Architecture-Driven Digital Transformation: A Case of India

Dr. Pallab Saha
- General Manager (India), The Open Group
- President, Association of Enterprise Architects (India)
- MeitY-NeGD Senior Lead Expert in Enterprise Architecture

Asia and the Pacific Regional Dialogue on Digital Transformation
8th December 2021

Digital Transformation Agenda

MeitY has a 1,000-day plan for a $1-trillion digital economy

Synopsis
Key to the initiative will be making India the largest connected nation in the world, bringing coherence into digital governance, simplifying rules and legislations for technology and social media companies, and focusing on building India's high-tech prowess.

Infrastructure
- Electricity is available, affordable and reliable
- National Broadband Strategy (wired & wireless)
- Accessibility and Affordability of access and computer
- Quality & Reliability of network (bandwidth & up time)

Smart Living & City
- Create a place where people want to live
- Attract and nurture **human capital**
- Great city will attract talent
- Talent will attract & create great business
- **Smart City** - water, flood, transport, air, energy, emergency, security
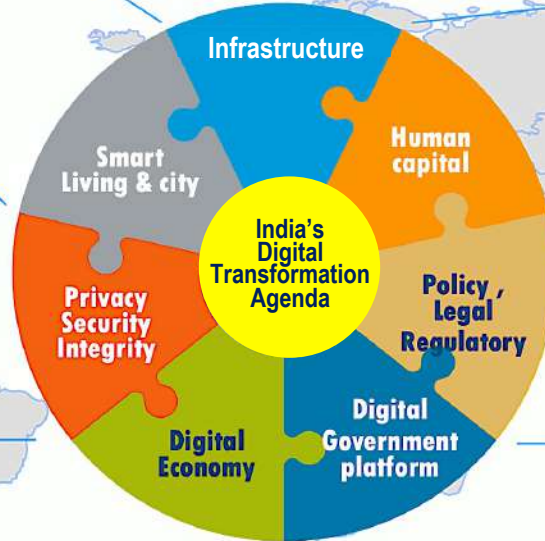
Human Capital
- Analog & Digital Inclusion (UID, access, knowledge and skill)
- Empowered all citizen (women ~ 50% pool of Talent)
- Digital Literacy (Technology savviness)
- ICT capable government employees
- Capacity Building

Privacy, Security, Integrity
- Openness & Transparency foundational
- Build culture of trust – Government/Citizen/Business
- Strong Policy & Legislation on confidentiality/Privacy/Transparency
- Personal Data Protection - Ownership and Usage need to be controlled & audit by users
- Cybersecurity by design

Policy, Legal & Regulatory framework
- Political, Economic & Social Openness
- Enable & accelerate key ICT infrastructure development
- Create Open & Sustainable Competitive market
- E-Governance / E-Services friendly
- Accelerate Public-Private Partnerships

Digital Economy
- Financial Inclusion
- Digital Payment capability
- Entrepreneurship & Innovation
- Credit availability & Fraud reduction
- Digitally enable MSME

Digital Government Platform
- Optimized Data Center
- Cloud based Infrastructure, Analytics
- EID & End user Device
- Security, Network, Open-Data, Open API
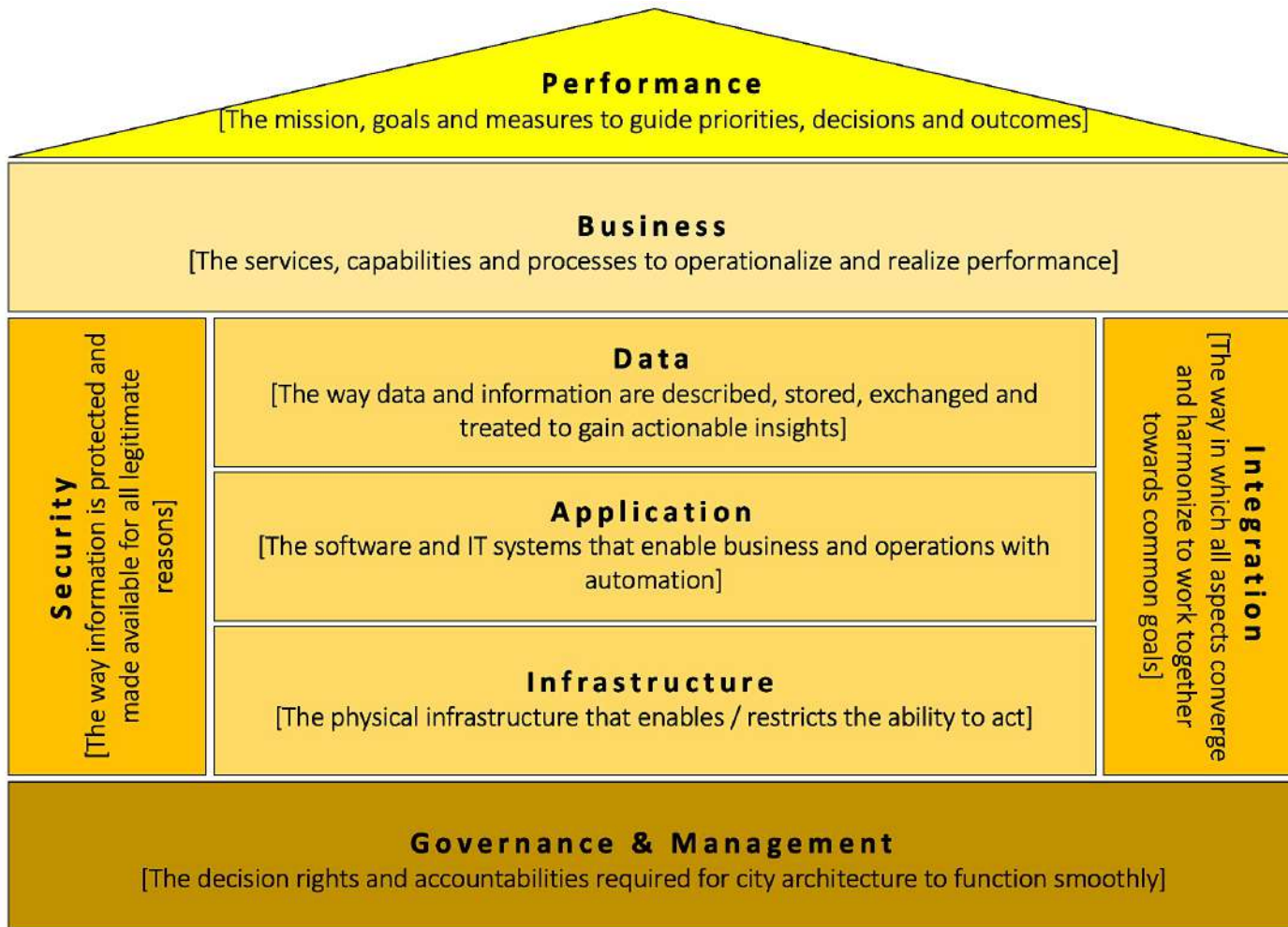- E-Services platform, Government Portal

India's Digital Transformation Agenda

Infrastructure · Human capital · Smart Living & city · Privacy Security Integrity · Policy, Legal Regulatory · Digital Economy · Digital Government platform

India Enterprise Architecture Framework

The vision of IndEA is "**to establish best-in-class architectural governance, processes and practices with optimal utilisation of ICT infrastructure and applications to offer ONE Government experience to the citizens and businesses through digital services enabled by Boundaryless Information Flow™.**" The IndEA comprises of eight distinct yet inter-related reference models, each covering a unique and critical architecture view or perspective.

- **Part 1 [India Enterprise Architecture Framework]**: This details the eight reference models based on TOGAF® and other Open Group Standards.

- **Part 2 [IndEA Adoption Guide – A Method Based Approach]**: This describes how IndEA can be adopted by government entities with TOGAF® ADM as the underlying methodology.

- **Part 3 [Digital Service Standard]**: This elaborates the lifecycle of initiating, designing, developing, deploying, measuring and governing digital services as a way to enable the architecture.

- **Part 4 [Agile IndEA Framework]**: This standard blends agile practices into architecture activities and describes the steps needed to build a minimum viable architecture through the use of reusable building blocks.
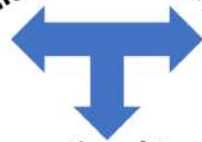
Architecture Domains in IndEA Framework

Performance
[The mission, goals and measures to guide priorities, decisions and outcomes]

Business
[The services, capabilities and processes to operationalize and realize performance]

Security
[The way information is protected and made available for all legitimate reasons]

Data
[The way data and information are described, stored, exchanged and treated to gain actionable insights]

Application
[The software and IT systems that enable business and operations with automation]

Infrastructure
[The physical infrastructure that enables / restricts the ability to act]

Integration
[The way in which all aspects converge and harmonize to work together towards common goals]

Governance & Management
[The decision rights and accountabilities required for city architecture to function smoothly]

Digital Government Architecture Process

Political Commitment

Transformational Leadership Collective Intelligence

Vision Guides Strategy

Primary Interventions For SDG Implementation

1. Context and Situation Analysis

- Assessing Legal & Governance Frameworks
- Assessing Attitudes, Beliefs & Capabilities
- **Primary Tool To Be Used**
  Situation Analysis Through Participatory Workshops

2. Vision of the Future

- Developing a Shared Vision of Sustainable Development, a Comprehensive Mission Statement & the Role of Digital Government
- **Primary Tool To Be Used**
  Multistakeholder Visioning Workshops & Scenario Planning

3. Digital Government Transformation Strategy and Roadmap

Priority Setting and Action Planning

- Leadership & Changing Mindsets at all Levels and Across all Sectors
- Enabling Institutional, Legal & Regulatory Frameworks
- Catalyzing Organization Culture & Design
- Mainstreaming Systems Thinking & Orchestration
- Data Governance & Data Driven Public Sector
- ICT Infrastructure, Universal Access to Digital Technologies, & Inclusion
- Mobilizing Resources & Aligning Them with Future Vision and SDGs
- Reinforcing Institutional Capacities at all Levels
- Fostering Digital Competency of Societies & Collaborative Innovation

4. Implementation

Monitoring and Evaluation

- System Coherence
- Platform Ecosystems
- Open Communication
- Ethics, Public Trust & Legitimacy
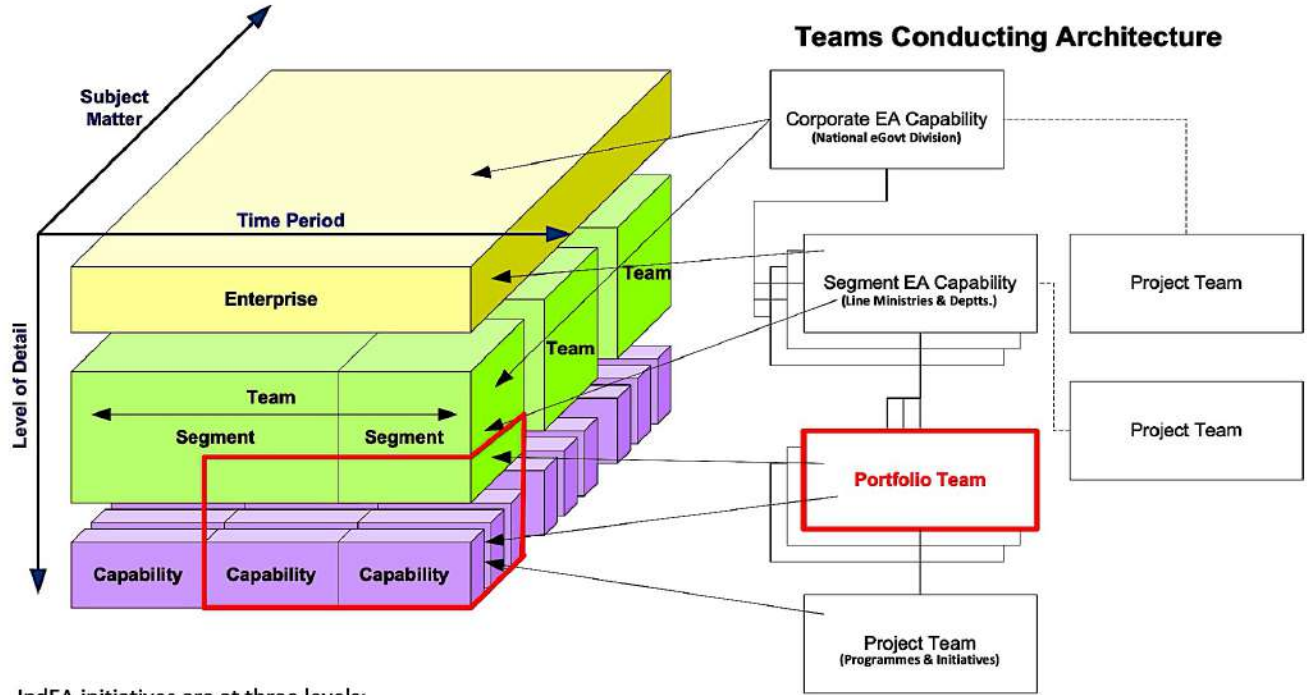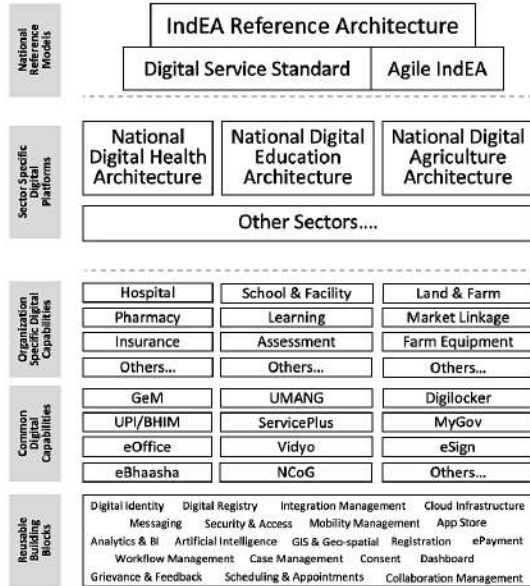- Outcome-Based Budgeting
- Security & Privacy

Ongoing Feedback and Diagnosis

Course Correction and Prognosis

Transparent, Accountable and Inclusive Public Service Delivery for SDG Implementation

The Architecture of Architecture

Realization Initiatives

National Reference Models	IndEA Reference Architecture		
	Digital Service Standard	Agile IndEA	
Sector Specific Digital Platforms	National Digital Health Architecture	National Digital Education Architecture	National Digital Agriculture Architecture
	Other Sectors....		
Organization Specific Digital Capabilities	Hospital	School & Facility	Land & Farm
	Pharmacy	Learning	Market Linkage
	Insurance	Assessment	Farm Equipment
	Others...	Others...	Others...
Common Digital Capabilities	GeM	UMANG	Digilocker
	UPI/BHIM	ServicePlus	MyGov
	eOffice	Vidyo	eSign
	eBhaasha	NCoG	Others...
Reusable Building Blocks	Digital Identity Digital Registry Integration Management Cloud Infrastructure Messaging Security & Access Mobility Management App Store Analytics & BI Artificial Intelligence GIS & Geo-spatial Registration ePayment Workflow Management Case Management Consent Dashboard Grievance & Feedback Scheduling & Appointments Collaboration Management		

Teams Conducting Architecture

IndEA initiatives are at three levels:
- **National or State level** covers the entire country or the state and defines the high-level vision, principles, and strategic directions for the entire enterprise architecture by defining the relevant reference models
- **Segment level** defines the ecosystem architecture for a specific sector (or business domain) selected based on national priorities
- **Capability level** defines the architecture for a single business capability and at this level is the most detailed and leads directly to capability implementation (solution architecture and implementation)

Examples of Public Digital Platforms* in Action
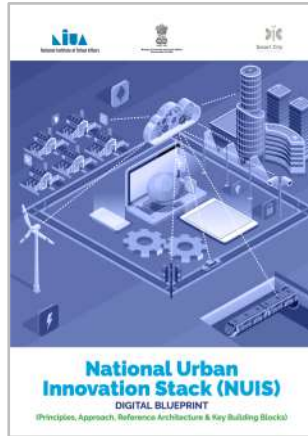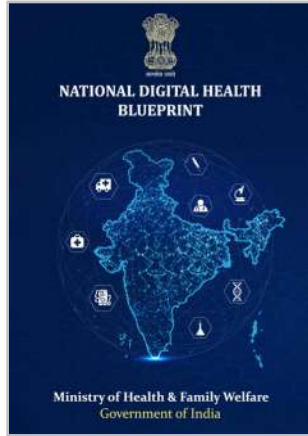
* Efforts are currently underway to create PDPs for *Power & Energy, Woman & Child, Skills & Employment, Logistics, Transportation, Industry Consortium (MSME), Criminal Justice System*, and *Tourism* among others.

The Open Group Architecture Framework (TOGAF) is one of the most used frameworks for enterprise architecture today in the public and private sectors, providing an approach for designing, planning, implementing, and governing an enterprise's digital architecture.

[World Bank. 2021. GovTech Maturity Index: The State of Public Sector Digital Transformation. World Bank, Washington, DC.]

Digital Platform Canvas

Platform Name	Platform Owner	Platform Type	Domain
		Public **Public-Private** **Private**	

Ecosystem Partners
Who are the key partners in your ecosystem that may contribute to your digital platform?

Ecosystem channels   **Social Media**
Helpdesk **Technical** **Manuals** **User**

Providers

Who are the key providers for your digital platform products and services?

Provider Incentives

What are the incentives for providers to contribute to your digital platform?

What are the key activities providers perform on the platform?

Governance Model
Centralised **Hybrid Federated** **Decentralised**

Business Model
Collaboration **Orchestration** **Creation** **Matching**

Value Proposition
How does your platform create value for all participants and what are the different elements that contribute to this?

Platform Technology

User Experience Platform   Ecosystems Platform

Data & Analytics Platform

IoT Platform   Information Systems Platform

Consumer Incentives

What incentives do consumers have to use your digital platform?

What are the key activities consumers perform on the platform?

Consumers

Who are the key consumers (segments) of your digital platform products and services?

API Structure
- API Model
- Location API
- API Standardisation

Location Data Value Creation
- Is the service
- Personalises the service
- Adds a community element
- Is static
- Adds intelligence

Cost Categories
- Expenses and Effort
- Data and Privacy
- Services and Integration
- Intellectual Property / Branding

Benefit Categories
- Revenues
- Data and Valuation
- Services and Personalisation
- Intellectual Property / Branding
- Society / Positive Externality

|| Public Digital Platform Reference Architecture ||

Governance Capabilities

- Federation
- Structure & Org Design
- Policy & Regulation
- Budget & Funding
- Conformance & Verification
- Zero Trust & Secure-by-Design

Integration Capabilities

- Shared Vision
- Agreements & Contracts
- Risk Management
- Digital Competence
- Collaborative Innovation
- Market Management

Users / Participants

Citizen/People	Government & Regulator	Supplier & Intermediary	Startup/ Entrepreneur	Marketer/ E-Commerce	Developer	Research Institution	Financial Institution

Access Channels

Web Browser	Mobile Device	Chatbot	Phone / IVRS	Service Centre	Call Centre

Business Capabilities

Partner Onboarding	Partner Management	Offering, Services & Catalog	Experience Design	Promotion & Marketing	Digital Services & Provisioning
Market Access	Charging & Revenue Model	Incentive & Subsidy	Trust & Reputation	Registration & Fulfillment	Search & Discovery

Data Capabilities

Data Governance & Control	Common/Shared Data	Master & Meta Data	Data Interoperability	Data Standards	Data Protection, Privacy & Security
Data Analytics	Open Data & Monetization	Consent, Aggregation & Anonymization	Data Registry	Data Quality	Data Value Chain

Application Capabilities

Cloud Ecosystem	Interface & Integration	Application Standards & Protocols	Application Architecture	Agile-by-Design	Application Lifecycle Management
Monitoring & Notification	Accelerator & Sandbox	Common Solution Building Blocks		Application Modernization	Orchestration & Coordination
	Universal Access & Inclusion	Core Building Blocks		Service Orientation	

Infrastructure Capabilities

Access Device	Network Infrastructure	Integration Services	Communication Services	Storage & Archival Services	Performance Monitoring & Operation
	Technology Modernization	Security Services	QoS & CoS	Compute Services	

E.g. National Digital Health Architecture

USER APPLICATIONS
Diverse user experiences & innovative solutions

UNIFIED HEALTH INTERFACE
APIs for Health services

HEALTH DATA EXCHANGE
Streamlining flow of patients, health information and money

JAM & OTHER DIGITAL PUBLIC GOODS
Cross domain generic building blocks

USER FACING SOLUTIONS / APPS
- Arogya Setu
- Telemedicine
- Other Apps

INSTITUTIONAL SOLUTIONS
- HIMS
- LIMS

Public & Private Solutions

Telemedicine APIs
Discover Doctor
Book Appointment
Teleconsult ...

Lab & Drugs APIs
Discover Lab
Discover Pharmacy
Avail Services ...

Other Health Service APIs
Discover Bed Availability
Discover Hospital facilities
Take Decisions ...

DIGITAL REGISTRIES
Health ID
Healthcare Professionals
Health Facilities
Drugs
...

HEALTH INFORMATION EXCHANGE
Health Information Exchange & Consent Manager

Health document standards
(diagnostic reports, prescriptions,...)

Aggregated health data & analytics

HEALTH CLAIMS STANDARDS
eClaims standard

Health Claims Platform

Policy Markup Language

Bill Markup Language

Aadhaar, UPI, UPI eVoucher, e-Sign, Digilocker, Consent Artefact ...
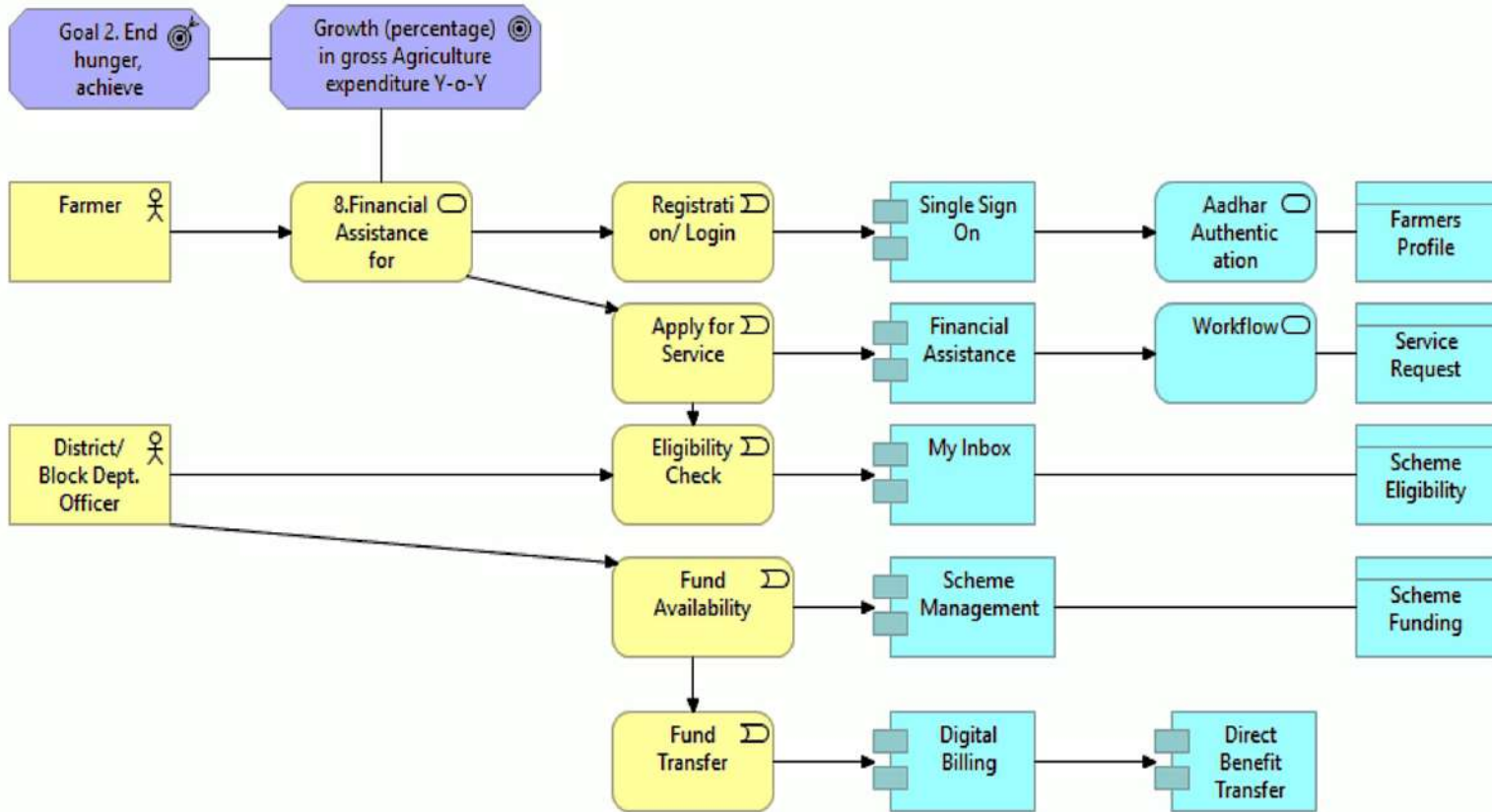
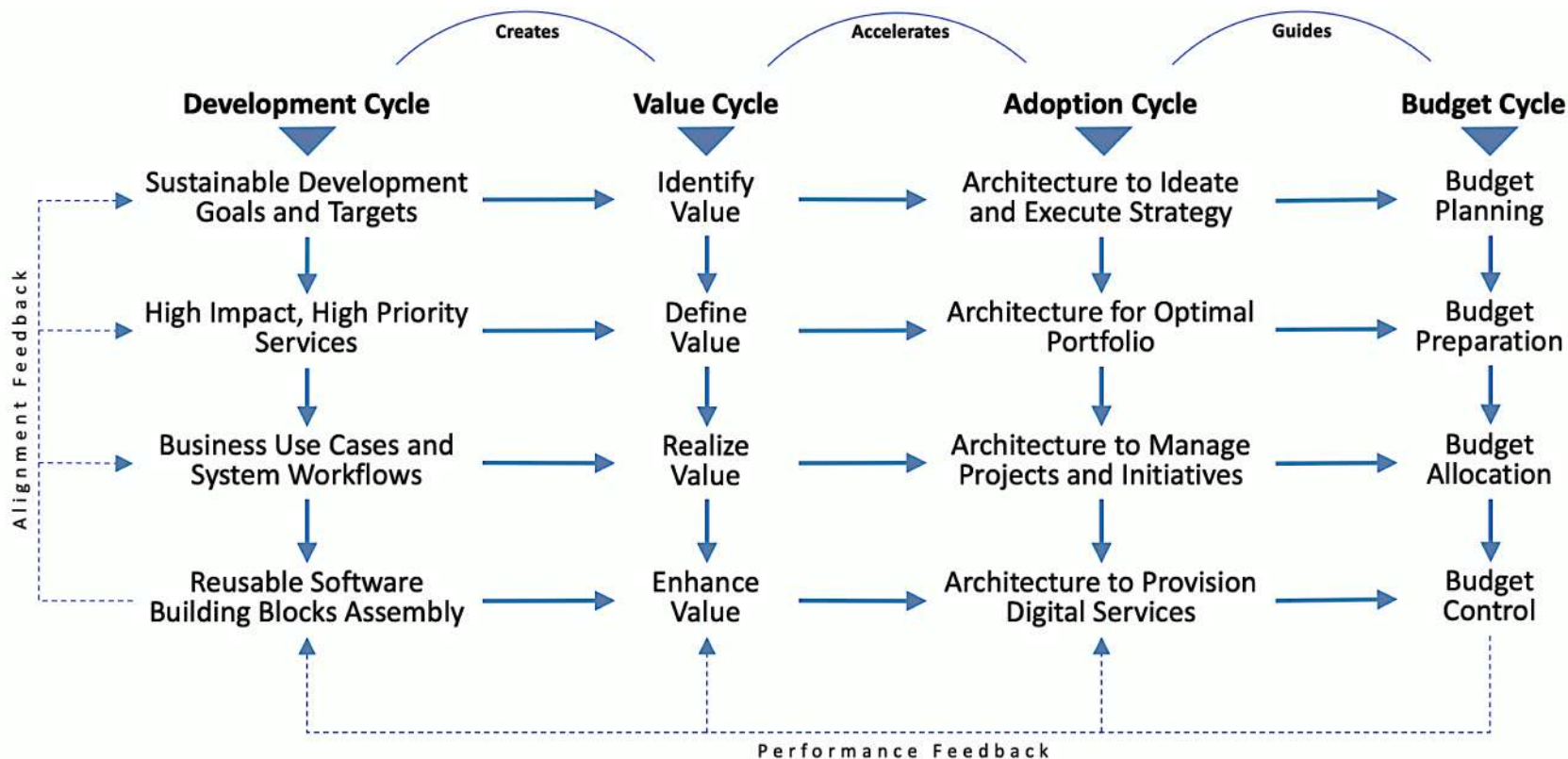*Digital Public Infrastructure*

E.g. Remote Consultation (Use Case Diagram)
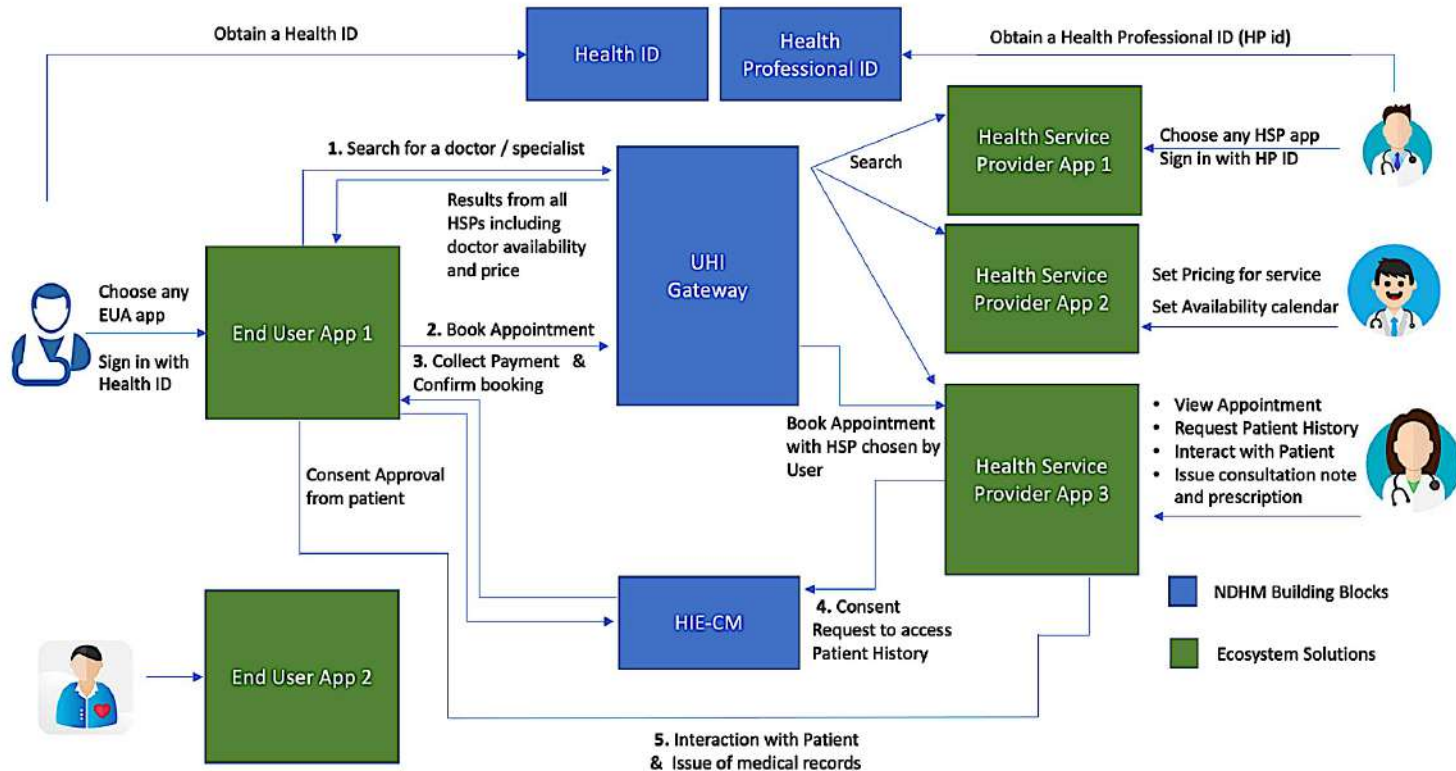
E.g. Digital Service (Use Case Diagram)

Enterprise Architecture Sustainability Model
(From Doing Architecture to Making Architecture Work)

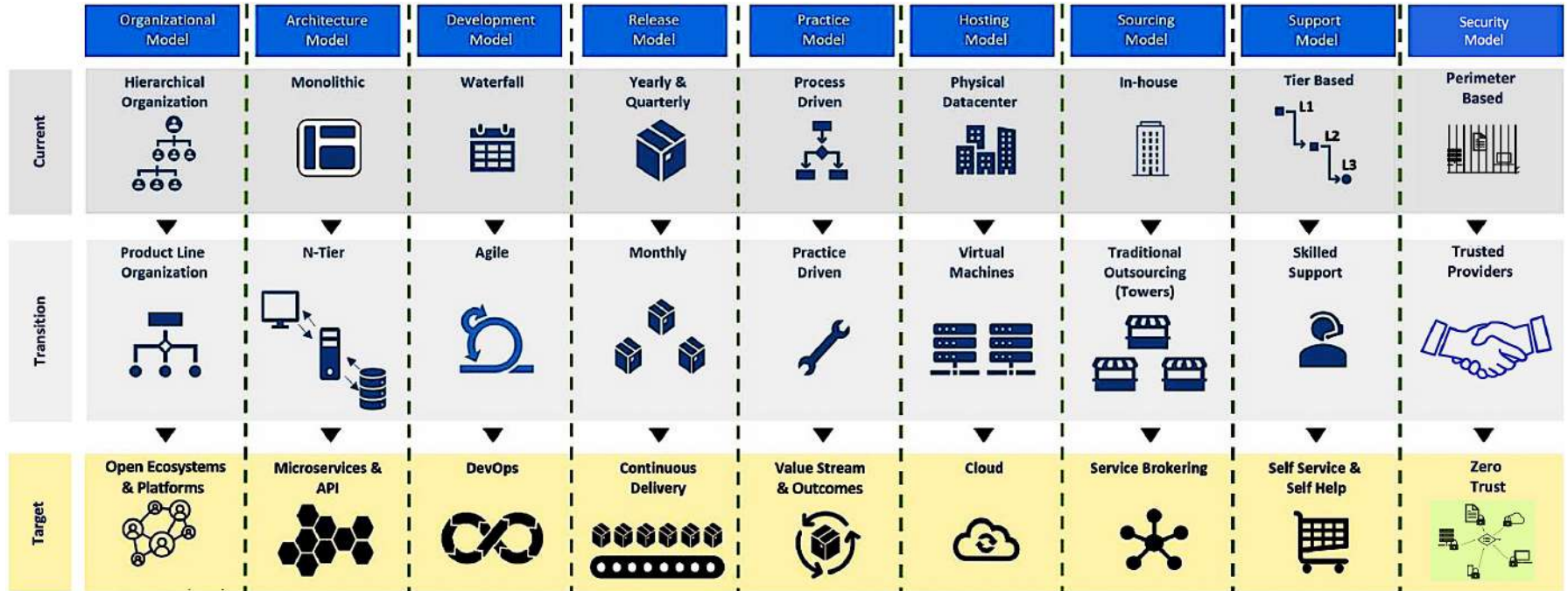# Explaining the Benefits of Architecture in Terms of Change and Impact On Ground

"Students face inequality and gaps in education. However, the School Quality Assessment and Accreditation Framework (SQAAF) will play a role in bridging this gap. The biggest benefit of this framework is the **flexibility it provides the states to tailor the curriculum** to suit their specific needs and demands. It will also allow schools to **adopt their own assessment** based on this framework. This framework will be used to encourage schools to bring **transformational change**. The National Digital Education Architecture (N-DEAR) will play a pivotal role in **eliminating inequality in education** through modernization. Just as UPI has revolutionized our banking sector, in the same way, N-DEAR will act as a **super-connector (integrator) between all academic activities**. Moving from one school to another, securing admission in higher education, allowing for multiple entries and exit options, and maintaining an academic record bank of student skills are the kinds of scenarios that will be digitally enabled by the N-DEAR. These transformational changes will become the face of our new-age education while also **eliminating discrimination in imparting quality education**."

Prime Minister Narendra Modi, 7th September 2021

Vectors of Digital Transformation

	Organizational Model	Architecture Model	Development Model	Release Model	Practice Model	Hosting Model	Sourcing Model	Support Model	Security Model
Current	Hierarchical Organization	Monolithic	Waterfall	Yearly & Quarterly	Process Driven	Physical Datacenter	In-house	Tier Based	Perimeter Based
Transition	Product Line Organization	N-Tier	Agile	Monthly	Practice Driven	Virtual Machines	Traditional Outsourcing (Towers)	Skilled Support	Trusted Providers
Target	Open Ecosystems & Platforms	Microservices & API	DevOps	Continuous Delivery	Value Stream & Outcomes	Cloud	Service Brokering	Self Service & Self Help	Zero Trust

Thank You!!

Reach Me At
p.saha@opengroup.org
psaha@alum.iisc.ac.in