Digital Public Infrastructure (DPI) Thinking
As of 2008, India was one of the world’s most unbanked. Less than 20% banking penetration.
Per BIS, India did for financial Inclusion in less than a decade what would have taken 5 decades by traditional means.

In 9 years, banking penetration shot up to 80% using digital ID, closing the gender gap in accounts!

Sources: BIS Paper by Derryl D'Silva, Zuzana Filkova, Frank Packer and Siddharth Tiwari
Teledensity also scaled from 37% to 93% in 8 years, and cost of data dropped!

Source: Blume Research, NPCI statistics

700+ Mn Unique Subscribers

$0.17 cents Per GB data
Digital Public Infrastructure (DPI) drove this exponential change.

- **Physical Infrastructure**
  - Railways, Roads, Cell Towers, Internet cables

- **Digital Infrastructure**
  - Open tech standards & systems for Identity, Signatures, Payments, Data, Fulfillment, and beyond

Both drive Public & Private Innovation.
DPI is inspired by the original digital infra!
Protocols & Standards of internet & mobile networks - complemented by hard physical ‘connectivity’ infra - drove exponential change

**Mobile/Telco**

- Powered by **common protocols and standards** - GSM, SMS...
- Ensuring **global voice communication interoperability**
- Allows **innovation** - handsets, applications ...
- Adoption is **driven by ecosystem** by unlocking value to users

**Internet**

- Powered by **common protocols and standards** - HTTP, HTMP, SMTP...
- Ensuring **global information exchange interoperability**
- Allows **innovation** - devices, applications ...
- Adoption is **driven by ecosystem** by unlocking value to users

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DPI helped transform a cash-based economy in Brazil

2020

Brazil rolled out interoperable payments via ‘PIX’

2022

300+ participating banks + fintechs;

140 Million users (80% of adults)

71 Million (~50%) had not used digital payments the year before
In 2016, India used mostly cash

5 Million PoS machines
<7% Debit cards

In 6 years, India led digital payments globally adopting a DPI approach to payments

$1 Trillion annual trxns

5 Million PoS machines
<7% Debit cards

In 6 years, India led digital payments globally adopting a DPI approach to payments

$1 Trillion annual transactions
In 2014, paper based certificates and data was prevalent in India. Today, 5.6 Billion verifiable certificates are on eLockers used by 152M+ people & 1.1 Billion bank accounts live on Open Banking.
The DPI approach works by using open tech standards & enabling policy to bring the best out of markets.

If it can’t be reused by others, it’s not DPI!

**Market:** Public and private innovation; Competitive market players designing diverse solutions;

**Governance:** Legal and institutional framework; Public programs to drive adoption; Ecosystem facilitation; Participatory governance;

**Open Tech Standards & Building Blocks:** Open specifications & protocols or shared systems across verifiable ID & registries; signatures, consent, and trust; payments, data sharing, credentialing, and open AI/ML models; and discovery & transactions.
Defining Digital Public Infrastructure

A set of technology building blocks powered by interoperable open standards/specifications operated under a set of enabling rules with open, transparent, and participatory governance to drive innovation, inclusion, and competition at scale.
5 Foundational Digital Public Infra Categories within & across sectors

- **Verifiable Identity & Registries**
  - Verifying ID & accessing profile data of people, entities, & objects
    - Authentication
    - eKYC
    - Single Sign On
    - Civil/Functional Registries
    - Entity Registries
    - Object Registries (land, etc.)

- **Data Sharing, Credentials, & AI/ML Models**
  - Sharing Data (credentials, history, attributes) or Models peer to peer or publicly
    - Personal data with consent, including credentials
    - Non personal data
    - Open datasets
    - Open reusable AI/ML Models

- **Signatures & Consent**
  - Assuring that data/agreements came with permission from source
    - Tamper proof, non-repudiable digital signatures
    - Digitally signing a document to indicate agreement
    - Granular, revocable consent

- **Discovery & Fulfilment**
  - Accessing goods and services
    - Open APIs for services (public/private)
    - Open eCommerce networks

- **Payments**
  - Making payments with ease
    - P2P/M
    - B2B
    - G2P
    - P2G

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DPIs in each category become a Building Block for Digital economies.

### Verifiable Identity & Registries
- **Individual ID**
  - Authentication & eKYC
- **Health Facility Registry**
- **Business/Tax ID**
  - Digitally signed Certificate

### Data, Credentials & AI/ML Models
- **Open Finance**
  - Financial data sharing API standards & schemas
- **Health Data Sharing**
  - APIs for health records
- **AI Natural Language Models**
  - Made open for reuse

### Signatures & Consent
- **eSign**
  - Sign any document on mobile
- **PKI/Digital Signature**
  - Make documents tamper proof
- **Consent Artefact**
  - Electronic std For consent to share data

### Discovery & Fulfilment
- **eCommerce**
  - Open interoperable e-commerce network
- **Mobility & Transport**
  - Open protocols for mobility
- **Open Tax filing APIs**
  - Direct tax collection

### Payments
- **P2P/P2M Payments**
  - Interoperable, Fast, Mobile-based
- **G2P Benefit Transfers**
  - Financial Address Mapper, etc.
- **Bill Payments Protocols**
  - Paying any bill using any app
- **Electronic toll collection**
  - Interoperable tolls for transport
DPI: Foundational Ingredients of a Digital Economy

Digital Finance

- Digital Education & Skilling
- Digital Agriculture
- Digital Health

Digital Commerce & Mobility

- Digital Sustainability & Environment
- Digital Government

Verifiable Identity & Registries

Data Sharing, Credentials, & AI/ML Models

Signatures, Consent, and Trust

Discovery & Transactions Networks

Payments Networks

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DPI has the potential to create exponential societal change

If well architected.
5 DPI Technical Architecture Principles
make digitisation inclusive & scalable

1. **Interoperability**
driven by open specifications

2. **Minimalist, Reusable building blocks**
rather than end-to-end solutions

3. **Diverse, inclusive innovation**
by the public + private ecosystem via open & multi-modal access

4. **Federated & Decentralized**
with a preference for letting data stay where it’s been collected

5. **Security & Privacy**
by design

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# Why these principles matter

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<td>Choice of solutions and services for individuals</td>
<td>Feasibility &amp; Success of digital intervention</td>
<td>Inclusion</td>
<td>Autonomy of Institutions &amp; players</td>
<td>Public Trust in the Infrastructure</td>
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<td>Scale of access and adoption for individuals</td>
<td>Privacy protection based on minimalism</td>
<td>Scale</td>
<td>Fewer Intermediaries; more peer to peer transactions</td>
<td>Protection of individuals from harmful actors</td>
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<td>Competition in markets while remaining interoperable</td>
<td>Combinatorial innovation by market</td>
<td>User Choice</td>
<td>Cybersecurity</td>
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<td>User-centric solutions</td>
<td>Resilience because of diverse providers</td>
<td>Privacy</td>
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<td>Financial sustainability (lower cost of the DPI)</td>
<td>User-centric solutions</td>
<td>Resilience - avoid overdependence on any one system</td>
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<td>Evolvability &amp; Extensibility</td>
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DPIs combine the best of Public & Private provision

Public Only

Single Provider
Cautious Innovation

Government Apps
Departments/Ministries
Government

DPI Approach

Addresses diversity & choice
Encourages Innovation &
competition,
Ensures openness and sovereignty

Interoperable DPI
(open APIs/protocols, shared
platforms and enabling policies)

Diverse applications
and market innovation

Government / Regulators

Private Only

Lack of interoperability
Lack of competition

Market Apps
Platforms,
Appstores, OS
Private Tech
Companies
DPIs are NOT about digitization in silos ...

Attempting to build monolithic, centralized systems goes against the principles of good DPI design.
... and not about centralization

DPIs are inherently decentralized, managed by many, evolved in different ways, and need to work together to achieve the transformation.

They get connected and combined via interoperability specifications/protocols.
Many countries already have some DPI.

If not, it is feasible to do quickly.

Convert to DPI with:

- **Existing ID**: Verifiable QR/eKYC
- **Fast payments**: Interoperable QR + Interoperable Auth
- **Tax system**: Verifiable certificate
  - Open filing APIs
- **Certificate**: Verifiable QR (MR/DS!)
- **Database**: Open APIs
  - Verifiable Registry
- **Gov’t Services Bus**: Open APIs
Defining Digital Public Goods

To help countries implement DPI faster & cheaper!

A set of well designed assets/resources in the form of specifications/software/data/content made freely available having its own lifecycle and governance allowing others to build and operate their own DPIs
Thank You!