Sattva Knowledge Institute SKI primer

DIGITAL PUBLIC GOODS

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Acknowledgements

About the Authors

This primer has been written by **Abhishek Modi,** with support from **Arnab Mukherjee, Pragati Keswani and Harleen Kaur.**

Disclaimer

About Sattva Knowledge Institute

Sattva Knowledge Institute (SKI), established in 2022, is our official knowledge platform at Sattva. The SKI platform aims to guide investment decisions for impact, shedding light on urgent problems and high potential solutions, so that stakeholders can build greater awareness and a bias towards concerted action. Our focus is on offering solutions over symptoms, carefully curating strong evidence-based research, and engaging decision-makers actively with our insights. Overall, **SKI aims to shift intent and action toward greater impact by influencing leaders with knowledge**. All of our content proactively leverages the capabilities, experience and proprietary data from across Sattva.

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EXECUTIVE SUMMARY

Overview of DPGs

Digital public goods (DPGs) refer to new and enhanced service delivery of public goods such as healthcare, government schemes, and public infrastructure. DPGs in India can unlock over $700 billion by creating new opportunities, and by optimising current service delivery systems. They are a form of shared infrastructure enabled by using open software, data, content and protocols.

Stacks, the building blocks of DPGs, comprise four primary layers that enable the development of a variety of end-to-end solutions. These include (i) an identity layer that allows personal records to be associated with an online identity; (ii) a data registry that acts as a single point of truth for both personal and institutional information, thus increasing compatibility amongst all stakeholders; (iii) data exchange that facilitates the safe exchange of data across systems, thus enhancing service delivery, innovation and customised solutions and (iv) an interface that allows applications to communicate through open APIs or software intermediaries, and third parties to build end-user solutions on the stack. Platforms built using this shared infrastructure approach are open, modular and interoperable in nature.

Sector-wise DPGs

Across sectors, India is conceptualising, developing, and deploying almost 17 transactional stacks across sectors. Some of these are as follows:

- India Stack, which revolutionised payments in India, is now working on layers to deliver digital lending and insurance.
- The development of the National Health Stack is the key to India's universal health coverage mission.
- DESH-Stack, which intends to improve the skilling and livelihoods space in India, was announced in the Union Budget speech of 2022-23.
- The Open Network for Digital Commerce (ONDC) aims at shifting India's e-commerce from a platform-centric model into an open network. In addition to reducing e-commerce monopolies, this will also boost India's significant MSME sector.
- A number of other stacks in education, urban development, logistics, and agriculture follow a similarly mapped-out model with identity, data registries, and data exchange components, and are currently either under development or at a conceptual stage.

Challenges associated with DPGs

As DPGs bring together all stakeholders on one network, they potentially give rise to threats relating to privacy violations, identity theft, and exclusion from essential public services.

- Data consolidation into a single source enhances the likelihood and scope of data theft.
- Inadequate governance and security frameworks on sensitive personal data might be used to perpetuate exclusionary biases.
- Sub-optimal internet speed and penetration in the country's rural locations might pose challenges for the deployment of DPGs at scale.
- Discrepancies in or lack of identity documents, which are the foundation of DPGs, could prevent beneficiaries from accessing essential public services.
- Lack of awareness of digital tools and their value proposition in the formal sector could result in low adoption of DPGs.
- Compromised or unusable formatting of datasets could hinder the development of applications by developers.
- Lack of private funding and government incentives prevent developers from leveraging the technology infrastructure.

Role of philanthropic and social organisations

Philanthropic and social organisations play a significant role in promoting the adoption of the stack across vulnerable segments of the population:

- Philanthropic funders can collaborate with the government on programme advisory and support NGOs in expanding their ICT infrastructure and utilising these shared technologies for better service delivery. Additionally, they can assist developers in creating equitable and user-friendly solutions through funding and technical assistance.
- Local NGOs can facilitate the adoption of these digital platforms by increasing awareness and assisting key participants like nurses, teachers, and artisans with compliance and implementation. NGOs can also use DPGs to enhance the delivery of their services by integrating with these platforms, utilising insights from consolidated data in DPGs to pinpoint target audiences, as well as concentrating on the deployment of digital infrastructure through their programmes.

CONTEXT

Since the launch of UPI, the government has explored similar digital public goods in other sectors.

BACKGROUND

- **India has emerged as a pioneer in developing and deploying digital public goods at scale.**
- It was one of the first developing countries to have a population-scale digital ID initiative, and has built digital payments infrastructure such as Unified Payments Interface (UPI).
- **Since the launch of UPI in 2016, the government has sought to create similar digital public goods in a host of other areas such as digital lending, healthcare, agriculture, and livelihoods.**

CONTEXT

- In this primer, we provide an overview of government stacks in agriculture, education, logistics, e-commerce, financial inclusion, digital lending, education, healthcare, skill training, and others.
- The objective of this primer is to:
  - Develop an understanding of the concept of open digital ecosystems and their governance.
  - Dive deeper into each stack's building blocks and practical application in daily life.
  - Explore how philanthropic organisations can help promote the adoption of these stacks.

OVERVIEW OF DIGITAL PUBLIC GOODS

Digital public goods have the potential to rapidly unlock large-scale economic, societal, and governance transformation.

Digital public goods (DPGs) have transformed service delivery by offering scale and interoperability…

…and hold the potential to transform the economy and society.

Several DPGs are being developed in India
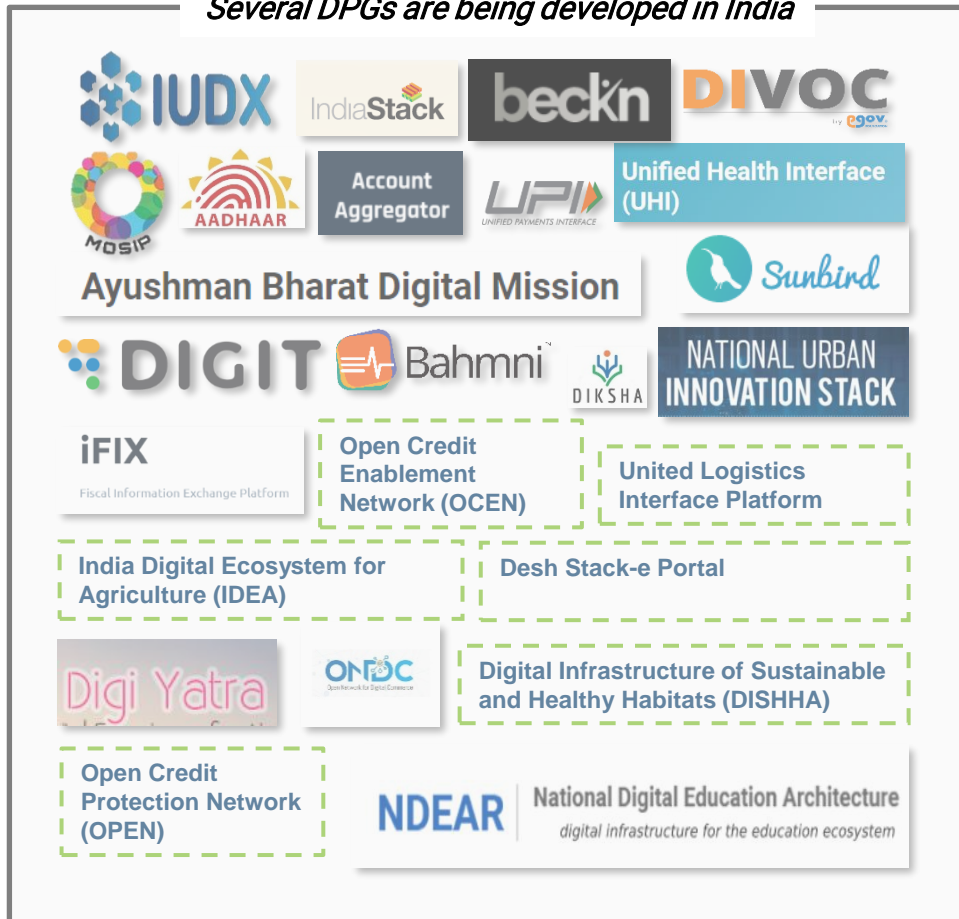
$700+bn opportunity can be unlocked by digital public goods in India *(BCG &ONI 2020)*.

- Includes creation of new value of **$500+ billion** equivalent to 5.5% of India's GDP.
- Generation of **$200+ billion** in savings to the country.

$88bn transacted through 3.6 billion UPI transactions. UPI transactions increased at a **785%** CAGR between 2017-2020.

$38bn expected transformation in **India's digital e-commerce** market by the implementation of an **open network for e-commerce.**

48Mn vaccinations were facilitated through the government's **COWIN platform** for 45 million beneficiaries in eight months.

Digital public goods refer to open software, data, standards and content that facilitate new and enhanced methodologies of delivering public goods.

Public goods..

..with open digital technologies…

…offer enhanced service delivery

Public goods refer to commodities or services that are provided **without the intention of profit and are made available to members of a society**, either by the government, or a private individual, or an organisation with the aim of benefitting the well-being of the public.

Examples:

- Infrastructure

- Healthcare

- Public services

Open software (APIs)
Architecture that makes it **easy for one application to 'consume' capabilities** or data from another application.

Open data
Data that can be freely used, re-used and redistributed by anyone. This is facilitated through **stacks.**

Open standards
Standards that are openly accessible and usable by anyone. They establish protocols and building blocks that can help make apps more **functional and interoperable.**

Open content
Content that is freely available and accessible for all.

Adoptable
- Freely adopted by all stakeholders off existing technologies without having to reinvent the wheel

Scalable
- Easy scalability across and within countries

Adaptable
- Adapted to fit local-needs

Collaborative
- Share resources and best practices

Transparent
- Set of shared technical standards that bring all players onto one network

Interoperable
- Compatible as they are open source and do not lock the user into one technology vendor

Stacks, the building blocks of DPGs, are made up of identity, data registry, data exchange layers, along with a service layer that enables developers to build end-user solutions over it.

Stacks facilitate the open data and open standards aspects of DPGs through different layers…

…while the service layer facilitates the open software and open content aspects.

Stack

Building blocks

Identification Data

- Personal data that allows direct identification of the data subject.
- Example -

Data Registry

- Registries include both personal and community information and records that provide a 'single source of truth'.
- Example - Financial data, civil registries, land registries

Data Exchange

- Data exchange facilitates the flow of data generated by governments, businesses and individuals across entities.
- Example - IUDX   Account Aggregator

Interface

- API (Application Programming Interface) allows two applications to interact with each other.
- Example- UPI

Two-way information flow

End-user Solutions

Service layer

What is it?

- A service layer is built over the user interface. This layer enables developers to build end-user solutions leveraging the stack.

- Includes solutions such as marketplaces, information access portals, or co-creation platforms.

- Built by both public and private organisations and accessible by all citizens.

Examples

Paytm   Co-WIN   GeM Government e Marketplace

G Pay   MobiKwik   GST Network

SECTOR-WISE DIGITAL PUBLIC GOODS

Across sectors, India is conceptualising, developing, and deploying a variety of DPGs.

Concept → Development → Deployment

FINANCIAL INCLUSION
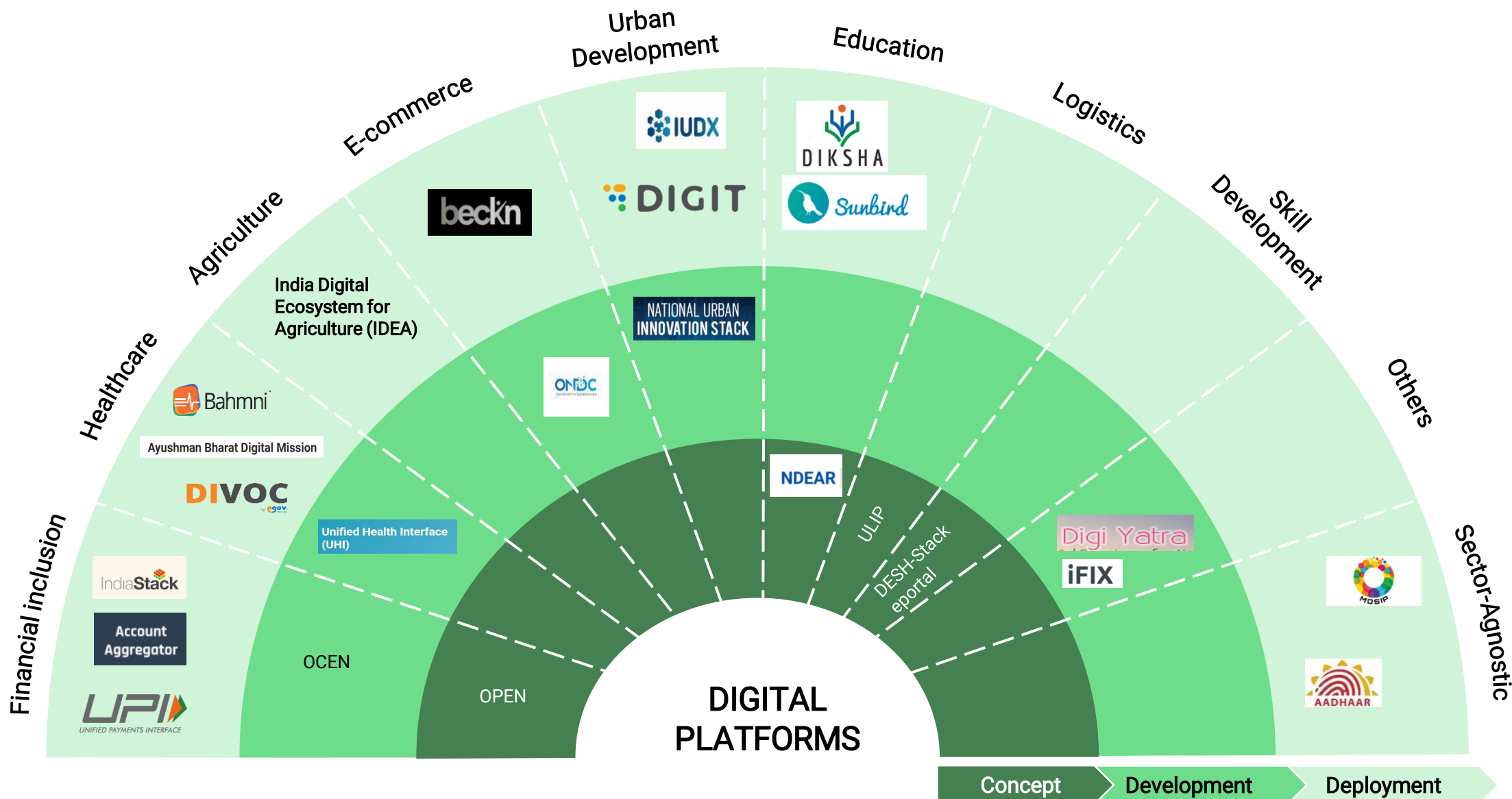
India Stack, a set of open APIs connecting Aadhaar, eKYC, UPI, and other platforms offering digital services such as access to financial products, disbursement of welfare benefits.

What is India Stack?	India Stack is a set of APIs that allows governments, businesses, start-ups and developers to utilise a unique digital Infrastructure to solve India's problems towards presence-less, paperless, and cashless service delivery.

India Stack

Building Blocks

Insurance Layer — Open Protection Enablement Network

Credit Layer — Open Credit Enablement Network

Data Layer

Account Aggregator

Digilocker

Facilitate secure sharing of data
- An interface to facilitate the easy sharing and consumption of data from various entities with user consent.
- A digital document wallet that provides access to authentic digital documents.

Payments Layer

UPI — UNIFIED PAYMENTS INTERFACE

Enables interoperable payments
- A real-time mobile payments system that enables interoperability between money custodians, payment rails and front-end payment applications.

Identity Layer

AADHAAR

eSign

Provides every resident a unique ID
- Secure, versatile digital IDs that can be used to quickly authenticate a user's identity.
- A digital signature product built atop Aadhaar.

Service layer

End-user Solutions

Paytm   MobiKwik   BHIM   G Pay

UBER   AXIS PAY   BHIM SBI Pay   PhonePe

chillr   AePS AADHAAR ENABLED PAYMENT SYSTEM   Tez

Impact

- Aadhaar enabled millions of people to enter the banking system.
- UPI provided these account holders with an easy way to transact.
- The data layer aims to enable account holders to utilise their data history in obtaining financial and other services.

MOSIP is an open-source platform meant for governments or international organisations to build a foundational identification system in a cost-effective way.

FINANCIAL INCLUSION

Open Credit Enablement Network (OCEN) aims to provide a common language for lenders and marketplaces to build innovative financial credit products at scale.

What is OCEN?	OCEN aims to digitise India's credit infrastructure by operating as a layer of APIs (Application Programming Interfaces) that standardises the loan disbursal, monitoring and collection process.

Loan application process via OCEN

1 Consumer applies for loan on Loan Service Provider* (LSP) platform

2 LSP platform requests Account Aggregator to access consumer financial information for risk assessment and loan monitoring

3 Consumer gives authentication to Account Aggregator to share their data

4 LSP platform collects loan quotes from Banks/Non-banking Financial Companies (NBFCs) via OCEN

5 LSP platform presents top loan quotes to consumer

Consumers

LSP

Payment Platforms
Paytm

SME Platforms
BharatPe

Market Places
Flipkart

1
5
3 Consumer authentication

OCEN Protocol

4
2

Account Aggregator

The Account Aggregator framework will provide LSPs access to financial customer data

Banks and NBFCs

HDFC BANK
ICICI Bank
TATA CAPITAL
BAJAJ FINSERV

Impact

Customers
• Access to the widest range of loan quotes.
• Retention of data sovereignty via consent architecture.

Bank/NBFCs
• Ability to disburse loans to a wider range of customers.

Loan Service Providers
• No need to integrate with multiple Banks/Fin-techs/NBFCs to enable lending.

* Loan Service Providers would be a new class of entities focused on origination of loans on behalf of NBFCs and banks who offer risk capital for lending.

Open Protection Enablement Network (OPEN) aims to provide insurance companies and loan aggregators or distributors platforms with a common language for insurance distribution

What is OPEN? OPEN would operate as a layer of APIs that standardise insurance underwriting, distribution and claims processes.

Insurance application process via OPEN

1 Consumer applies for insurance on platform

2 Platform requests – i) Account Aggregator to access consumer financial information, ii) National Health Stack (NHS) to access health information

3 Consumer gives authentication to
i) Account Aggregator to share their data
ii) NHS, where needed

4 Platform collects insurance quotes from insurance carriers/techs via OPEN

5 Platform presents top insurance quotes to consumer

Consumers

Platforms/Distributors

Payment Platforms
Paytm

SME Platforms
BharatPe

Market Places
CarDekho

NHS to provide consent to use health data, wherever needed

2

National Health Stack

4

OPEN Protocol

2

Account Aggregator

Insurance Carriers/Techs

BAJAJ | Allianz

digit

Plum

GOQii

1

5

3 Consumer authentication

The Account Aggregator framework will provide platforms access to financial customer data

Impact

Customers
- Products tailored to their needs
- Access to competitive prices and easier process

Insurance Companies
- Fairer pricing structure based on information from Health stack and Account Aggregators
- Access to new sources of distribution

Distributors
- Access to best commission rates
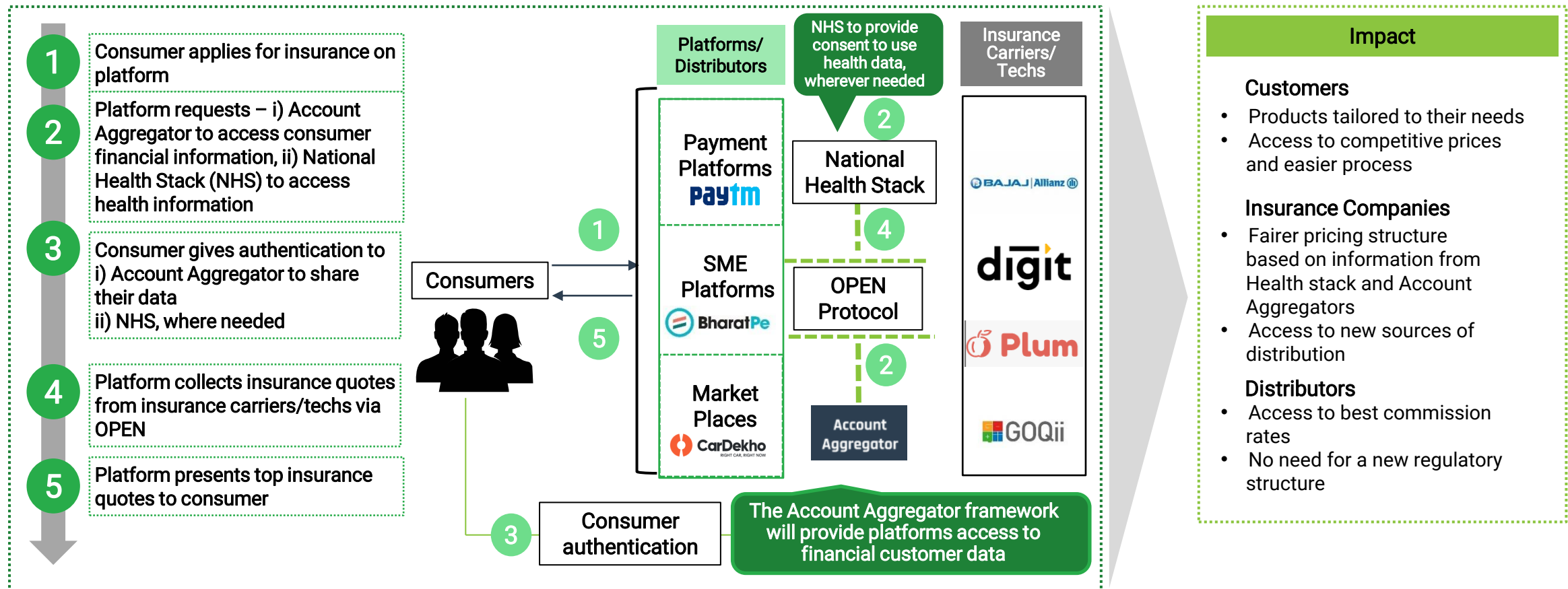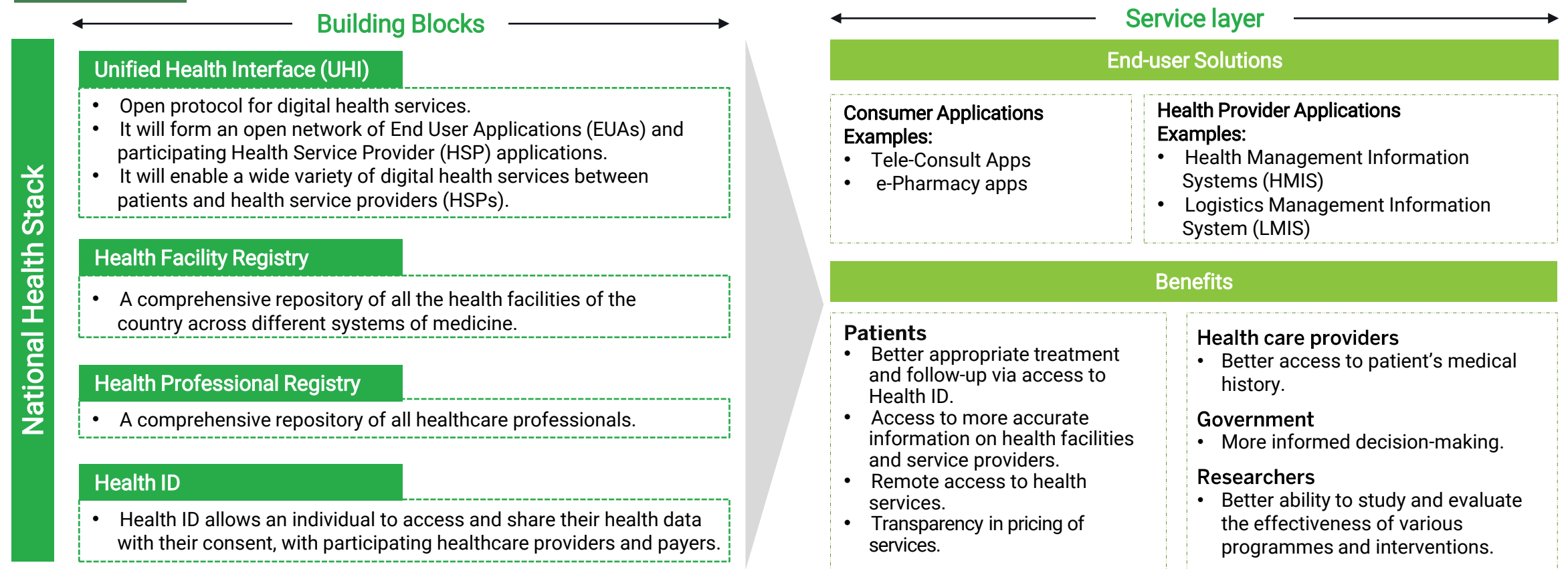- No need for a new regulatory structure

* Loan Service Providers would be a new class of entities focused on origination of loans on behalf of NBFCs and banks who offer the risk capital for lending

HEALTHCARE

National Health Stack (NHS) is driving universal health coverage through a set of building blocks such as health ID, health registries and health information exchange.
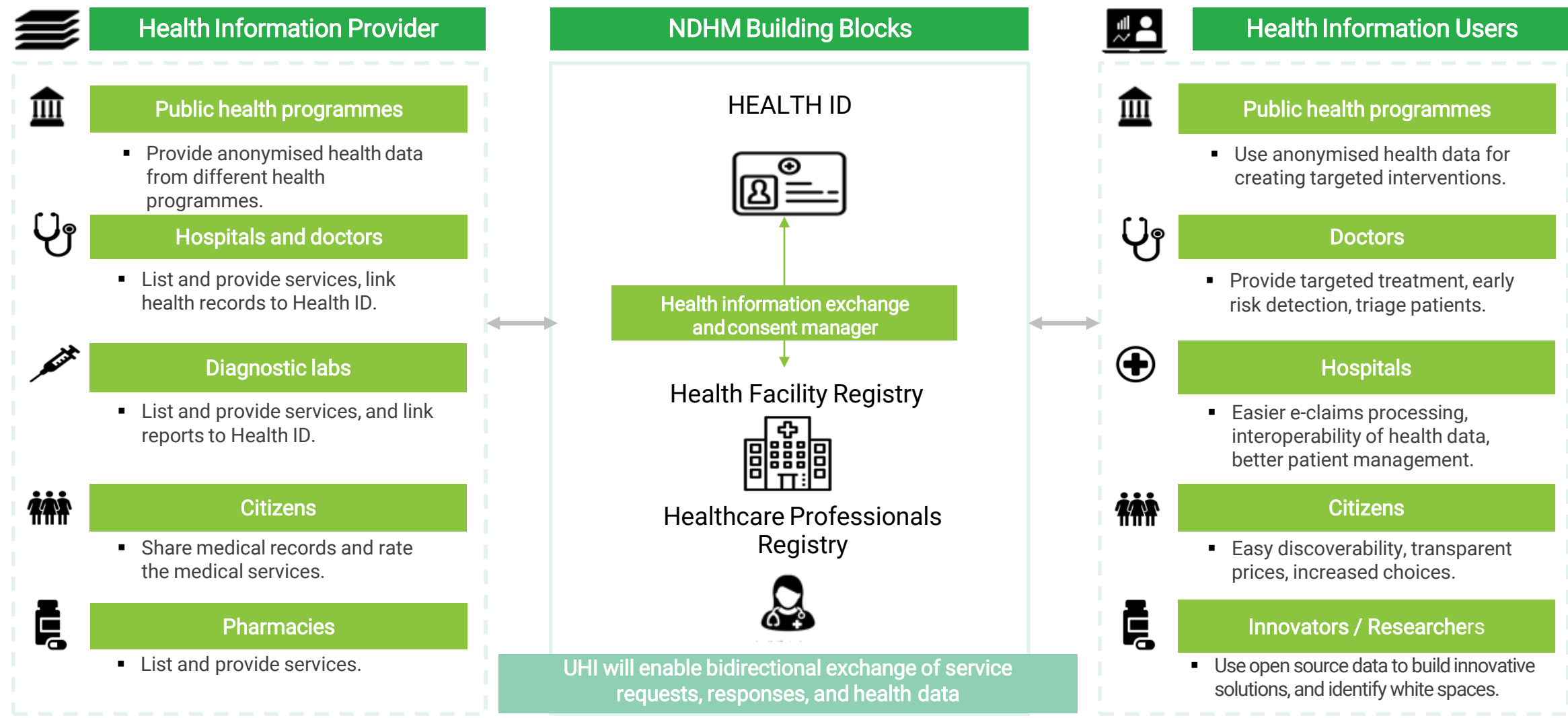
What is NHS? National Health Stack is a shared digital infrastructure usable by both Centre and State as well as private players.

Building Blocks

National Health Stack

Unified Health Interface (UHI)

- Open protocol for digital health services.
- It will form an open network of End User Applications (EUAs) and participating Health Service Provider (HSP) applications.
- It will enable a wide variety of digital health services between patients and health service providers (HSPs).

Health Facility Registry

- A comprehensive repository of all the health facilities of the country across different systems of medicine.

Health Professional Registry

- A comprehensive repository of all healthcare professionals.

Health ID

- Health ID allows an individual to access and share their health data with their consent, with participating healthcare providers and payers.

Service layer

End-user Solutions

Consumer Applications Examples:
- Tele-Consult Apps
- e-Pharmacy apps

Health Provider Applications Examples:
- Health Management Information Systems (HMIS)
- Logistics Management Information System (LMIS)

Benefits

Patients
- Better appropriate treatment and follow-up via access to Health ID.
- Access to more accurate information on health facilities and service providers.
- Remote access to health services.
- Transparency in pricing of services.

Health care providers
- Better access to patient's medical history.

Government
- More informed decision-making.

Researchers
- Better ability to study and evaluate the effectiveness of various programmes and interventions.

- DIVOC is an open-source digital platform for **large-scale digital vaccination**, verifiable credentials, and public health programmes.
- Bahmni is an easy to use, complete, open **source Hospital Information and Electronic Medical Records System.**
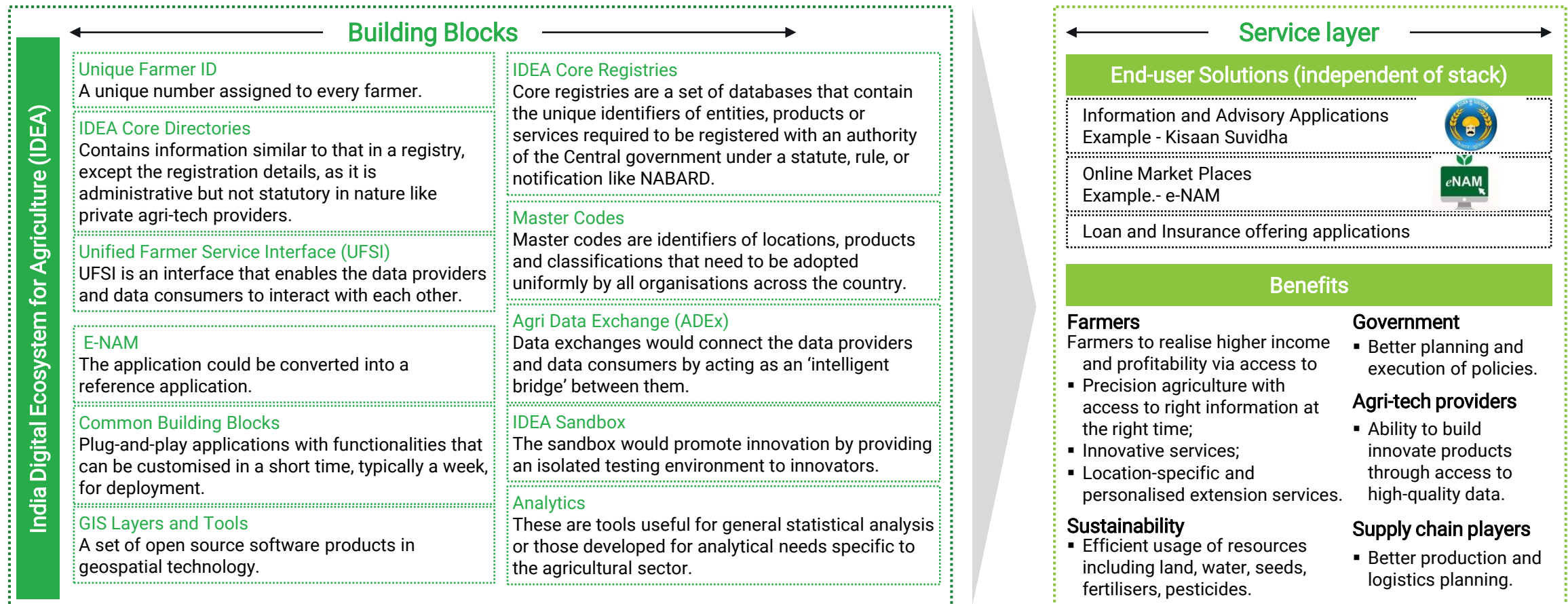
HEALTHCARE

Ayushman Bharat Digital Mission (ABDM) bridges the existing gap amongst different stakeholders of the healthcare ecosystem, enabling seamless delivery of services.

Health Information Provider

Public health programmes
- Provide anonymised health data from different health programmes.

Hospitals and doctors
- List and provide services, link health records to Health ID.

Diagnostic labs
- List and provide services, and link reports to Health ID.

Citizens
- Share medical records and rate the medical services.

Pharmacies
- List and provide services.

NDHM Building Blocks

HEALTH ID

Health information exchange and consent manager

Health Facility Registry

Healthcare Professionals Registry

UHI will enable bidirectional exchange of service requests, responses, and health data

Health Information Users

Public health programmes
- Use anonymised health data for creating targeted interventions.

Doctors
- Provide targeted treatment, early risk detection, triage patients.

Hospitals
- Easier e-claims processing, interoperability of health data, better patient management.

Citizens
- Easy discoverability, transparent prices, increased choices.

Innovators / Researchers
- Use open source data to build innovative solutions, and identify white spaces.

AGRICULTURE

India Digital Ecosystem for Agriculture's (IDEA) core has features such as unique farmer ID, data on weather, information and access to schemes, which aim to improve the efficiency of the sector.

What is IDEA? IDEA lays down the architecture for the Agri-stack in the country that would serve as a foundation to build innovative agri-focused solutions, leveraging emerging technologies and improving the welfare and income of farmers in India.

Building Blocks

India Digital Ecosystem for Agriculture (IDEA)

Unique Farmer ID
A unique number assigned to every farmer.

IDEA Core Directories
Contains information similar to that in a registry, except the registration details, as it is administrative but not statutory in nature like private agri-tech providers.

Unified Farmer Service Interface (UFSI)
UFSI is an interface that enables the data providers and data consumers to interact with each other.

E-NAM
The application could be converted into a reference application.

Common Building Blocks
Plug-and-play applications with functionalities that can be customised in a short time, typically a week, for deployment.

GIS Layers and Tools
A set of open source software products in geospatial technology.

IDEA Core Registries
Core registries are a set of databases that contain the unique identifiers of entities, products or services required to be registered with an authority of the Central government under a statute, rule, or notification like NABARD.

Master Codes
Master codes are identifiers of locations, products and classifications that need to be adopted uniformly by all organisations across the country.

Agri Data Exchange (ADEx)
Data exchanges would connect the data providers and data consumers by acting as an 'intelligent bridge' between them.

IDEA Sandbox
The sandbox would promote innovation by providing an isolated testing environment to innovators.

Analytics
These are tools useful for general statistical analysis or those developed for analytical needs specific to the agricultural sector.

Service layer

End-user Solutions (independent of stack)

Information and Advisory Applications
Example - Kisaan Suvidha

Online Market Places
Example.- e-NAM

Loan and Insurance offering applications

Benefits

Farmers
Farmers to realise higher income and profitability via access to
- Precision agriculture with access to right information at the right time;
- Innovative services;
- Location-specific and personalised extension services.

Sustainability
- Efficient usage of resources including land, water, seeds, fertilisers, pesticides.

Government
- Better planning and execution of policies.

Agri-tech providers
- Ability to build innovate products through access to high-quality data.

Supply chain players
- Better production and logistics planning.

E-COMMERCE

Open Network for Digital Commerce (ONDC) aims to democratise digital commerce, moving it from a platform-centric model to an open-network one.

What is ONDC? Open Network for Digital Commerce is a network based on open protocol* that will enable local commerce across segments, such as mobility, grocery, food order and delivery, hotel booking and travel, among others, to be discovered and engaged by any network-enabled application.
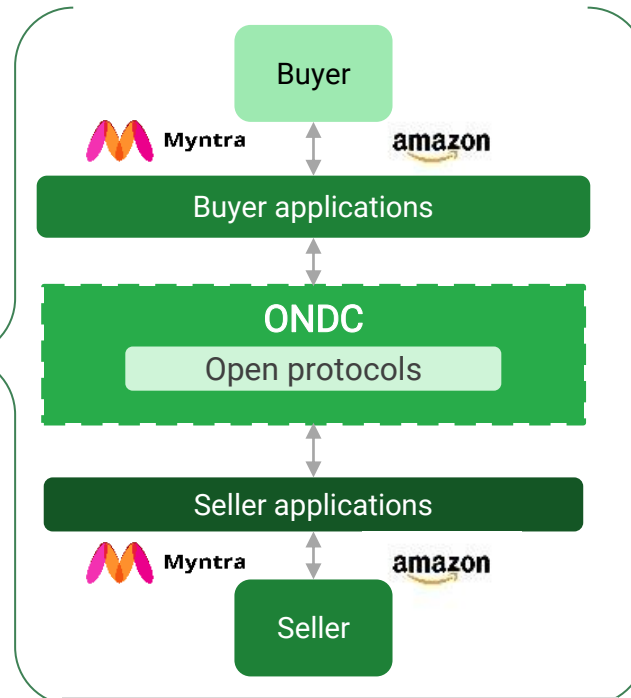
Shift from a current closed platform centric e-marketplaces…

…to open network-centric e-marketplaces
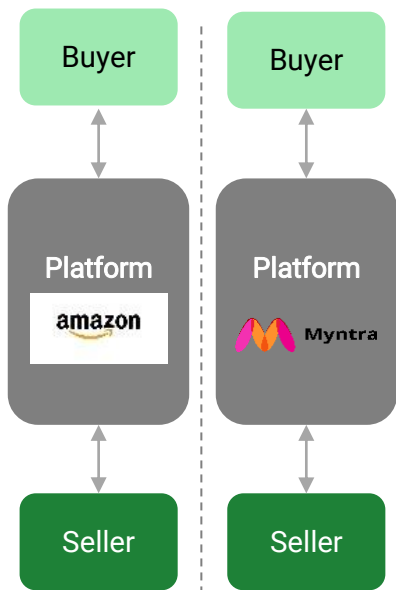
- In this model, sellers need to separately register on each platform.
- Buyers also need to access separate platforms for various need.
- Platforms use proprietary software and do not interact with each other.

- Sellers gain greater visibility as they can access multiple marketplaces by registering on a single portal.
- Allows for interoperability of platforms.

*Open-Source Protocols are readymade tools to help existing software applications quickly adapt to the network

Benefits

Retailers and e-commerce platforms
- ONDC would provide open-source processes which would be available freely for others to use, redistribute and modify.
- All e-commerce companies would have to operate using the same processes.
- MSMEs and online retailers would be able to employ these processes.
- This would digitise the entire value chain of e-commerce.
- ONDC would bring all players in one network, where buyers and sellers would be able transact irrespective of whether they are attached to any specific e-commerce portal.

Buyers
- Buyers would gain access to larger number of products and better prices.

- Beckn Protocol forms an open network allowing buyers and sellers to connect to these open commerce networks using any platform of their choice and transact with each other.
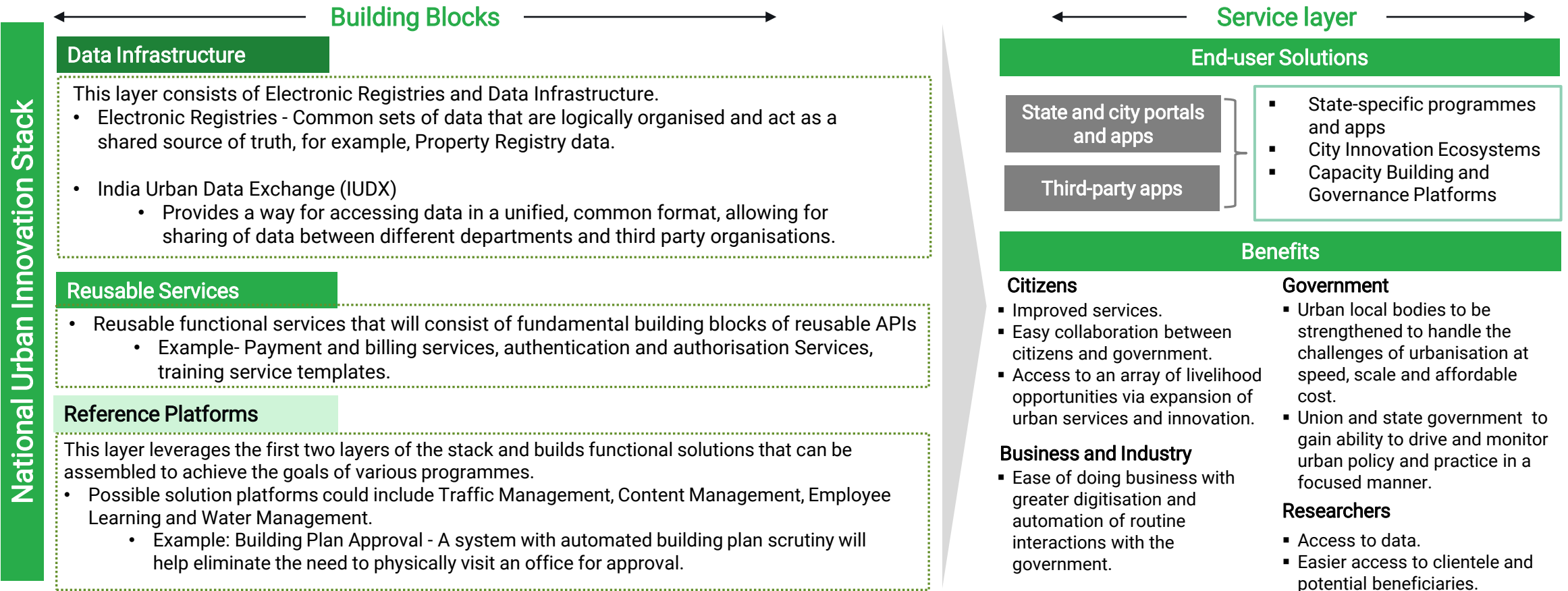- ONDC is built upon Beckn Protocol.

National Urban Innovation Stack (NUIS) aims to bring all public urban services on one platform to enable greater automation and digitisation of routine government interactions.

URBAN DEVELOPMENT

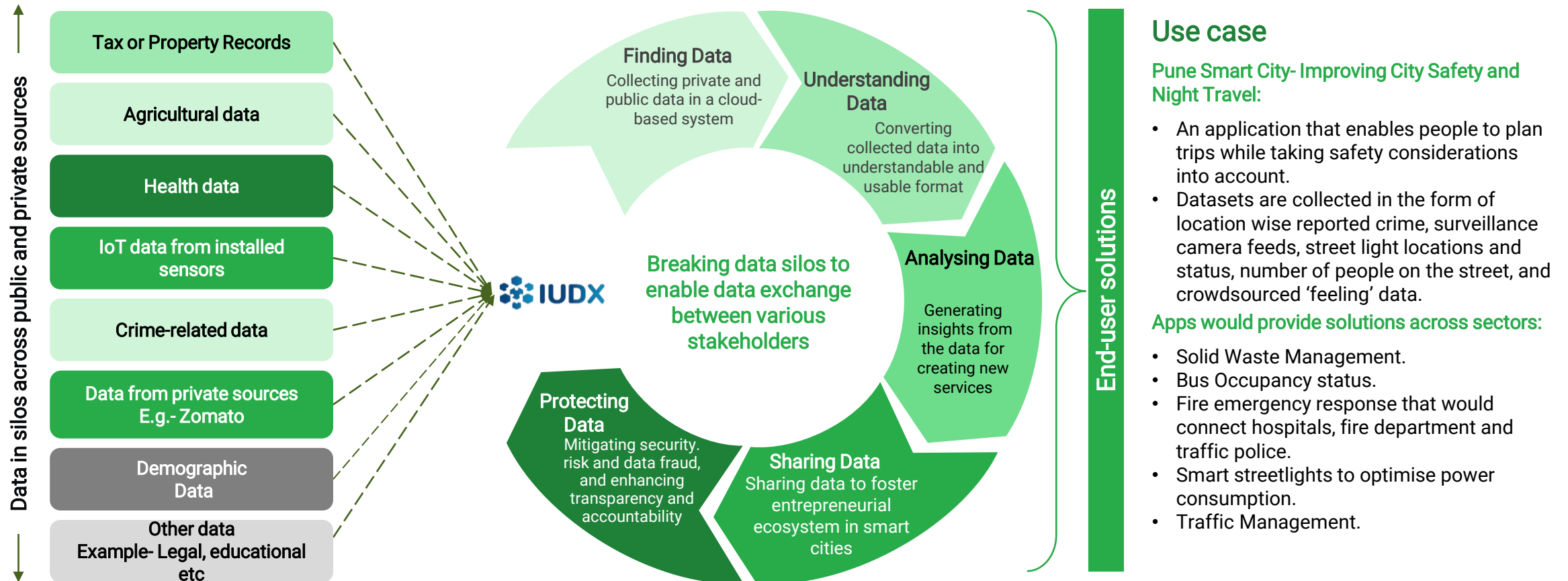| What is NUIS? | A set of shared, modular digital building blocks that can enable all cities and states to build applications and services to unlock myriad urban solutions. |

National Urban Innovation Stack

Building Blocks

Data Infrastructure

This layer consists of Electronic Registries and Data Infrastructure.
- Electronic Registries - Common sets of data that are logically organised and act as a shared source of truth, for example, Property Registry data.

- India Urban Data Exchange (IUDX)
  - Provides a way for accessing data in a unified, common format, allowing for sharing of data between different departments and third party organisations.

Reusable Services

- Reusable functional services that will consist of fundamental building blocks of reusable APIs
  - Example- Payment and billing services, authentication and authorisation Services, training service templates.

Reference Platforms

This layer leverages the first two layers of the stack and builds functional solutions that can be assembled to achieve the goals of various programmes.
- Possible solution platforms could include Traffic Management, Content Management, Employee Learning and Water Management.
  - Example: Building Plan Approval - A system with automated building plan scrutiny will help eliminate the need to physically visit an office for approval.

Service layer

End-user Solutions

| State and city portals and apps | ▪ State-specific programmes and apps |
| Third-party apps | ▪ City Innovation Ecosystems
▪ Capacity Building and Governance Platforms |

Benefits

Citizens
- Improved services.
- Easy collaboration between citizens and government.
- Access to an array of livelihood opportunities via expansion of urban services and innovation.

Business and Industry
- Ease of doing business with greater digitisation and automation of routine interactions with the government.

Government
- Urban local bodies to be strengthened to handle the challenges of urbanisation at speed, scale and affordable cost.
- Union and state government to gain ability to drive and monitor urban policy and practice in a focused manner.

Researchers
- Access to data.
- Easier access to clientele and potential beneficiaries.

DIGIT
- DIGIT Urban Stack is a set of Open APIs, services, and reference implementations, set up as a public good, to allow government entities, businesses, start-ups, and civil society to use a unique digital Infrastructure and build solutions for urban India at a large scale.

URBAN DEVELOPMENT

India Urban Data Exchange (IUDX) interacts with different sectors to enable urban transformation through a set of cloud-based services.
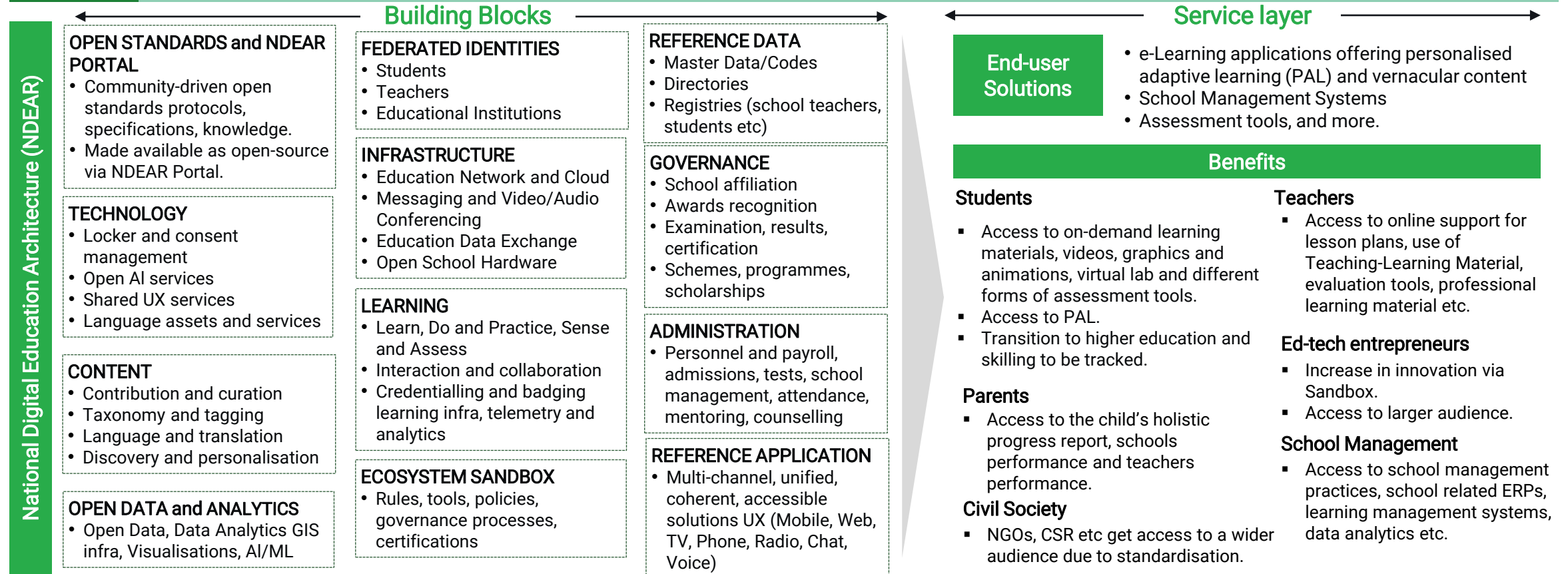
What is IUDX?	▪ IUDX is one of the main components of the NUIS. It will interact across various sectors with the potential to interact with other stacks in future. ▪ It is an open source software that provides a way for accessing data in a unified, common format, allowing for sharing of data between different departments in a city, as well as opening up data for third-party developers to create innovative new applications and citizen services.

Data in silos across public and private sources

- Tax or Property Records
- Agricultural data
- Health data
- IoT data from installed sensors
- Crime-related data
- Data from private sources E.g.- Zomato
- Demographic Data
- Other data Example- Legal, educational etc

IUDX

Breaking data silos to enable data exchange between various stakeholders

Finding Data
Collecting private and public data in a cloud-based system

Understanding Data
Converting collected data into understandable and usable format

Analysing Data
Generating insights from the data for creating new services

Sharing Data
Sharing data to foster entrepreneurial ecosystem in smart cities

Protecting Data
Mitigating security. risk and data fraud, and enhancing transparency and accountability

End-user solutions

Use case

Pune Smart City- Improving City Safety and Night Travel:

- An application that enables people to plan trips while taking safety considerations into account.
- Datasets are collected in the form of location wise reported crime, surveillance camera feeds, street light locations and status, number of people on the street, and crowdsourced 'feeling' data.

Apps would provide solutions across sectors:

- Solid Waste Management.
- Bus Occupancy status.
- Fire emergency response that would connect hospitals, fire department and traffic police.
- Smart streetlights to optimise power consumption.
- Traffic Management.

EDUCATION

National Digital Education Architecture (NDEAR) is meant to enable a common set of principles and approaches to be followed in building, using and re-using technology for education

What is NDEAR? An architectural blueprint for the education stack through which the Government will provide a framework where technology can be built by anyone.

Building Blocks

National Digital Education Architecture (NDEAR)

OPEN STANDARDS and NDEAR PORTAL
- Community-driven open standards protocols, specifications, knowledge.
- Made available as open-source via NDEAR Portal.

TECHNOLOGY
- Locker and consent management
- Open AI services
- Shared UX services
- Language assets and services

CONTENT
- Contribution and curation
- Taxonomy and tagging
- Language and translation
- Discovery and personalisation

OPEN DATA and ANALYTICS
- Open Data, Data Analytics GIS infra, Visualisations, AI/ML

FEDERATED IDENTITIES
- Students
- Teachers
- Educational Institutions

INFRASTRUCTURE
- Education Network and Cloud
- Messaging and Video/Audio Conferencing
- Education Data Exchange
- Open School Hardware

LEARNING
- Learn, Do and Practice, Sense and Assess
- Interaction and collaboration
- Credentialling and badging learning infra, telemetry and analytics

ECOSYSTEM SANDBOX
- Rules, tools, policies, governance processes, certifications

REFERENCE DATA
- Master Data/Codes
- Directories
- Registries (school teachers, students etc)

GOVERNANCE
- School affiliation
- Awards recognition
- Examination, results, certification
- Schemes, programmes, scholarships

ADMINISTRATION
- Personnel and payroll, admissions, tests, school management, attendance, mentoring, counselling

REFERENCE APPLICATION
- Multi-channel, unified, coherent, accessible solutions UX (Mobile, Web, TV, Phone, Radio, Chat, Voice)

Service layer

End-user Solutions
- e-Learning applications offering personalised adaptive learning (PAL) and vernacular content
- School Management Systems
- Assessment tools, and more.

Benefits

Students
- Access to on-demand learning materials, videos, graphics and animations, virtual lab and different forms of assessment tools.
- Access to PAL.
- Transition to higher education and skilling to be tracked.

Parents
- Access to the child's holistic progress report, schools performance and teachers performance.

Civil Society
- NGOs, CSR etc get access to a wider audience due to standardisation.

Teachers
- Access to online support for lesson plans, use of Teaching-Learning Material, evaluation tools, professional learning material etc.

Ed-tech entrepreneurs
- Increase in innovation via Sandbox.
- Access to larger audience.

School Management
- Access to school management practices, school related ERPs, learning management systems, data analytics etc.

- Sunbird is an open-source repository of learning management micro-services that serve as building blocks for the creation of diverse teaching and learning solutions.

DIKSHA
- DIKSHA is made using open-source technology from Sunbird.
- It offers various building blocks that support solutions for teaching and learning.
- Its components will be available as NDEAR building blocks.

EDUCATION

NDEAR enhances learning and administrative efficiency by providing each student with a digital passbook, facilitating content sharing and discussion forums across stakeholders.

Learning enhancement

Crowdsourced content through varied approved sources such as individuals, ed-techs, NGOs etc.

→ Content creation →

NDEAR Portal

Student digital learning passbook

Access to content → Content accessible to diverse groups such as dropouts, and children with special needs.

Online/offline channels → Access through both online and offline channels such as TV, radio, web apps.

Collaborative platform → Collaboration through online discussion forums and groups.

- Digital learning passbooks will act as a digital diary that will help authorities and teachers keep a tab on progress of individual students as well as schools.
- Content is structured, curated and shared across channels - NCERT/ SCERT, NGOs, private organisations etc.

Administrative efficiency

Administrative efficiency across schools, state and national level educational institutions

- Schools/School management get access to school management practices, school-related ERPs, learning management systems, data analytics etc.
- Colleges, schools, workforces have easy access to a student's records through the portal.

Policy advocacy

- Educational administrators use data analytics to bridge infrastructure gap, teacher availability gap, address dropouts and make informed policy choices.

Connects key personas	Student (any learner)	Parent (any caregiver)	Teacher (anyone who provides formal/informal teaching)	Administrator (anyone who can manage help)	Community Member (anyone from society, including market players)

Core of NDEAR includes	Open Standards and principles	Federated Architecture	Building Blocks	Ecosystem
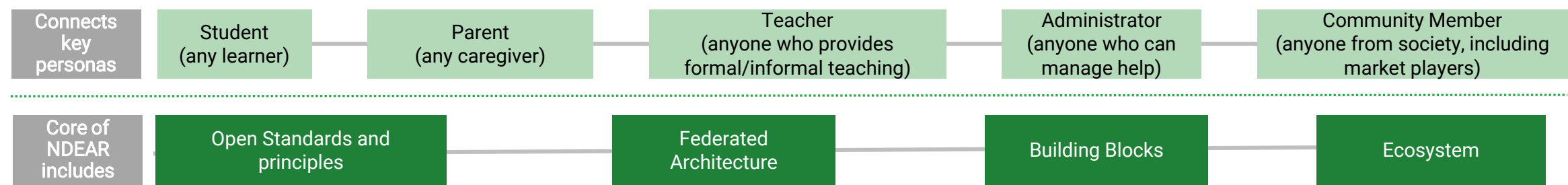
LOGISTICS

Unified Logistics Interface Platform (ULIP) acts as a one-stop shop for all logistics needs across private and public players.

What is ULIP?	Unified Logistics Interface Platform (ULIP) is designed to enhance efficiency and reduce the cost of logistics in India by creating a transparent, one window platform that can provide real-time information to all stakeholders.

Components of ULIP

Integration with existing data sources of ministries

- Authorisation, compliance and clearance are some of the critical activities of logistics.
- The integration with data points of ministries shall enable a holistic view and interlink the handshaking points.

Data exchange with private players

- Enable the private players, logistics service providers, and industries to utilise the data available with ULIP, and
- Share their data (transportation, dispatch, delivery, etc.) with ULIP, thereby streamlining the processes to bring better efficiency through data exchange.

Unified document reference in the supply chain

- Enable a single digitised document reference number for all the documentation processes in a single platform.

ULIP data exchange process

Private Players

ULIP

About 24 Digital Systems of six Ministries are being integrated through ULIP.

Public Players

Port, Shipping and Waterways	Railways
Commerce and Industry	Civil Aviation
Road and Transport	Other Sources Eg Finance
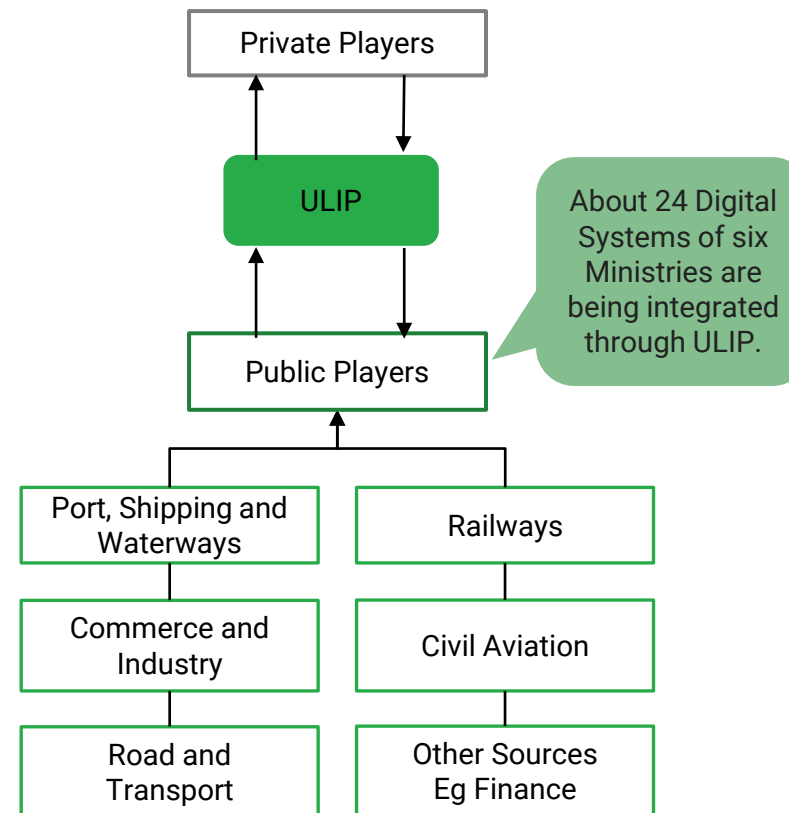
IMPACTS

Paperless/only electronic data transfer regime leading to reduction in compliances and tedious documentation processes.

Standardisation of procedures and harmonisation of processes for seamless trade, thereby enhancing ease of doing business for all.

Efficient inventory management and real-time monitoring of cargo movement, while ensuring data confidentiality with end-to-end encryption.

Comprehensive reduction in logistic cost resulting in competitive costing.

SKILLING

Digital Ecosystem For Skilling and Livelihoods (DESH) offers digitally verifiable credentials, consolidation of jobs and training on one portal and an open protocol.

What is DESH? DESH is envisioned to be a digital infrastructure/stack for the education and skills ecosystem to enable frictionless exchange for skill development, deployment and associated supply-chain and enabling services.

Components of DESH

Electronic Registries

- A single source of truth containing data about accredited/authorised agencies, authorised professionals, training centres, certified platforms on the discovery network, and other key stakeholders in the ecosystem.

Verifiable Credentials

- An electronic standard for data representing credentials, allows certificates to be awarded in a digital, machine-readable format and makes them digitally verifiable.

Open Protocol

- Open networks and open protocols for the skilling ecosystem to enable interoperability over a nationwide, decentralised, open, secure and inclusive network.
- Bring service providers and users on a single open network reducing demand-supply gap in skilling, training and employment sector.

Process to verify credentials

A corporation creates a training credential for an individual

The aforesaid credential is added to the individual's credential repository

Individual uses his credential repository to apply for a job

The employer verifies credentials through the DESH-Stack eportal
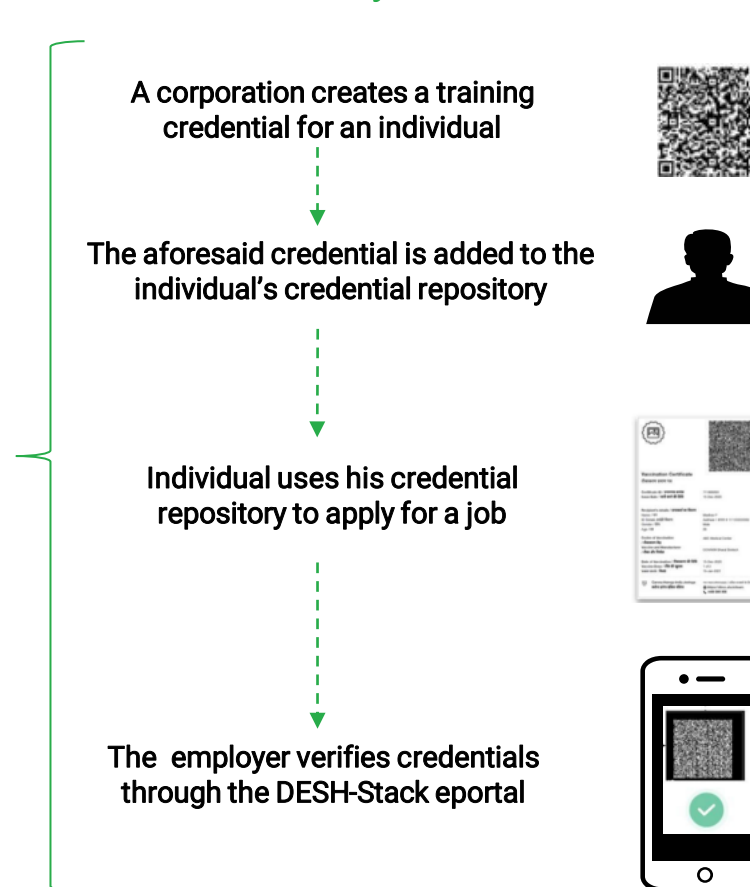
IMPACTS

Enable any stakeholder to issue verifiable credentials reducing the information asymmetry and bringing trust in transactions.

Empower individuals to store verifiable credentials and act as a gateway for them to discover opportunities.

Facilitate individuals to discover skilling, training and job opportunities and employers to discover potential candidates.

Allow any stakeholder to be able to provide targeted financing for upskilling of individuals by using India Stack.

MISCELLANEOUS

iFIX facilitates real-time exchange of information across government entities and Digi Yatra enhances the travel experience.

iFIX Fiscal Information Exchange Platform

Digi Yatra Digital Yatra

	iFIX	Digi Yatra
Purpose	• iFIX facilitates real-time seamless information exchange across government entities and departments in a standardised manner.	• Digi Yatra envisages a connected ecosystem enhancing the seamless travel experience for the passengers and improving security.
Services	• iFIX provides standard APIs for the management of master data like Departments, Funds, Charts of Accounts, Expenditures (e.g. Schemes, Non-Scheme) and Projects. • Client systems can register into iFIX and based on the permissions granted use the APIs to manage the master data and/or post-primary fiscal events e.g. Receipt, Bill, Payment. • iFIX then makes this information available through Standard API for aggregated and disaggregated forms for other systems to query and leverage. • As events flow into iFIX, it enables real-time correlation of various chains of events and provides visibility of the fiscal and cash positions of various assets, projects and agencies.	• Digi Yatra system has a digital ID backed by a strong verifiable government-issued identity like Aadhaar card, passport and others, enabling a seamless travel experience for passengers at all airports across India. • Aims at enhancing security at Indian airports using Digi Yatra ID-based identification with real-time biometrics. • The common Digi Yatra ID platform offers core passenger services viz. enrolment, authentication, consented profile sharing etc., and will be built as a shared national infrastructure with APIs for airports and apps to integrate. • Digitises current manual processes to bring efficiencies like real-time notifications on flight delays etc.
Use Cases	• National, state and local governments can use iFIX to exchange fiscal information.	• Digital Yatra platform that offers core services like enrolment, authentication, etc. along with open APIs for airports and other players to build on.

CHALLENGES ASSOCIATED WITH DIGITAL PUBLIC GOODS

Data security, discriminatory biases, and insufficient infrastructure raise concerns about the equitable implementation of DPGs.

Threat	Description	Threat	Description
Data breach	▪ Consolidation of large sets of personal, sensitive citizen data in a single source increases potential of data breach. ▪ Example: Two major data leakages were reported for Aadhaar where consumer data was shared over WhatsApp at minimal costs *(The Tribune 2022)*.	Inaccessibility to government services	▪ Lack of or discrepancies in identity documents may result in exclusion from government services and benefits. ▪ Example: Land records, that form the core of the Agri stack, are either dated, incomplete, erroneous or non-existent in India. The stack also fails to include tenant farmers in this case *(Digital Land Records Modernisation Programme 2021)*.
Exclusionary bias	▪ Sharing of personal sensitive without proper security safeguards may lead to creation of exclusionary biases. ▪ Example: Concerns raised on sharing and governance of sensitive health data such as a person's sexual orientation.	Low adoption by the informal sector	▪ Lack of awareness on digital technologies in the informal sector may lead to low adoption of DPGs. ▪ Example: The adoption of UPI/India stack rose significantly after demonetisation. The lack of cash triggered the adoption of digital payments across consumers and sellers.
Sub-optimal infrastructure	▪ Sub-optimal internet speeds could make data entry an onerous proposition for rural users as well as providers. ▪ India's internet penetration rate stood at 47% of the total population at the start of 2022 *(DataReportal 2022)*. ▪ Example: Rural educational institutions and healthcare providers might struggle in digitised service delivery through these platforms.	Lack of innovative applications	▪ Lack of private funding and government incentives prevent developers from leveraging the technology infrastructure. ▪ Compromised datasets or datasets in unusable formats can impact the quality of applications and make it challenging for the developers to leverage it.

ROLE OF PHILANTHROPIC AND SOCIAL ORGANISATIONS
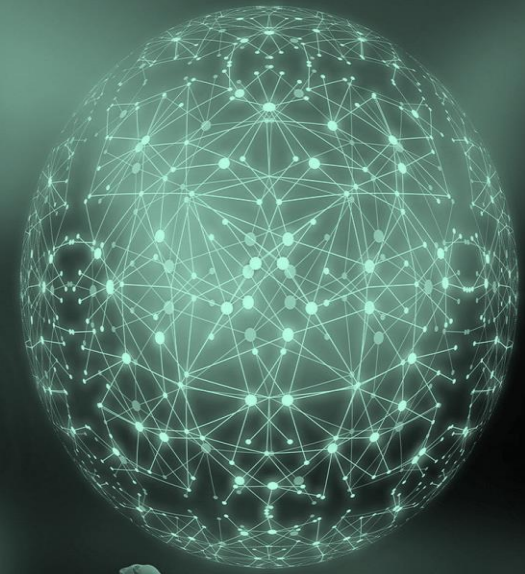
Funders will play an important role in the development and adoption of ODEs and end-user solutions.

	Fostering innovation	Programme design and monitoring	Capacity building of NGOs	Government advisory

Social sector activity	• Provision of capital and incubators to innovators to promote inclusive, low cost and large-scale building blocks and end-user solutions.	• Technical assistance with the technological design of Digital Platforms.
		• Monitoring and evaluation tools and services to assess the impact of Digital Platforms-related programmes.
			• Strengthen ICT infrastructure and know-how among NGOs to enable them to participate in the Open Digital Ecosystem.	• Advisory to government on DPG-related programmes:
				   • Improve and refine the programme design.
				   • Implementation support and oversight of DPG projects.
				   • Development of monitoring and evaluation tools to assess programme efficiency and effectiveness.

Use Case	BILL & MELINDA GATES foundation • Gates Foundation has provided funds for several digital public goods, including DIVOC, DHIS2, CommCare, Mojaloop, and MOSIP, in addition to Digital Square which invests in a range of digital health DPGs.	THE WORLD BANK • World Bank launched Africa Nenda, a technical assistance facility which aims to support African central banks, to build interoperable national payment systems. • World Bank supported the first cross-country data collection effort on government-to-person payment methods that will help inform our understanding of the status digitisation of government payments stands and the opportunities going forward.	GitHub • GitHub's Skills-Based Volunteering programme engages their staff and leverage their skills and expertise to help social sector organisations solve complex business and technical issues.	CENTRAL SQUARE FOUNDATION • CSF has created 'Implementing Personalized Adaptive Learning (PAL) at Schools: A Guidance Note for States' to support states who are interested in deploying PAL in schools under the 'Use of ICT in School Education' policy of MHRD. digital square • Digital Square works with more than 15 country governments and country-based technology experts to strengthen local capacity to implement and manage digital health programmes.

Note: Most of the funders would not need any major internal changes as they already use digital tools for internal operations as well as service delivery.

NGOs will play an important role to build trust and facilitate the adoption of Digital Platforms on the ground.

Significant changes in modality of operation...

NGOs will play an important role in facilitating adoption of DPGs

Ecosystem Engagement

Awareness-building:
- NGOs can spread awareness about the utility of stack and solutions, and build on top of these stacks via awareness workshops and programmes.

Capacity-building:
- NGOs can train grassroot level workers, nurses, lab technicians, school teachers to
  - Enable them to use end-user solutions.
  - Act as field agents who pass on the training to the rest of the community.

Internal Adaptation

Adoption of digital tools:
- Use data and building blocks for service delivery.
- Facilitate adoption of DPGs.

Capacity-building:
- Digital training of existing staff and introduction of technology experts to utilise stacks for service delivery and further implementation.

Data-based strategy and operation:
- NGOs can leverage increased access to data from various stacks (education, skilling, etc.) to develop more efficient programmes.

...leading to significant positive impact.

Use Cases

Improve adoption
Work with vulnerable and underprivileged sections to improve adoption on ground and hence access to government schemes and benefits.

Smarter data-based decisions
An NGO working towards prevention of communicable diseases uses data to better allocate resources by identifying the most affected communities and by forecasting trends.

Ease with building applications
An NGO builds an application to provide tele-medicine to people in rural areas by using building blocks provided by Health Stack.

Enhanced service delivery
NGOs working on the ground with retailers, educational and healthcare institutions can handhold them through the process and ensure successful adoption and utilisation.

Transparent and efficient implementation of programmes
NGOS use eVIN (Electronic Vaccine Intelligence Network), which provides real-time information on vaccine stocks, flows, and storage temperatures across all cold chain points, to improve their immunisation efforts.

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