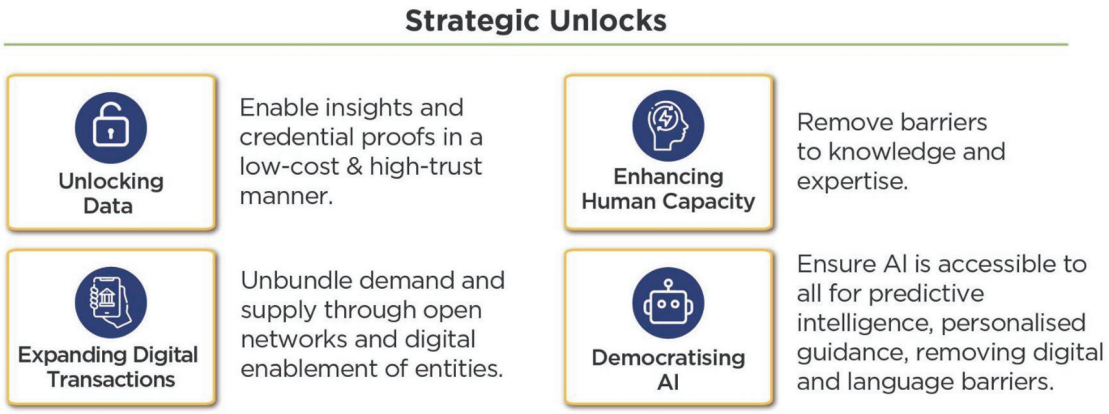
If entrepreneurial innovation is unleashed, India could witness a dynamic shift with the emergence of one million startups by 2035, from the current 150,000 with an expected annual growth rate of 20%[22], many from beyond traditional metropolitan centers. This vibrant entrepreneurial landscape would boost incomes and service quality across sectors, drive innovation at scale, and help India become an $8 trillion economy by 2035.

3: Leverage AI Momentum

Artificial Intelligence (AI) is the most significant productivity engine in human history, offering the potential to solve complex, deeply rooted systemic problems that inhibit inclusive growth. Enabling the use of AI through the DPI approach—making it accessible to every entrepreneur and beneficial to every citizen—can create a momentum of exponential order required to achieve DPI@2047 goals. By making AI a strategic imperative for accelerated adoption, India ensures its execution strategy is future-proof and rapidly becomes a global leader in AI use cases.

4: Deploy Cross-Sector Strategic Unlocks

The sectoral transformations outlined in the DPI 2.0 scope face a common set of structural bottlenecks: fragmented data systems, high cost of trust and transactions, limited market access, knowledge gaps and language barriers. To address these common systemic problems at speed and scale we recommend deploying four cross-sectoral strategic unlocks:

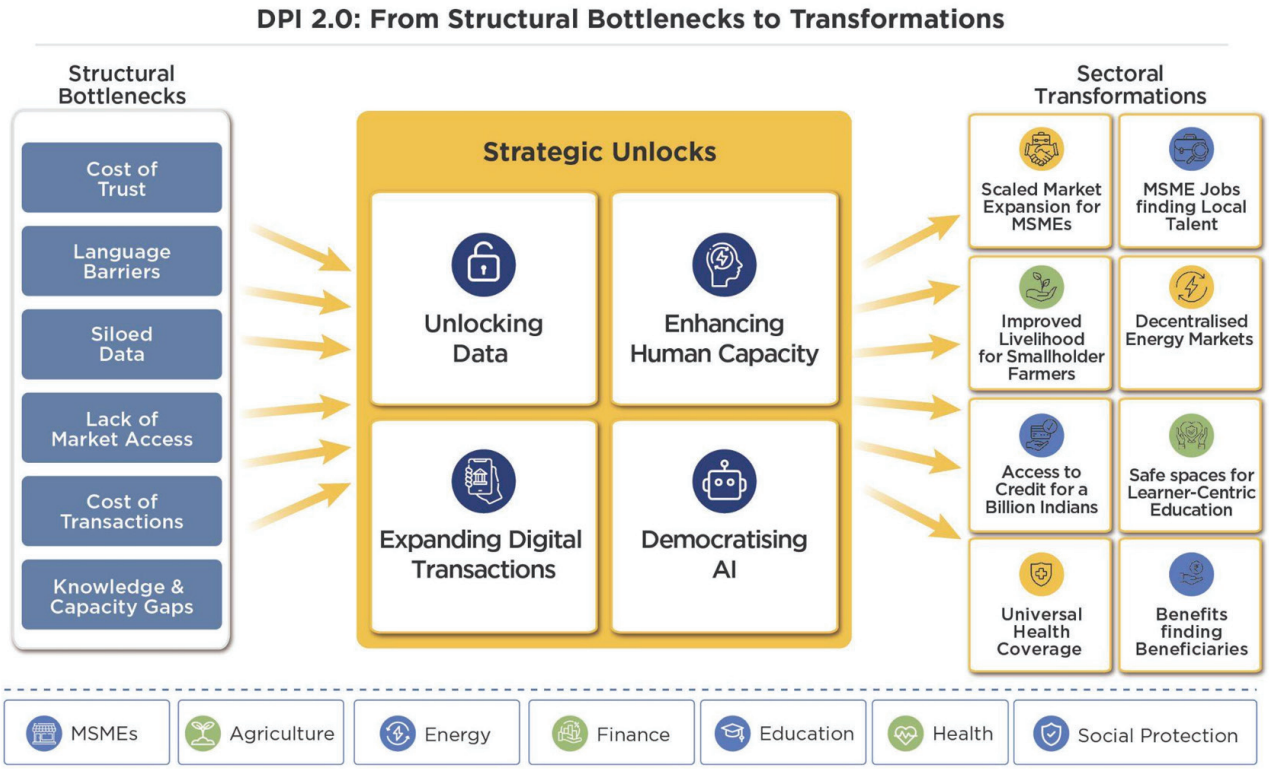


As these unlocks are implemented, the different elements of DPI architecture will interact and compound each other's value. This collaboration, addressing deep-rooted socio-economic frictions, unlocks entirely new services and economic opportunities that were previously impossible. This is required not only for massive inclusive growth in DPI 2.0 but also for the critical transition to widespread prosperity in DPI 3.0.

The Chapter 5 details these four strategic unlocks.

Chapter 05
Detailing Cross-Sector Strategic Unlocks

As described in the previous chapter, one of the key imperatives of execution strategy is deploying four cross-sector strategic unlocks: **Unlocking Data, Democratizing AI, Enhancing Human Capacity,** and **Expanding Digital Transactions**. When combined together, they can unlock the structural bottlenecks across sectors and enable DPI 2.0 sectoral transformations.



The following sections describe each unlock in terms of capabilities it should aim to enable, its potential impact and key implementation considerations for realising the unlock inline with the execution strategy.

1: Unlocking Data

Across DPI 2.0 priority sectors such as agriculture, MSMEs, Education, Health — vast amounts of relevant data already exist. Yet much of it remains siloed, inaccessible and unusable. Enabling use of data responsibly is essential for timely insights, improving productivity and expanding market opportunities for individuals, enterprises, and institutions.

What types of data to focus on?

We need to focus on both public and private data sources. The data to unlock can be classified into three categories:

1. **Non-personal data** such as climate and weather information, soil data, geospatial layers, local market prices, or disease surveillance trends. When this data becomes more accessible it supports better advisories, more accurate forecasting, and stronger planning across sectors like agriculture, health, energy.
2. **Anonymized and Aggregated data,** such as indicators derived from GST filings, mobility flows, district-level learning outcomes, energy demand patterns or aggregated credit patterns. This helps reveal broader trends without identifying individuals or businesses. These datasets can help identify market trends-allowing MSMEs to expand, policymakers, regulators, to understand market behaviour, identify risks and gaps.
3. **Personal and Transactional data**, when shared securely and with informed consent, enables individuals and enterprises to prove their identity, skills, eligibility, and performance. Learning histories, health records, job experience, invoices, repayments and service-delivery footprints can all help people access opportunities, - jobs, credit, markets, benefits, and services — more easily. When this data becomes portable and verifiable, it reduces friction, strengthens trust, and allows citizens and enterprises to carry their records across platforms and providers.

These datasets represent powerful but underutilised resources. Data is the new additional currency of the digital economy which needs to be harnessed for social good - to create value for individuals, communities, and small enterprises through secure, governed, and trusted frameworks for sharing and reuse.

What should it aim to enable?

To unlock data, we recommend focusing on enabling the following:

1. Actionable Insights

Unlocking data should make it possible to access and derive timely and meaningful insights from diverse sources of both non-personal and aggregated data. Today, such data remains locked within departmental silos or buried in non-standard formats, making it difficult to analyse or use. Data becomes more accessible and interoperable when it is machine-readable, ready for AI use, organised through open specifications, and supported by simple policies that enable safe and consistent exchange across systems. These approaches help data flow more easily, enabling AI systems and analytics tools to convert raw information into actionable, localised intelligence. This can improve productivity and expand markets.

2. Ability to Prove Credentials in a Low-cost, High-trust Manner

Unlocking data must strengthen trust in transactions by enabling individuals and enterprises to prove who they are, what they are eligible for, and what they have —securely and with consent.

Most verification today relies on manual checks, fragmented records, or personal networks, leading to delays, exclusion, and high transaction costs. When data becomes portable, verifiable, and anchored in clear safeguards, it reduces transaction cost significantly making additional market segments viable and allowing the formalization expansion in multiple sectors - benefits reaching more beneficiaries, workers can prove their skills, and enterprises can demonstrate compliance in a low cost and high trust manner.

Trust can be strengthened through mechanisms such as consented data sharing, real-time online verification where appropriate (such as eKYC-type checks), offline or asynchronous verification through verifiable credentials.

For tradable and monetisable assets such as energy units, carbon credits, real estate, gold, or fine art—tokenization can also be used for secured exchange across systems, expanding access to credit and new forms of economic opportunity.

Key considerations for implementation

1. Use-case Driven District-level Ecosystems

The value of data is unlocked only when it is used in real, high-value use cases—such as farmer advisories, market intelligence for MSMEs or teacher support. Districts are the natural unit where citizens, markets, and government programs intersect. When local institutions, entrepreneurs, and solution providers work around concrete problems, they create tangible demand for data use. This ensures that data unlock efforts stay grounded in real-world needs, not in abstract system design.

2. A Sustainable Data Economy

Building a sustainable data economy is a mandatory pre-condition to ensure that value flows to every stakeholder—data custodians, solution builders, and end users. Following three aspects are critical to achieve that:

a. Incubate and grow data aggregators - commercial or public-interest entities - with sustainable business models who will combine datasets, improve quality, and make them usable for analytics and AI.

b. Activate data custodians - private and public - with relevant incentives to unlock data safely and in a federated way.

c. Set clear terms of use for all actors regulated by existing or new regulators in the respective sectors.

2: Democratizing AI

Artificial Intelligence is transforming what is possible across every sector. It can solve problems of processing huge volumes of data, reducing knowledge and capacity gaps, making digital systems more accessible, and automate repetitive cognitive tasks. These capabilities were previously inaccessible or prohibitively costly at scale. When combined with DPI, AI amplifies the value of data and knowledge across sectors—helping farmers receive customised crop advice, enabling MSMEs to navigate markets, supporting teachers and learners and improving access to social benefits.

As highlighted by Nandan Nilekani in *AI will change India, and India will change AI,* in The Economist, 2025[23], India's greatest contribution to the world may come from developing AI systems that work at population scale, grounded in local languages, institutional trust, and real-world use cases.

What should it aim to enable?

To realise the potential of AI, we recommend focusing on enabling the following:

1. Predictive Intelligence for Insights and Risk Management

India's sectors have long operated mostly in a reactive mode. AI can change this. It can analyse patterns across different datasets to surface early signals—allowing people and institutions to act in advance. For example, an MSME using anonymised district-level transaction trends can anticipate a rise in local demand two weeks in advance, and increase production to meet the demand. Such anticipatory insights shift systems from reacting to events toward making timely decisions that enable growth, reduce risk and improve outcomes.

2. Personalised Guidance - Always Available for Citizens

While knowledge exists across sectors, people often struggle to get timely help when making everyday decisions—whether it is a farmer choosing the right input, a parent navigating school admissions, a worker interpreting a job requirement, or a small merchant trying to comply with a new rule. Limitation of human capacity, capability and access to experts is a significant bottleneck for a large population.

AI must become a *first-response assistant* to help people make better decisions in their specific context. A farmer asking, "What should I do about this pest?", a shop owner wondering "What's the demand for my product next month?", or a teacher unsure about a new classroom procedure - should all get clear, localised contextualized trusted guidance instantly.

This requires AI systems that understand local data, local language, and local knowledge—bringing expert support to people who have never had access to specialists.

3. Language AI to Bridge Digital and Language Barriers

Irrespective of the level of language and digital literacy - every Indian is comfortable with verbal engagement in their language. AI has the potential to enable voice as a de facto interface for every Indian to engage with technology. This is a paradigm shift for the digital economy making technology to work for everyone, inclusive by design. Enabling conversations built on translation, speech-to-text, text-to-speech, and summarisation—must make digital systems intuitive and inclusive, enabling users with varying literacy levels to access services and information effortlessly. Shared Language AI capabilities such as voice, translation and conversational interfaces, tailored to Indian languages must be widely available so that public institutions and innovators can integrate them into services.

Key considerations for implementation

While AI has made significant progress, globally only 10-30% of AI based POCs move successfully into production[24] with a few handful large tech organizations shaping the AI. We must address structural barriers such as access to affordable compute, quality data sets, India specific models and safety frameworks for AI to reach every citizen and sector.

1. Open Data for Training

AI systems can deliver context-aware outcomes only when they are trained on high-quality, representative datasets. Creating such training datasets is therefore fundamental for creating India specific AI models by a diverse set of tech players. This requires the enabling of sourcing, contribution and curation of open training datasets, by both public institutions and private ecosystem players, covering priority domains and populations.

2. Affordable Compute

Affordable and predictable access to compute is essential for AI adoption, especially for researchers, small innovators and public institutions. India's IndiaAI Mission is already working towards this. Builders need access to the right kind of AI compute along with simple onboarding, affordable pricing, and transparent service levels. Compute becomes truly democratised when these resources are easy to access, fit for purpose, and available for public-interest different sizes of workloads, not only for large actors.

3. AI Models for Indian Context

India needs AI models that understand its languages, cultural and domain contexts. This requires a strategic focus on the scaling of tech entrepreneurship imperative described in the execution strategy with three mutually reinforcing elements:

- **Expanding India's AI entrepreneurship base:** India must significantly grow its pool of AI builders and startups capable of delivering India-specific models and tools. These entrepreneurs form the distributed innovation engine needed to respond to DPI-aligned demand emerging from districts and sectors. India's AI mission is already taking steps in this direction by encouraging local model development.
- **Demand driven AI Research:** Aggregated demand emerging from states and districts should drive the research priorities. Creating innovation clusters by actively directing R&D setups (in academia and the private sector) ensure that research outputs address these priorities. The research outputs can then flow into entrepreneurial ecosystems, where they are translated into deployable solutions.
- **Strategic engagement with global AI players:** Though leading global AI companies have large investments, AI talent and advanced AI capabilities, they are looking for the use cases to solve in order to become commercially viable. Aggregated demand via DPI 2.0, across agriculture, health, education, and MSMEs, provides an unique opportunity for India to steer global players

to co-develop models "in India, for India," working alongside domestic startups and academic institutions. The Aadhaar program did similar market shaping in the biometric space.

4. Tools and Standards for Safe AI

As AI systems enter high-stakes domains, trust and safety become highly critical. Developers and institutions need tools for evaluation, red-teaming, bias assessment, and monitoring. Developing frameworks, standards and tools for transparent evaluation, and simple operational guidelines help institutions deploy AI responsibly without adding heavy compliance burdens. This ensures AI deployments are trustworthy, transparent, and aligned with public values.

5. Strengthening AI talent

AI transformation depends on strengthening talent across three types of stakeholders: builders who create AI solutions, government officials who adopt and apply them, and policymakers who set the guardrails for safe and effective use.

Democratizing AI requires practical skilling for each of the stakeholder groups for effective solutioning, usage as well as governance.

3: Enhancing Human Capacity

Across sectors, people often struggle to figure out the answer to their question from existing data and knowledge —whether a teacher preparing for a class, a student trying to grasp a concept, a farmer trying to figure out when to sow seeds, or a small business owner handling compliance. Unfortunately availability and access to experts and guides is also limited, especially for folks with limited financial means. Enhancing human capacity at scale means ensuring that people receive contextual guidance when they need it and ongoing learning that helps them build skills over time, making capacity building inclusive and lifetime.

What should it aim to enable?

1. Actionable, Contextual Knowledge at the Moment of Need

Knowledge should be easy to discover, tailored to a person's situation, and simplified into steps they can apply immediately—in the language and format they understand.

For example, a government school teacher who wants to teach a new chapter receives an instant, simple explanation of the learning objective, a short demonstration video, and two recommended activities tailored to her grade and language—right when she needs them.

2. Continuous Learning and Upskilling through Real-time Guidance

People should be able to strengthen their skills and confidence while performing their day-to-day roles. This means that teachers can refine their instruction practices over time, agricultural field functionaries can better diagnose crop issues —all through timely nudges, clarifications, and feedback that help them improve with each task. This progression must be enabled in the languages and modalities that users are most comfortable with, so that learning happens naturally and continuously.

Key considerations for implementation

1. Use of AI to Deliver Knowledge in a Contextual, Simple and Usable Form

This builds on the broader democratization of AI described in the previous section, which makes AI capabilities accessible for use across sectors. AI plays a catalytic role in enhancing human capacity as it can convert institutional knowledge into actionable steps with personalised explanations. For example, a shopkeeper filing a GST return can ask the AI based assistant, "What do I do next?" and receive a clear, context-specific sequence of steps instead of navigating long manuals—just as teachers and students receive subject-specific guidance in real time.

2. A Well-governed Ecosystem of Diverse, Trusted Knowledge Resources

Enhancing human capacity requires a reliable pool of accountable knowledge—both existing and newly created—that can be easily discovered, reused, and adapted across contexts. This can include curated policies, manuals, demonstrations, explainers, and multimedia learning content. When these resources are made discoverable, up-to-date, and published in reusable formats, they become accessible for use by people and for powering AI-based guidance.

For example, agriculture departments and KVKs may publish pest advisories, dosage recommendations, and demonstration videos in reusable formats. A farmer or extension worker can instantly access a short video on identifying a new pest outbreak along with the recommended action—either directly or via an AI assistant.

4: Expanding Digital Transactions

Across India's local economies, a large share of everyday socio-economic transactions—finding work, accessing services, selling produce or applying for benefits—remain informal and not digitally enabled. These interactions often rely on personal networks, intermediaries, paper records, or closed platforms, making them difficult to discover, verify, or scale. This creates a large hidden economy - estimated at 20–30% of national GDP[25].

As a result, transaction costs remain high, market access is limited, and growth is constrained. Small enterprises and informal actors are unable to participate in larger value chains, reducing productivity and preventing economic activity from scaling.

While other strategic unlocks reduce the cost, trust, and usability of digital interactions—through verified data, AI-enabled interfaces, and consent-based systems—people and organisations must be able to participate digitally in the first place. This foundational constraint is addressed here by enabling transactions to scale across a wider and more diverse set of participants, making formalisation faster, easier, and more inclusive. At population scale, this expansion of digital transactions is critical to achieving the non-linear growth envisioned under DPI 2.0.

What should it aim to enable?

1. Unbundling Demand and Supply through Open Networks

Today, often demand (people seeking work, services, goods, or benefits) and supply (providers, workers, institutions) are tightly bundled within closed platforms. These platforms are responsible for end-to-end transactions—discovery, coordination, and fulfilment—making participation costly and limiting scale. As a result, only large providers can participate meaningfully, while small providers face restricted market access. Consumers, in turn, are limited to the options offered within a single platform.

Expanding digital transactions requires unbundling demand and supply through a network-based approach. Interoperable transaction networks allow demand and supply to be broadcast, discovered, and matched across multiple platforms and channels. Providers can reach demand through multiple channels, and consumers can discover and engage with providers through different interfaces—while retaining choice over how and where interactions occur.

Shift from platform-centric models to network-enabled participation, allows to:

- Expand market access at significantly lower cost.
- Reduce the cost of doing business by avoiding repeated integrations and intermediaries.
- Combine different types of offers—jobs, services, credit, logistics, benefits—to serve diverse and long-tail needs more inclusively.

2. Digital Enablement of Physical Entities

For these network-enabled transactions to be inclusive at scale, the underlying physical entities—individuals, MSMEs, cooperatives, panchayats, service providers—must be digitally enabled to participate. This means ability to broadcast who they are, what they offer, what they seek in a credible way.

When entities are digitally enabled, they can participate in multiple platforms and programs without repeated onboarding or manual verification. This becomes a prerequisite for transacting digitally—especially for small and informal actors who are otherwise excluded due to lack of documentation or visibility.

Key considerations for implementation

1. Enable Ecosystem-led Network Operation

Unbundling demand and supply through open networks requires ecosystem-led network operation, where shared transaction networks are designed, governed, and operated by dedicated ecosystem players rather than controlled by any single platform or market participant.

Such network operation provides common rails for broadcasting, discovering, and engaging across platforms, while ensuring open access, interoperability, and non-discriminatory participation. This approach reduces fragmentation, lowers integration costs, and prevents gatekeeping—while still allowing competition and innovation at the application layer.

2. Drive District-level Digital Enablement of Entities

Transaction networks only succeed when a critical mass of local entities can participate meaningfully. This requires focused district-level initiatives to digitally enable individuals and organisations who form the backbone of local economies.

Districts are the natural unit where local markets, livelihoods, and public programs intersect, making them the most effective level for driving adoption at scale. Digital enablement is driven by actors who verify entities, issue credentials, onboard them onto networks, and support initial participation and activation — functions that may be performed by local governments, NGOs, industry bodies, or market players.

Chapter 06

Sectoral Transformations: Strategic Unlocks in Action

This section outlines DPI 2.0 sectoral transformations and offers recommendations for leveraging strategic unlocks to achieve them. These are not detailed implementation blueprints, but strategic directions towards actioning the transformations.

1: Scaled Market Expansion for MSMEs

Micro, Small and Medium Enterprises (MSMEs) form the backbone of India's economy, comprising 6.3 crore enterprises, contributing 30% to GDP, over 40% to exports[26], and employing around 110 million people[27]. Yet, MSMEs constrained by complex compliance processes, limited access to market and credit, are unable to grow and are discouraged to formalize.

What is the transformation?

DPI 2.0 recommends enabling MSMEs to move from fragmented, hyper-local markets to scaled market expansion and growth. By enabling access to market intelligence, widening market linkages, and simplifying compliance, DPI 2.0 can help at least 10 million enterprises to grow and fuel job creation as well[28].

By reducing information asymmetry, compliance and transaction friction, MSMEs can move beyond survival-driven local trade towards predictable participation in regional and global value chains—strengthening competitiveness, improving productivity, and unlocking non-linear growth.

> "Asha, who runs a small garment unit in Surat, once sold only within her local market, relying on a few brokers and uncertain word-of-mouth orders. Today, using AI-based market intelligence she identifies both local and global trends. She has expanded her reach across India and begun exporting to new markets abroad. What began as a neighborhood business has grown into an internationally trusted brand."

What can enable this leveraging the strategic unlocks?

1. AI-Driven Market Intelligence: By combining enterprise data, trade flows, and consumer trends, MSMEs can access real-time insight into demand patterns, pricing, and buyer discovery. AI-enabled assistants help entrepreneurs identify opportunities, benchmark performance, and make informed decisions in local languages. *(Unlocking Data + Democratizing AI + Enhancing Human Capacity)*

2. Market expansion through Digital Networks: Open, interoperable transaction networks allow digitally enabled MSMEs to be discovered across demand channels, logistics platforms, procurement systems, and export channels—without being locked into a single platform or limited by physical constraints of

customer reach. This dramatically lowers entry barriers and enables even micro-enterprises to reach wider markets. *(Expanding Digital Transactions Unlock)*

3. Digital Compliance Enablement: AI-assisted compliance systems simplify filings, auto-generate reports, and validate submissions using verified enterprise data and digital credentials. This reduces compliance burdens, encourages formalisation, and builds a verifiable enterprise profile. *(Unlocking Data + Democratizing AI + Enhancing Human Capacity)*

2: MSME Jobs Finding Local Talent

India's blue and grey collar labour market remains highly fragmented and informal. Most hiring is mediated through informal channels — local contractors, intermediaries or word-of-mouth. While many MSMEs cite manpower unavailability and skill shortages as major constraints to growth, many local job seekers are unaware of the unfilled opportunities[29]. In addition, MSMEs face high costs often over ₹1,000 per lead and long lead times that can stretch two weeks or more per lead to find qualified candidates. Job seekers missing out on local opportunities are forced to migrate or settle for jobs that do not match their aspirations.

What is the transformation?

The MSME jobs market can be largely categorised as low income, high job volume with high churn rate. It requires a transformative approach which is grounded in reducing the transaction access friction and cost significantly.

The transformation focuses on making local jobs, job seekers & their skills digitally visible, comparable, and matchable in a credible way through trusted local employment digital networks. The aim is to make job discovery and fulfillment significantly a low cost transaction. This expands access to nearby and appropriate work for job seekers, and strengthens local economies.

> "Ravi, a trained machine operator in Guntur, earlier depended on word-of-mouth for daily work. Now, with a verifiable skill credential from a district skilling center and a digital worker profile, he's automatically matched to nearby MSMEs looking for his skill set. The system finds him — not the other way around."

What can enable this leveraging the strategic unlocks?

1. Digitally Enabled Job Seekers: Enabling a job seeker to broadcast who they are, their skills, certifications, work history and what they are seeking in a credible way as a "blue dot". This creates "Know Your Applicant" (KYA) capability for employers reducing manual verification, and cost of trust. *(Unlocking Data + Expanding Digital Transactions Unlock)*

2. Digitally Enabled MSMEs: Enabling MSMEs to broadcast who they are, what the job opportunities are, required skills, wages, and location. *(Unlocking Data + Expanding Digital Transactions Unlock)*

3. Digital Employment Networks: Federated local digital employment networks connecting digitally enabled MSMEs and job seekers —enabling seamless job discovery and fulfillment. These networks ensure that skills supply and demand are visible and actionable at the local level. *(Unlocking Data + Expanding Digital Transactions Unlock)*

4. Vernacular AI-powered Job Assistants: AI assistants help job seekers to apply for jobs easily, in their own language and through voice assistance. They also help MSMEs to reduce the cost of evaluating and filtering suitable candidates for their job fulfillment. *(Democratizing AI + Enhancing Human Capacity)*

ONEST is an ecosystem initiative, lead by EkStep in partnership with government departments, market and not-for-profit organizations that aims to unlock no-frills, trusted, and timely discovery of demand, enabling the needs and aspirations of 500 million+ young Indians in the context of employment opportunities. (https://onest.network/)

The recent "Blue Dot Project" pilot in Dharwad, Karnataka, has shown striking results. Over **350 MSMEs and 1,100 students** in Dharwad are now connected through ONEST network. Placement officers report **hiring times reduced by nearly 90%**, and young trainees—especially women—are receiving job calls before completing training. This represents the foundation of a **district-wide digital employment exchange** - not as a website or an app or an office, but as an interoperable DPI services layer where youth, employers, government offices, not-for profits, startups, and service providers all participate.

3: Improved Livelihood for Smallholder Farmers

Agriculture and its allied sectors remain the backbone of rural livelihoods in India, with nearly 70% of rural households primarily depending on them for income. India's agricultural sector employs over 45% of the workforce, yet contributed only about 18%[30] to the GDP (in 2023-24). Over 85% smallholder farmers continue to operate at subsistence levels[31], with a meagre average monthly income of ₹13,661, and only ₹4,476[32] coming directly from agriculture.

These gaps exist because farmers operate in an environment marked by fragmented information, volatile weather, limited access to market and credit, and difficulty obtaining timely benefits, leading to low-yield and lower price realization.

What is the transformation?

The transformation enables farmers to increase their yield and access to the better price for their produce. It aims to achieve it by enabling timely climate and farming advisories in their context to manage weather risks, along with better access to markets—so they can discover fair prices, reliable buyers, and efficient storage and logistics. In addition, enabling easy access to credit and timely benefits for their working capital needs.

> "Earlier, a smallholder farmer like Ramesh in Vidarbha relied on guesswork — uncertain rainfall, middlemen for pricing, and months of waiting for credit. Now, with a digital farmer profile, AI-based weather and crop advice in Marathi, and direct buyers on interoperable market platforms, his decisions are guided by data, not chance. What was once a risky livelihood is now a connected, trusted enterprise."

What can enable this leveraging the strategic unlocks?

1. Agriculture Registries: Enabling agriculture related digital registries - including farmer information, land records, soil data enables precision advisory, insurance, and credit services. *(Unlocking Data + Expanding Digital Transactions)*

2. AI-Powered Advisory Assistants: AI assistants can provide contextualized, voice-based guidance on crop management, weather risks, and pest outbreaks. They can also help farmers access loans, insurance, and welfare schemes in their own language—turning complex information into personalized, actionable advice at the moment of need. *(Democratizing AI + Enhancing Human Capacity)*

3. Digital Networks for Agri Services: Interoperable digital networks connect farmers directly with buyers, input suppliers, logistics providers, finance services and agri-tech innovators. These networks enable price realization, reduce dependence on intermediaries, and enable transparent, traceable transactions. *(Expanding Digital Transactions)*

4. Digital Credit Access: Verified digital farmer profiles linking land, crop cycles, and transaction history enable collateral-light lending, faster claim settlement, and more accurate credit assessments. This expands financial inclusion enabling farmers to working capital. *(Unlocking Data + Expanding Digital Transactions)*

VISTAAR

The **VISTAAR** initiative of the Ministry of Agriculture & Farmers Welfare (MoAFW) offers an example of how open networks using Beckn can enable the discovery & fulfillment of verified agriculture content, best practices, and agri-skilling across diverse private and public provider platforms - driving innovation and collaboration across the agriculture ecosystem. (https://vistaar.da.gov.in/)

MahaVISTAAR is an open network by the Department of Agriculture, Government of Maharashtra under the national VISTAAR framework. It brings together various platforms offered by the State for agricultural advisory and services. This infrastructure has been supercharged by the introduction of Generative AI, which enables farmers to search for and receive agri-advisory in a simple to understand manner, in a language of their choice. (https://mahavistaar.ai/)

4: Decentralized Energy Markets

India's energy demand is already three times the global average[33].The country remains heavily dependent on imported fossil fuels, leaving it vulnerable to price shocks and supply disruptions. Without adequate renewable backup, rising power cuts are expected by 2027[34]. At the same time, India has a natural advantage: nearly 300 sunny days a year[35] and strong policy momentum through initiatives such as the *PM Surya Ghar Muft Bijli Yojana.*

Yet, despite rapid rooftop solar adoption, distributed energy remains underutilised. Households and small enterprises lack real-time visibility into generation and consumption, face limited mechanisms to monetise surplus power, and depend on fragmented systems that do not support seamless energy transactions. As a result, decentralised energy assets exist—but do not yet function as a market.

What is the transformation?

DPI 2.0 can transform India's energy landscape by creating a trusted, digital ecosystem where energy assets and services are visible, verifiable, and tradable. This will enable decentralised energy markets where households and enterprises can produce, store, and sell renewable power directly to verified buyers such as EV charging stations, small businesses and individuals through trusted transactions — much like how UPI democratized payments.

> "Earlier, Arjun a shop owner in a small town faced frequent power cuts and rising electricity bills, relying solely on the grid. Today, with rooftop solar panels connected through a digital energy marketplace, he can track his generation in real time and sell surplus power to nearby EV stations. His verified energy tokens make each transaction transparent and instant. What was once a cost burden is now a source of steady income and energy independence."

What can enable this leveraging the strategic unlocks?

- **Tokenisation of Energy Assets:** Intangible assets such as rooftop solar, battery storage and carbon credits are converted into digital tokens that can be traded or exchanged - allowing individuals and enterprises to monetise surplus energy and green assets. *(Unlocking Data)*
- **Digital Energy Networks:** Trusted, interoperable digital networks match local energy supply and demand in real time. They allow certified producers to sell surplus power directly to the verified buyers. *(Expanding Digital Transactions)*

Unified Energy Interface

The UEI Alliance (Unified Energy Interface), is a collaborative community that brings together utilities, startups, regulators, digital platforms, and ecosystem enablers, to advance open, interoperable digital infrastructure with the UEI network. Among multiple possibilities, the UEI network built using Beckn enables seamless discovery and transactions between energy consumers and providers. (https://ueialliance.org)

A Peer-to-Peer (P2P) energy trading pilot in Uttar Pradesh, implemented on UEI by the Uttar Pradesh Power Corporation Limited (UPPCL) with private partners, allowed rooftop solar prosumers to sell surplus energy directly to nearby consumers. Smart meters and digital settlements ensured transparency, accuracy, and fair compensation, validating the potential of citizen-led energy markets and providing a scalable model for distributed solar monetisation across India.

5: Access to Credit for a Billion Indians

As of 2023 only 20% of MSMEs had access to formal credit[36], and over half of the urban poor still rely on informal moneylenders[37]. The Account Aggregator (AA) framework[38] initiative is already unlocking a new wave of fintech innovation to disburse micro-loans using alternative data from UPI and GSTN.

However large volumes of monetizable individually owned assets remain illiquid and unusable for formal credit, leaving entrepreneurial capacity underutilised. There is an opportunity to unlock these assets by enabling multiple microcredits as well as addressing significant friction in loan processing due to rigid collateral requirements, extensive paperwork, and static risk assessments, as a result.

What is the transformation?

DPI 2.0 focuses on making individual owned assets productive by enabling access to multiple microcredits maximizing the utilization of asset value as a collateral, in a low friction manner.

It recommends achieving this by digitally representing monetizable assets - such as land holdings, invoices, receivables, carbon credits, and transaction histories - which can be fractionally claimed, and securely shared, allowing even small or partial assets to support access to credit.

This transformation democratises access to credit for small enterprises, farmers, and low-income households—reducing dependence on informal lenders, lowering the cost of capital, and unlocking new pathways for livelihoods, growth, and innovation.

> **"Earlier, Leela, a small farmer in UP, had land but no collateral the bank would accept. Each season she borrowed from local lenders at high interest, pledging her harvest informally. Now, with her land record verified and tokenised, when she needs funds for seeds, she pledges a fraction of that land token on an open credit platform. Within minutes, a lender offers her a low-interest micro-loan — no paperwork, no visits. Her land stays hers; her data works as her collateral."**

What can enable this leveraging the strategic unlocks?

- **Financial Ledgers of Tokens:** Monetizable assets—such as land records, invoices, receivables, carbon credits, or verified transaction histories—can be digitally represented and transacted on shared financial ledgers that record assets, money, and obligations together. This enables assets to be divisible, portable, and reusable across financial services, allowing lenders to assess value, manage risk, and extend credit even for small ticket sizes. *(Unlocking Data)*
- **Open Ledger Protocols and Specifications:** Open ledger protocols and specifications enable seamless interoperability across a network of ledgers and financial service providers. They ensure the integrity and consistency of transactions, providing finality that once a transaction, such as an asset transfer, is completed, it is secure and irreversible. *(Expanding Digital Transactions)*

Finternet

The **Finternet™** is an initiative to create an open, programmable infrastructure that interconnects fragmented financial ecosystems, much like the internet connects information. Through enabling tokenization of monetizable assets, unified financial ledgers, and Unified Interledger Protocol (UILP), Finternet™ demonstrates how creditworthiness can be assessed dynamically and loans disbursed instantly. (https://finternetlab.io/)

Several pilots in India and across the globe are demonstrating how unified ledgers and interoperable digital assets can simplify credit flow, improve trust, and expand financial access for small enterprises. For example, the **Vivriti Capital pilot** uses tokenisation of SME loan portfolios and receivables to improve liquidity. The GLEIF pilot applies verifiable Legal Entity IDs for faster KYC, while the **E-Liability pilot** uses tokenised carbon data for real-time carbon emissions accounting.

6: Safe Spaces for Learner-Centric Education

Education is central to achieving Viksit Bharat by 2047, fueling human capacity, productivity, and social mobility, especially for lower-income groups striving for better livelihoods. India's education system serves close to 250 million school students[39] and 40 million higher education learners across diverse geographies and socio-economic backgrounds[40]. Despite near-universal enrollment, foundational learning outcomes remain low — with the 2022 ASER survey showing that only 42% of Class V students can read a Class II text[41].

Learning inequities persist due to language barriers, uneven teacher capacity and limited access to locally relevant learning resources. These structural gaps hinder productivity, upward mobility, and lifelong learning opportunities, particularly for rural and first-generation learners. Furthermore, traditional one-size-fits-all approaches and psychological barriers like fear of failure prevent many learners from reaching their full potential.

What is the transformation?

DPI 2.0 helps realize the NEP's aim to strengthen learner-centric education by empowering students, teachers as well as administrators. This can be achieved through equitable access to quality learning materials in local languages, fostering judgement-free safe spaces for continuous personalized learning that adapt to each student's unique needs and strengths and learn at their own pace without fear of falling behind. Teachers can deliver truly individualized support, improving learning outcomes across diverse classrooms. Administrators create better interventions through actionable insights using various data sources.

> "Earlier, a student like Meena in rural Odisha relied on rote learning and limited access to qualified teachers. Today, through a multilingual AI-based learning assistant on her school tablet, she can ask questions in Odia, get explanations in simple language, and receive personalized guidance aligned with her curriculum. Her teacher uses the same system for lesson planning and real-time student feedback, transforming the classroom into a collaborative learning space."

What can enable this leveraging the strategic unlocks?

1. Education Resources Network: Enable discoverability and reuse of verified educational resources across boards, states, and providers through a federated infrastructure — linking digital content repositories, educational data, and institutional registries to promote interoperability and evidence-based decision-making. *(Unlocking Data, Expanding Digital Transactions)*

2. AI-Powered Learning Assistants: Provide contextual, curriculum-aligned, and language-inclusive learning and insights to students, teachers and administrators. These assistants deliver personalized explanations, practice exercises, feedback loops and actionability using insights. *(Enhancing Human Capacity)*

3. Verifiable Learning Credentials: Enable seamless recognition of learning across institutions through portable, verifiable digital credentials for courses, skills, and assessments. These credentials strengthen student and teacher mobility. *(Unlocking Data)*

ASSISTED LANGUAGE AND MATH LEARNING
A philanthropic initiative of EkStep

The **Assisted Language and Math Learning (AXL)** is a system-led, AI-powered initiative that helps children read and do math by creating safe spaces for learning through self-pace personalized practice. (https://all.ekstep.org/)

AXL based solutions have been rolled out in states of Tamil Nadu, Telangana and Karnataka across 19000+ schools. They are already showing a visible positive impact on learning outcomes of the children.

7: Universal Health Coverage

Nearly 30% of India's population—the "missing middle"—remains uninsured[42] facing a very high risk of ruining the financial wellbeing of the family due to a health incident. And the same risk is faced even by millions of insured families due to high out-of-pocket expenditure, 39.4% of total health spending[43].

What is the transformation?

Universal Health Coverage (UHC) means all people have access to the full range of quality health services they need, when and where they need them, without suffering financial hardship. UHC protects the economic gains of DPI 2.0, ensuring that a single health crisis doesn't erase a family's progress toward financial stability.

UHC has many aspects including - coverage of a full continuum of essential health services throughout a person's life for every citizen; implementation design of insurance to truly promote preventive care; robust health care service provider network.

The Ayushman Bharat Mission with a goal to achieve Universal Health Coverage (UHC) has made significant progress so far. It is important to strengthen and accelerate the mission further to achieve the UHC by 2030.

We recommend DPI 2.0 to focus on strengthening and fast-tracking the Ayushman Bharat Digital Mission (ABDM) which is already working towards developing digital health infrastructure for the country.

"Earlier, Kavita, a schoolteacher from Thirumalapuram village near Madurai, went to the doctor only when she fell seriously ill. Her insurance didn't cover check-ups, so she ignored early signs of headaches. Now, using her Health ID on the Unified Health Interface (UHI), she books low-cost preventive screenings at a nearby clinic. Test results are shared securely with her family doctor, who reviews them on an AI-assisted dashboard. When early signs of hypertension appear, the system alerts both her and her ASHA worker, who visits with guidance on diet and exercise.

What can enable this leveraging the strategic unlocks?

ABDM is already enabling following:

- **Digital Healthcare Registries:** Digital healthcare registries for professionals and facilities. *(Unlocking Data)*
- **Digital Health Records:** Creation of individual health records linked with digital health ID - ABHA Number. *(Unlocking Data)*
- **Digital Health Networks:** Networks for citizens to discover and access health service providers, shared digital health records and settle insurance claims. *(Expanding Digital Transactions)*

DPI 2.0 strategic unlocks can further strengthen the ABDM mission with following:

- **Diagnostic AI Assistants:** AI can help process large amounts of health data to help doctors for early detection and better diagnostics for patients. *(Data Unlock, Democratizing AI)*
- **Healthcare Worker AI Assistants:** Equip ASHAs and primary care providers with AI-enabled tools for assessment and clinical guidance and engagement in regional languages. *(Democratizing AI, Enhancing Human Capacity)*
- **AI-Powered Public Health Management:** Anonymized health data can be analyzed by AI systems to generate insights that help disease surveillance & early detection of outbreaks. *(Data Unlock, Democratizing AI)*

ABDM can also consider aggregating demand via district programs as suggested by DPI 2.0 Execution Strategy to enable its adoption and usage at the grassroots level.

8: Benefits finding Beneficiaries

As India advances toward Viksit Bharat, social protection must evolve into a proactive enabler of aspiration and upward mobility. Direct Benefit Transfer (DBT) has transformed the last-mile welfare delivery by digitizing fund transfers and reducing leakages.

Now we have to focus on improving the discovery and application. Citizens struggle to discover relevant schemes, prove eligibility, and navigate complex, paper-heavy procedures—often in unfamiliar languages—creating friction and delay. A significant portion of India's scholarship budget remains unutilised, amounting to thousands of crores.

What is the transformation?

To enable end to end benefit realization process, it requires a transformative approach which is grounded in reducing the transaction access friction and cost significantly. This transformation focuses on making potential beneficiaries digitally visible, comparable, and matchable in a credible way through trusted digital beneficiary networks. It would also enable automatic enrollment and pre-filling applications,

minimizing the effort and burden on citizens. The aim is to make benefits discovery and fulfillment significantly a low cost transaction.

> "Earlier, Ravi, a daily-wage worker from Gumla district in Jharkhand, often missed out on welfare schemes as he didn't know about what schemes and how to apply. Long trips to government offices meant losing a day's wages. Now, his digital profile and verified livelihood data, automatically matches him to eligible schemes. Through a voice-based app in Hindi, he gets alerts about new benefits and confirms enrollment with a simple consent. Benefits reach his account without follow-ups. For Ravi, support no longer depends on he knowing the system — the system now knows him.

What can enable this leveraging the strategic unlocks?

1. Digitally Enabled Beneficiaries: Enabling a potential beneficiary to broadcast who they are, their certifications and what they are seeking in a credible way as a "blue dot". This creates "Know Your Applicant" (KYA) capability for benefit providers reducing manual verification, and cost of trust. *(Unlocking Data + Expanding Digital Transactions Unlock)*

2. Digitally Enabled Benefit Providers: Enabling benefit providers to broadcast who they are, what the benefits are, required qualifications etc. *(Unlocking Data + Expanding Digital Transactions Unlock)*

3. Digital Beneficiary Networks: Federated local digital beneficiary networks connecting digitally enabled benefit providers and potential beneficiaries —enabling seamless benefit discovery and fulfillment. *(Unlocking Data + Expanding Digital Transactions Unlock)*

4. Vernacular AI-powered Benefit Assistants: AI assistants help beneficiaries to apply for benefits easily, in their own language and through voice assistance. They also help benefit providers to reduce the cost of evaluating and filtering suitable candidates eligible for their benefits. *(Democratizing AI + Enhancing Human Capacity)*

ONEST

One of the focus areas of the **ONEST** initiative, apart from employment is social benefits. It aims at revolutionizing the process of discovery, application, verification and disbursal of benefits through digital systems.

It has run several pilots with partners like Piramal Foundation, Physics Wallah where a reimagined scholarship application, approval and disbursement experience was created. The pilots saw 2-minute scholarship approvals with same-day disbursement from an average of 6+ months—a big win for the ecosystem and more importantly, a huge relief for the beneficiaries.

IV. CALL TO ACTION

Chapter 07
Recommended Action Plan for DPI 2.0

India stands at a once-in-a-generation inflection point. India's DPI initiatives are already contributing nearly 1% of GDP and could reach 4% by 2030[44]. Actioning DPI 2.0 as articulated in the Execution Strategy (Chapters 4-6) on an immediate basis is critical to get the momentum going for the journey to Viksit Bharat. We recommend following four actions to achieve that:

#1: Decentralized State-led execution

DPI 2.0 is best advanced through decentralised state led initiatives with Government of India and NITI Aayog acting as catalysts. As mentioned earlier, India is vast with extreme diversity—where a single state rivals a continent and our districts comparable to small or mid-size nations. Achieving the compounding impact envisioned under DPI 2.0 requires developing strong, self-sustaining local economies keeping their local context in mind. States are best placed to lead the initiative to drive local growth through district programs.

While ownership and agency of implementation remain with the states, Government of India and NITI Aayog have an important role to play as a catalyst and enabler - in terms of funding, guidance, coordination, enabling state support through ecosystem collaboration and co-learning.

#2: Adopt Collaborative 2-year Iterative cycles of Transformations

2-year Iterative cycles of collaboration to drive Sectoral Transformations are recommended to be executed. Digital Public Infrastructure (DPI) as a design approach is still unevenly understood across States, Union Territories and the ecosystem. As States embark on the uncharted journey of DPI 2.0 sectoral transformations, it is important to create the momentum in an iterative way so that we can figure out exemplar pathways - solutions and replicable models - and build ecosystem capacity before focusing on scaling them across states.

We recommend 2-year iterative cycles, with each cycle focusing on a specific set of sectoral transformations. Year 1 of each cycle will focus on working with few champion States/UTs on lighthouse pilot implementations for selected transformations to figure out exemplar pathways and demonstrate impact. Year 2 can focus on building ecosystem capacity and scaling the adoption of exemplar pathways figured out in year 1 across states. A curated set of DPI expert organizations will also be engaged who can guide the states in their sector specific transformation journeys. The 2-year iterative cycles can have some overlap.

This approach creates an expanding ecosystem network of states, civil society organisations, and market players to collaborate enabling peer learning, shared innovation, and faster adoption.

#3 First cycle (2026-2027) focus on MSME and Agriculture

The success of the first cycle of 2-year is critical to set up the momentum. It will require extra attention and agility to learn and evolve the execution. Following is the suggested design for 2026-2027 (first cycle) plan:

Objective & Scope

- Focus on 3 sectoral transformations in MSME and Agriculture as they have the biggest potential of scale impact on livelihood.
- For 2026 lighthouse pilot implementations - target to work with 6 Champion States/UTs with 2 each for 3 sectoral transformations. Each state identifies 1-2 districts for pilot.
- Try to have at least one champion state/UT from each of the 5 regions - north, south, east, west and north-east India.
- Build institutional and implementation capacity within States/UTs and private sector ecosystem including understanding of DPI approach, sectoral transformation solutions.
- Strengthen India's global leadership on DPI approach by enabling global collaboration and visibility for State-led transformations.

Indicative Milestones
• State workshops and Shortlisting of Champion States/UTs for pilots • Pilots design and Implementation readiness by Champion States
• Pilots design and Implementation readiness by Champion States
• State Pilots rollout
• Demonstrated impact in pilot districts with at least one replicable exemplar path-way emerging for each sector transformation • MSME & Agriculture transformation implementation playbooks. It will include use cases, solution architectures, operating & replicable models
• State workshops and shortlisting of states to scale transformations • Implementation capacity building with States/UTs and private sector
• Design and Implementation readiness by shortlisted States
• State rollouts
• 5+ States/UTs rollouts for proven transformations from 2026

Institutional Setup

We recommend MeitY and NITI Aayog constitute and institutionally setup following to drive overall program, as a catalyst and enabler, starting with 2026-2027:

a. A team to orchestrate and coordinate the overall execution in close coordination with participating States/UTs.

b. An expert advisory group, comprising DPI, AI, and sectoral experts from government, civil society, and the market, who will provide overall strategic guidance to the initiative.

c. A curated set of DPI expert organizations who can support and guide the states during their journey on specific sectoral transformations.

d. Engaging global partners - a set of global development and philanthropic institutions as collaborators and funders in State-led transformations.

e. An Impact Award program to incentivise 2026 and 2027 state outcomes.

f. Consider enabling pilot delivery capacity to states for program & solution design and technical implementation to expedite state-led lighthouse pilots.

#4 A neutral ecosystem body for global engagement is proposed

The engagement of global partners as collaborators in State-led transformations as per 2026-27 plan will be important to figure out a structured global engagement model. India should consider establishing a globally focused initiative in 2027 within a neutral body in collaboration with global partners that will spearhead India's global engagement on DPI — showcasing scalable models, supporting country cohorts for implementation, and fostering a global community of collaboration on DPI and AI for public good. This will reinforce India's leadership in shaping an open, inclusive, and interoperable digital future. A global DPI event can be planned for the launch of this initiative.

The Mission Ahead: A Future of Shared Prosperity

Achieving Viksit Bharat by 2047 is more than an aspiration; it is a strategic imperative that rests on our ability to transform the economy into a high-productivity engine. India has already proven that the DPI approach can deliver results at population scale, bringing hundreds of millions into the digital fold in record time. By moving from foundational access to livelihood-led growth, we can ensure that prosperity is not just a top-down vision, but a grassroots reality. The mission now is to act with speed and synergy—leveraging our proven digital leadership to secure India's place as a global benchmark for inclusive, non-linear growth.

V. Appendices

Appendices

Appendix A: Case Studies of India's DPI Successes

India's Digital Public Infrastructure (DPI) journey has emerged as a cornerstone for scalable, inclusive, and efficient development. By enabling market innovation using shared digital rails across identity, payments, data sharing, and public service delivery, India has driven deep-rooted transformation across sectors. The appendix shares case studies of key DPI initiatives to explain the purpose, design and key success factors. They are intended to be used as reference material to complement the strategic learnings outlined in Chapter 1.

Case Study: Aadhaar

Context and Problem

Before Aadhaar, India's welfare delivery systems suffered from large-scale leakages and exclusion. Beneficiary identification relied on fragmented, paper-based records maintained by multiple departments, often at local levels. These systems made it difficult to reliably distinguish genuine beneficiaries from duplicate or "ghost" identities created through outdated records, migration, or weak verification processes.

In addition, schemes, benefits were routed through intermediaries, creating leakages through diversion during disbursement. Collecting a pension or a food subsidy often required a citizen to travel long distances to a government office, navigate complex paperwork, and often pay a bribe to an intermediary. For a daily wage laborer, this process frequently meant losing a full day's wages just to collect a fraction of their entitlement.

The Initiative and Outcomes

Aadhaar Initiative was set up to address this structural problem by providing a unique, verifiable digital identity to every resident. By assigning a single Aadhaar number linked to biometric and demographic attributes, the system enabled high-certainty identification at the individual level, independent of location, paperwork, or local records.

As Aadhaar was integrated into welfare delivery, it enabled large-scale deduplication of beneficiary databases and high-confidence verification at the point of service. This laid the foundation for Direct Benefit Transfers (DBT), allowing benefits to be transferred directly into beneficiaries' bank accounts without intermediaries.

DBT's success was not driven by identity alone. The Pradhan Mantri Jan Dhan Yojana (PMJDY)—a mission to drive inclusive financial inclusion—leveraged Aadhaar-based e-KYC and a zero-balance accounts policy to rapidly expand access to banking. This enabled India to achieve within a decade a level of financial inclusion that earlier projections had estimated would take several decades. Bank account ownership surged from around 25% to over 80%.

In parallel, the Department of Telecommunications' approval of Aadhaar-based e-KYC in 2016 transformed the telecom sector. This reduced customer acquisition costs by 90%, making it economically viable for operators to scale. Consequently, mobile ownership reached 85% by 2025, turning the mobile into a primary gateway for financial services.

Together, Jan Dhan accounts, Aadhaar, and mobile connectivity—the JAM Trinity—formed the backbone of India's digital transformation. Leveraging this trio, the DBT mission created the world's largest government-to-person (G2P) payment infrastructure, significantly plugging social benefit leakages

while reducing access costs for beneficiaries. The impact has been substantial. Aadhaar-enabled DBT has facilitated the direct transfer of subsidies and entitlements exceeding ₹35 lakh crore (over USD 450 billion) to beneficiaries. By eliminating duplicate and ineligible beneficiaries and reducing diversion during disbursement, the system has generated savings of over ₹2.2 lakh crore (approximately USD 27 billion).

Because of its minimal design, Aadhaar enabled the "e-KYC" (Electronic Know Your Customer) revolution beyond welfare. What used to take days of paperwork—opening a bank account or getting a SIM card—could now be done in seconds, lowering customer acquisition costs for businesses by nearly 90%.

How the DPI Approach Enabled It

a. Programmatic Drive

Aadhaar was implemented through a sustained mission-mode program with a clear focus on universal coverage. Rather than relying solely on a centralised government office model, the enrollment was outsourced to a vast network of registrars, including banks and local governments. This drive was synchronized with sectoral policies—like the DoT's e-KYC approval and the Ministry of Finance's PMJDY mission—ensuring that the digital identity was immediately put to use in high-impact public and private programs.

b. Institutional Setup and Governance

The creation of the Unique Identification Authority of India (UIDAI) was a critical institutional choice. Originally an attached office, it was later given statutory backing through the Aadhaar Act. This provided a clear legal framework for data privacy, security, consent, and accountability.

c. Shared Digital Capabilities and Infrastructure

At its core, Aadhaar created a shared digital identity and authentication infrastructure that could be reused across programs and service providers. Standardised, machine-readable authentication mechanisms—both biometric and demographic—enabled departments to verify beneficiaries digitally without storing sensitive personal data themselves.

By treating identity and authentication as shared digital capabilities, the government removed the need for every department or company to build its own verification system. This modularity made Aadhaar a "plug-and-play" component for other DPIs including UPI and DigiLocker.

Aadhaar authentication was designed around the principle of minimal data sharing, typically responding with a simple "Yes/No" confirmation rather than exposing underlying identity profiles. This model ensured that Aadhaar provided core identity infrastructure while leaving service delivery to line departments and regulated private entities.

d. Market Participation

To ensure the technology reached the last mile, Aadhaar fostered a diverse market ecosystem by activating the demand. Private companies competed to manufacture low-cost, certified biometric scanners (fingerprint and iris), making them affordable for small-town banks and fair-price shops.

By allowing private entities—from telecom giants to fintech startups—to become Authentication User Agencies (AUAs), the system enabled the private sector to build new business models around instant verification. This market participation ensured that the utility of Aadhaar grew exponentially; the more places that accepted it, the more valuable the ID became to the citizen.

Case Study: Unified Payments Interface (UPI)

Context and Problem

For decades, India's digital payment landscape was characterized by "walled gardens". While IMPS and RTGS existed, they were designed for high-value, bank-to-bank transfers. For a small merchant, accepting a digital payment meant paying high MDR (Merchant Discount Rate) fees and managing multiple proprietary terminals. For a consumer, sending money required knowing the recipient's bank account number and IFSC code, a process that lacked the immediacy and simplicity of physical cash.

The Initiative and Outcomes

The Unified Payments Interface (UPI) was introduced to address this gap by making digital payments as simple and ubiquitous as cash. UPI enabled instant, bank-to-bank transfers using familiar identifiers such as mobile numbers and QR codes, without requiring users to share sensitive bank details or navigate complex processes.

As the system scaled to process over 20 billion transactions a month, it did more than just move money; it normalized the concept of the "micro-payment". UPI made paying for a single cup of tea or a handful of vegetables as seamless as a large bank transfer. This shift brought millions of informal street vendors into the formal fold, creating a visible shift where QR codes became commonplace alongside cash boxes.

Beyond the volume, this evolution began to turn transaction histories into "reputation data", allowing small businesses that previously had no financial record to finally access formal credit based on their verifiable digital cash flow.

How the DPI Approach Enabled It

a. Programmatic Drive

The government's mission-mode approach to financial inclusion —specifically the creation of over 500 million bank accounts under the Pradhan Mantri Jan Dhan Yojana —provided the necessary endpoints for the UPI to function as a population-scale system.

b. Institutional Setup and Governance

UPI operates under the regulatory oversight of the Reserve Bank of India, with National Payments Corporation of India (NPCI) serving as the not-for-profit system provider and operator. While NPCI provided the technical switch, its institutional identity as a not-for-profit, industry-led umbrella organization was critical. Because the entity was owned by a consortium of banks, it provided the necessary neutrality to ensure that no single private entity could gatekeep access to the payment network.

The decision to implement a Zero MDR policy for UPI transactions removed the primary financial friction for small-scale merchants. By eliminating the cost of acceptance at the bottom of the pyramid, the policy shifted the merchant's perspective of digital payments from an expense to a convenience.

c. Shared Digital Capabilities and Infrastructure

UPI was built as a shared, interoperable transaction rail rather than a standalone application. Rather than requiring every bank to build its own proprietary payment language, UPI introduced standardized APIs and the Virtual Payment Address (VPA). The VPA acted as a middle layer of abstraction, allowing a user to link a simple identifier (e.g., name@bank) to their underlying bank account. This capability meant that sensitive banking details never had to be shared during a transaction, lowering the risk of fraud and simplifying the user experience across different applications.

d. Market Participation

The UPI was designed to be minimalist at the core, leaving the experience layer to the market. By opening the APIs to Third-Party Application Providers (TPAPs), the initiative allowed fintech companies and global technology platforms to compete on user interface design, customer service, and value-added features.

This separation of the utility layer (NPCI) from the application layer (private apps) ensured that while the back-end remained a stable public utility, the front-end remained a highly competitive and innovative marketplace. This competition ensured that digital payments became accessible even to users with low digital literacy or entry-level smartphones.

Case Study: GSTN

Context and Problem

Before 2017, India's indirect tax landscape was a complex maze of overlapping central and state levies. A single product moving across state lines could be subject to Excise Duty, VAT, Entry Tax, and Octroi, each managed by different departments with separate paper-based filing systems.

For businesses, this meant maintaining multiple registrations and dealing with "tax cascading" (tax on tax), as credits from one levy often couldn't be set off against another. For the state, the lack of a unified view of a taxpayer's journey across the supply chain led to massive tax evasion through "missing trader" fraud and manual invoice manipulation. The economy was functionally divided by physical and digital borders that made national-scale commerce inefficient.

The Initiative and Outcomes

The Goods and Services Tax Network (GSTN) was established to provide the digital backbone for implementing a unified national GST regime. Rather than merely digitising existing tax processes, GSTN was designed as a digital infrastructure through which all GST registrations, returns, payments, and reconciliations would flow—across both central and state tax administrations.

By 2025, the Goods and Services Tax Network (GSTN) stands as one of the world's largest digital tax infrastructures, reflecting India's success in building a unified, technology-driven fiscal ecosystem. With over 1.56 crore registered taxpayers, more than 170 crore returns filed, and around 42 crore payment transactions amounting to nearly ₹97 lakh crore in tax payments[45], GSTN demonstrates the scale, reliability, and inclusivity of India's digital governance model.

How the DPI Approach Enabled It

a. Programmatic Drive

GST was implemented as a national mission involving simultaneous policy reform and digital rollout across the Union and states. GSTN was integral to this effort, providing a single interface for taxpayers regardless of jurisdiction. Extensive outreach, phased onboarding, and iterative refinement of filing processes enabled businesses—especially small firms—to transition gradually into the new system rather than face a one-time compliance shock.

b. Institutional Setup and Governance: The Trusted Utility

GSTN was structured as a Section 8 (not-for-profit) company with joint ownership by the Government of India and state governments, alongside regulated institutional shareholders. This hybrid ownership model ensured public oversight while allowing GSTN to function with operational autonomy and technology-sector agility.

The governance is anchored in the GST Council, a federal body where the Center and States make collective policy decisions. This ensures that it evolves not by executive decree, but through a consensus-based framework that respects India's federal structure.

c. Shared Digital Capabilities

Rather than building a "closed" government portal, GSTN was designed as a set of open, secure APIs. It provides three core shared capabilities that include standardized registration, invoice matching and automated ledger.

By treating these as shared services, the government removed the burden from individual states to build their own back-ends. This common infrastructure enabled interoperability across jurisdictions and reduced duplication of effort, while providing the foundation for analytics-driven compliance and enforcement.

d. Market Participation

GSTN's architecture deliberately enabled participation by a broad ecosystem of private players. Taxpayer-facing services—such as return preparation, accounting, invoicing, and compliance support—

were opened to licensed private software providers through standardised APIs. This allowed businesses to interact with GST through tools that suited their size and sophistication, rather than through a single government interface.

This market participation was particularly important for small and medium enterprises, which relied on accountants, tax practitioners, and software providers to navigate the transition. Competition among solution providers improved usability, reduced compliance friction, and accelerated adoption, while GSTN remained the stable, neutral backbone for data exchange and validation.

Case Study: FASTag

Context and Problem

For decades, India's national highways were plagued by chronic congestion at toll plazas. Despite the expansion of road infrastructure, the toll booths remained a manual, cash-based bottleneck. Vehicles often waited for 20–30 minutes in long queues, leading to massive fuel wastage, air pollution, and increased logistics costs.

The manual tolling was also vulnerable to revenue leakages, under-reporting, and reconciliation delays. Cash handling increased the risk of diversion, while fragmented toll systems made it difficult to obtain real-time visibility into collections across plazas and corridors. For a long-haul truck driver crossing state lines, there was no single way to pay for a journey, and the lack of a digital footprint made it difficult for transport companies to track expenses or prevent cash pilferage by drivers. For freight operators, unpredictable delays at toll booths translated into higher logistics costs, lower vehicle utilisation, and unreliable delivery timelines.

Earlier attempts at electronic tolling saw limited adoption due to lack of interoperability, inconsistent standards across plazas, and the absence of a unified national framework. As a result, tolling remained a major friction point in India's transport and logistics ecosystem.

The Initiative and Outcomes

FASTag was introduced to address these challenges by enabling cashless, contactless toll payments using radio-frequency identification (RFID) technology. It enabled a "drive-through" experience where toll payments are automatically deducted from a linked prepaid or savings account while the vehicle is in motion.

As the initiative moved from a voluntary pilot to a mandatory national standard, it reshaped the logistics landscape. Wait times at toll plazas dropped from an average of 12 minutes to less than 30 seconds.

The impact has been substantial. Digital tolling through FASTag has led to a reduction of over 90% in average wait times at toll plazas[46], fuel savings of up to 15%, and an estimated 20% reduction in CO_2 emissions from idling vehicles. Today, over 90% of toll transactions on national highways are conducted digitally[47], making FASTag the default mode of toll collection nationwide.

The integration of E-Way Bills with FASTag-enabled enforcement has eliminated physical checkpoints at state borders. This has reduced truck travel time by nearly 30%, effectively turning the entire country into a seamless logistics corridor.

What started as a tolling solution has evolved into a "Vehicle ID". By 2025, FASTag is being used for contactless parking payments at airports and malls, and even for automated fuel payments at petrol pumps.

How the DPI Approach Enabled It

a. Programmatic Drive

FASTag was rolled out through a strong mission-mode program led by the National Highways Authority of India (NHAI). Rather than a single-step rollout, adoption was achieved through phased sequencing. Initial pilots were launched on select highway corridors, followed by expansion across national highways.

The transition was supported by a massive nationwide distribution network, ensuring tags could be purchased at fuel stations, banks, and even via e-commerce platforms.

This was reinforced through clear policy mandates—first requiring FASTag for all new vehicles, and subsequently making it mandatory for all vehicles at national highway toll plazas.

This staged approach—pilot, scale, and mandate—helped overcome coordination challenges between users and operators, ensuring that FASTag transitioned from an optional facility to a national default.

b. Institutional Setup and Governance

FASTag operates under the National Electronic Toll Collection (NETC) framework, with the National Payments Corporation of India (NPCI) acting as the neutral operator of the toll payment network. NPCI manages the central clearing and settlement infrastructure, ensuring interoperability across issuing banks, toll operators, and plazas.

Policy oversight and highway operations are led by NHAI, while Indian Highway Management Company Limited (IHMCL)—a company promoted by NHAI—handles operational implementation, plaza integration, and monitoring. This clear separation of roles ensured that toll policy and enforcement remained with transport authorities, while the digital transaction infrastructure was managed as a shared public utility.

c. Shared Digital Capabilities and Infrastructure

FASTag is built on a set of shared digital capabilities that enable nationwide interoperability. These include standardised RFID-based vehicle identification, a centralised transaction switching and settlement system, and machine-readable data flows between toll plazas, issuing banks, and highway authorities.

By treating toll collection as a shared transaction infrastructure, FASTag eliminated the need for each toll operator to deploy proprietary systems. A single FASTag works seamlessly across states and highways, enabling frictionless mobility while providing authorities with real-time visibility into toll operations and revenues.

d. Market Participation

Market participation played a critical role in FASTag's nationwide adoption. Multiple public and private banks were authorised to issue FASTags, compete on distribution channels, and integrate FASTag issuance with existing customer relationships. Technology vendors supplied RFID tags, lane automation equipment, and backend integration services under common technical standards.

To reduce onboarding friction further, vehicle manufacturers began offering factory-fitted FASTags in new vehicles. This competitive, multi-actor ecosystem ensured wide availability, lowered issuance costs, and accelerated last-mile adoption—while the core infrastructure remained a neutral public utility.

Allowing private parking operators and fuel stations to join the NETC network created a new market for contactless mobility where private firms build user-friendly apps to manage vehicle-related expenses on top of the shared FASTag infrastructure.

Case Study: Account Aggregator (AA) Framework

Context and Problem

For decades, access to formal credit and financial services in India was constrained not by the absence of data, but by the absence of trusted data mobility. Individuals and small businesses generated financial data across banks, NBFCs, insurers, mutual funds, and pension systems, yet this data remained locked within institutional silos. Consumers had no practical means to access, control, or share their own financial information.

As a result, lenders relied on collateral, paper statements, and historical relationships to assess creditworthiness. Small enterprises, gig workers, and informal earners—despite having regular cash flows—were frequently excluded because they could not present verified, machine-readable financial records. Where data sharing did occur, it relied on insecure mechanisms such as physical documents, PDFs, or screen-scraping, increasing fraud risk and undermining privacy.

The Initiative and Outcomes

The Account Aggregator (AA) Framework was introduced to address this structural problem by enabling secure, consent-driven sharing of financial data. Under the framework, individuals and businesses can digitally authorise the transfer of their financial information—from data-holding institutions to regulated data users. The financial data flows through clearly defined roles. Financial Information Providers (FIPs)—such as banks, NBFCs, insurers, mutual funds, and pension institutions—hold users' financial data. Financial Information Users (FIUs)—such as lenders, wealth managers, or personal finance platforms—consume this data to deliver services like credit, investment advice, or financial planning. Account Aggregators (AAs) act as neutral consent managers, enabling users to securely authorise the transfer of specific data from FIPs to FIUs. Importantly, Account Aggregators do not store, process, or monetise the data themselves; they only facilitate consented, encrypted data flows between regulated entities.

The framework shifted control of financial data from institutions to the data principal. Data sharing became purpose-specific, time-bound, and revocable, replacing blanket consent and opaque data use with explicit, auditable permissions.

By late 2025, the AA framework has achieved significant scale: 126 financial institutions operate as both FIPs and FIUs. Over 2 billion financial accounts are enabled for data sharing, with over 223 million users linking their accounts to the AA ecosystem[48].

As adoption scaled, the AA framework began to transform credit underwriting and financial service delivery. Loan approvals that previously took weeks could be processed in minutes using verified, machine-readable data. Small businesses and individuals without collateral gained access to formal credit based on cash flows rather than assets, while fraud risks reduced through the elimination of document tampering.

How the DPI Approach Enabled It

a. Programmatic Drive

The AA framework was rolled out through a coordinated, regulator-led program rather than a single-mandate push. Standards for consent, data formats, and security were established first, followed by phased onboarding of financial institutions and use cases.

Ecosystem coordination and readiness were supported by the Sahamati Alliance, which worked with banks, NBFCs, fintech firms, and regulators to operationalise common standards and accelerate adoption across the financial sector.

b. Institutional Setup and Governance

A defining feature of the AA framework is its regulatory and institutional design. Account Aggregators are licensed and regulated by the Reserve Bank of India (RBI), with other financial regulators governing participation within their respective sectors.

Inter-regulatory coordination across the Securities and Exchange Board of India, Insurance Regulatory and Development Authority of India, and Pension Fund Regulatory and Development Authority ensured consistent fiduciary, security, and compliance standards across banking, insurance, investments, and pensions.

The AA framework is aligned with India's Digital Empowerment of Personal Accounts (DEPA) model, embedding consent, purpose limitation, and revocability as foundational principles for data sharing.

c. Shared Digital Capabilities and Infrastructure

At its core, the AA framework provides a shared consent and data-exchange infrastructure. It is built on a shared, interoperable protocol rather than a centralized database. It introduced the Electronic Consent Artefact, a standardized digital "contract" that specifies exactly - what data is being shared, for what purpose and for how long. By treating "consent" as a shared digital capability, the framework ensured that the user is the primary "controller" of their data.

Standardised, machine-readable data formats and APIs allow financial data to move securely and interoperably across institutions. This eliminated the need for bilateral integrations between every bank and fintech. Once integrated, participants could connect to the entire ecosystem, dramatically reducing onboarding costs while ensuring that sensitive financial data flowed directly between regulated entities.

d. Market Participation

The AA framework deliberately enabled market participation at multiple layers. Licensed Account Aggregators competed on user experience, reliability, and consent dashboards. Banks, NBFCs, fintech lenders, personal finance platforms, and MSME applications integrated as data users, building products on top of consented data flows.

This open yet regulated participation fostered competition in credit delivery, personal finance management, and risk assessment—while the underlying data-sharing rails remained interoperable and neutral. As participation increased, network effects strengthened without creating centralised data accumulation.

Appendix B: DPI Approach Enables Total Factor Productivity (TFP) Growth

What is Total Factor Productivity (TFP)

Total Factor Productivity (TFP) stands as a cornerstone concept in macroeconomics, representing the enigmatic yet powerful force that drives long-term economic prosperity. TFP focuses on the productivity of the whole economy of a country. TFP is a measure of an economy's ability to generate income from inputs (labour and capital)—to do more with less.

If an economy increases its total income without using more inputs, or if the economy maintains its income level while using fewer inputs, it is said to enjoy higher TFP. When TFP improves, it allows countries to maintain or increase living standards while conserving resources, including natural resources such as the climate and our biosphere.

TFP Growth - a measure towards developed nation

Countries with the world's highest TFP, such as The Netherlands, Norway, Switzerland, and the US, are also among its richest. There is a close association between productive efficiency and economic prosperity[49].

This relationship is reinforced by the Asian Development Bank[50], which provides strong empirical evidence that sustained **TFP growth is the central mechanism through which countries transition to high-income, developed status and avoid the middle-income trap -** a situation where nations experience growth stagnation as input-led strategies like adding more capital and labour yield diminishing returns. The report shows that growth slowdowns in middle-income economies are driven predominantly by sharp declines in productivity growth rather than by reductions in labour or capital accumulation, with studies finding that up to 85% of observed slowdowns can be attributed to falling TFP growth.

Conversely, countries that successfully graduate to high-income status consistently exhibit faster and more sustained TFP growth, reflecting a shift from input-led to productivity-led growth. The evidence thus establishes that TFP growth is the defining pathway through which nations escape middle-income stagnation and achieve sustained growth towards becoming a developed, high-income nation.

Sustained TFP growth is primarily driven by five interrelated factors:[51]

1. **Innovation,** defined as the generation and adoption of new technologies; leading to the development of higher value-added activities, products, and processes and improving the performance of existing ones. It involves investing in frontier R&D, enabling experimentation, learning, and structural upgrading.
2. **Market Efficiency**, defined as enabling efficient allocation and use of resources (e.g., labor, capital, and materials) across firms and sectors in a competitive environment. It enhances TFP by inducing unproductive firms to exit the market, facilitating productive firms to grow, and allowing new firms to emerge. Market frictions, misallocation and monopolies suppress aggregate TFP even in the presence of investment and skills.
3. **Public infrastructure** - physical and digital - that can provide timely and cost-effective access to input and output markets, workplaces, and knowledge and information sources, thus supporting all possible economic activities. An appropriate infrastructure network –in terms of quantity, quality, and diversity – can complement private capital and labor, increasing their returns and impact on economic growth. In this way, expanding public infrastructure becomes a source of TFP growth.
4. **Workforce productivity**, as the knowledge and skills of the population not only to produce more and better, but also to generate, disseminate, adapt, and implement technology throughout the economy. Higher levels of education, skills, and health improve labour quality and raise output per

worker. Differences in human capital explain a significant share of cross-country variation in TFP, particularly as production becomes more complex and knowledge-intensive.

5. **Public Institutions** – in the regulatory, justice, policy, and political systems – that promote social and economic stability; tap into the possible productivity benefits of innovations and tackle barriers to the opportunities for all across the economy.

DPI Approach - a design approach to enable TFP growth

While primary growth factors of TFP are fairly clear - the biggest question for policymakers is how to enable them effectively in a systematic way across the sectors and economy. Digital Public Infrastructure (DPI) as a design approach offers that mechanism to activate TFP growth factors and enable productivity-led growth across the economy. DPI as design approach is foundationally rooted in the TFP growth factors:

- Technology and innovation are the fundamental pillars of DPI approach with the focus on addressing structural challenges including transaction cost, productivity and market expansion.
- Creating a level playing field and competitive environment for innovators of all sizes and types - private sector, government, non-profits.
- Driving adoption through focused programs to ensure change on the ground.
- Enabling institutional setup including policy and regulation.

Appendix C: Abbreviations

Abbreviation	Expansion
AA	Account Aggregator
ASER	Annual Status of Education Report
BIS	Bank for International Settlements
DBT	Direct Benefit Transfer
DPI	Digital Public Infrastructure
e-KYC	Electronic Know Your Customer
FIU	Financial Information User
FIP	Financial Information Provider
GDP	Gross Domestic Product
G2P	Government-to-Person
GST	Goods and Services Tax
GSTN	Goods and Services Tax Network
IHMCL	Indian Highway Management Company Limited
IMPS	Immediate Payment Service
JAM	Jan Dhan–Aadhaar–Mobile
MeitY	Ministry of Electronics and Information Technology
MSME	Micro, Small and Medium Enterprise
NBFC	Non-Banking Financial Company
NETC	National Electronic Toll Collection
NHAI	National Highways Authority of India
NPCI	National Payments Corporation of India
PMJDY	Pradhan Mantri Jan Dhan Yojana
RFID	Radio Frequency Identification
RTGS	Real Time Gross Settlement
SEBI	Securities and Exchange Board of India
TFP	Total Factor Productivity
TPAP	Third-Party Application Provider
UCL	University College London
UIDAI	Unique Identification Authority of India
UPI	Unified Payments Interface

Appendix D: Glossary

Term	Definition
Account Aggregator (AA)	A consent-based system that allows people and businesses to securely share their financial data with service providers, enabling faster and simpler access to credit and financial services.
Aggregated Demand	The pooling of demand—often at district or state level—to create a clear and reliable market for digital solutions and service providers.
Blue Dot	Digital enablement of a physical entity such as an individual or organisation to broadcast who they are, what they have and what they are seeking in a credible way.
Building Blocks	Minimalist, reusable digital components enabling interoperability and innovation.
Citizen-Centric Design	Designing digital systems around real user needs and behaviours to ensure ease of use, trust, and inclusion.
Combinatorial Impact	The non-linear benefits created when multiple digital systems—such as identity, payments, and data—work together, producing outcomes far greater than any single system alone.
Direct Benefit Transfer (DBT)	A mission-mode program that uses digital infrastructure to transfer social benefits directly to bank accounts, reducing leakages.
Digital Public Infrastructure (DPI)	A design approach leveraging technology and market innovation across sectors to enable non-linear socio-economic development at scale.
Digital Registries	Authoritative digital records of entities—such as individuals, businesses, assets, or institutions—that provide a trusted source of verified information and enable identification, authentication, and interoperability across digital systems.
Digital Transactions	Trusted, low-cost digital exchanges that enable individuals and enterprises to participate easily in the formal economy.
Electronic Know Your Customer (e-KYC)	Paperless "Electronic Know Your Customer" identity verification enabled by the Aadhaar digital identity infrastructure.
FASTag	RFID-based digital toll collection system enabling seamless vehicular movement developed using DPI approach.
Goods and Services Tax Network (GSTN)	Goods and Services Tax Network; a digital system for tax filings whose data is often used for credit risk assessment.
Hidden Economy	Economic activities that operate outside formal systems of registration, taxation, regulation, and social protection, limiting access to formal credit, markets, and public services and reducing overall productivity and growth.

Term	Definition
Hockey-Stick Growth	A non-linear growth trajectory that rapidly accelerates as more people and businesses are onboarded onto shared digital infrastructure.
Interoperability	The ability of different digital systems, platforms, or applications to work together seamlessly using common standards or protocols, enabling data exchange and transactions without creating silos or lock-in.
Inclusive Prosperity	Economic growth that expands opportunities, incomes, and capabilities broadly across society, not just for a few.
Language AI	Artificial intelligence systems that understand, generate, and interact using human languages—especially local and vernacular languages—enabling voice- and text-based access to digital services for all citizens, regardless of literacy or technical skills.
Machine-Readable Data	Data that is structured and formatted so that digital systems can automatically read, process, and analyse it, enabling interoperability, automation, and effective use by analytics and AI systems.
Market Participation	The involvement of diverse public, private, and non-profit actors in building solutions on shared digital foundations, fostering competition and innovation.
Mission-Mode Programs	Outcome-driven initiatives designed to rapidly scale adoption and usage of digital systems to achieve specific national or sectoral goals.
Participatory Governance	A governance approach in which government, private sector, civil society, and other stakeholders jointly shape the design, operation, and evolution of digital systems through transparent, consultative, and inclusive processes.
Open Networks	Interoperable digital networks that unbundle demand and supply, allowing multiple providers to participate without a single controlling platform.
Preventive Care	Health services and interventions focused on preventing illness, detecting health risks early, and promoting well-being, reducing the need for costly and complex treatments later.
Regulatory Sandbox	A controlled environment where new digital solutions can be tested safely under regulatory oversight before wide-scale deployment.
Sustainable Data Economy	An economic system in which data is generated, shared, and used responsibly to create long-term value for individuals, businesses, and society, supported by trust, incentives, governance, and fair value exchange.
Total Factor Productivity (TFP)	A measure of economic efficiency reflecting growth achieved through better use of technology, skills, and systems—not just more labour or capital.
Tokenization	Converting physical assets like land property or carbon credits into digital tokens that can be traded or exchanged
Verifiable Credentials	Digitally issued and cryptographically secure credentials that allow individuals or entities to prove specific attributes or qualifications—such as identity, skills, eligibility, or compliance—in a trusted and privacy-preserving manner.

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