About Dr. Pramod Varma (Chief Architect of Aadhaar/UPI/India Stack and ONDC)

March 2025

Introduction by Kinji Saito

Suzuki Motor Corporation

India: Most Advanced Country in the World

More than 1.35 billion people have Aadhaar Card

- Biometric digital ID system connected with individual bank account.
- Government of India uses this to pay subsidies to millions of people directly to their bank accounts.

Cashless India (Unified Payment Interface)

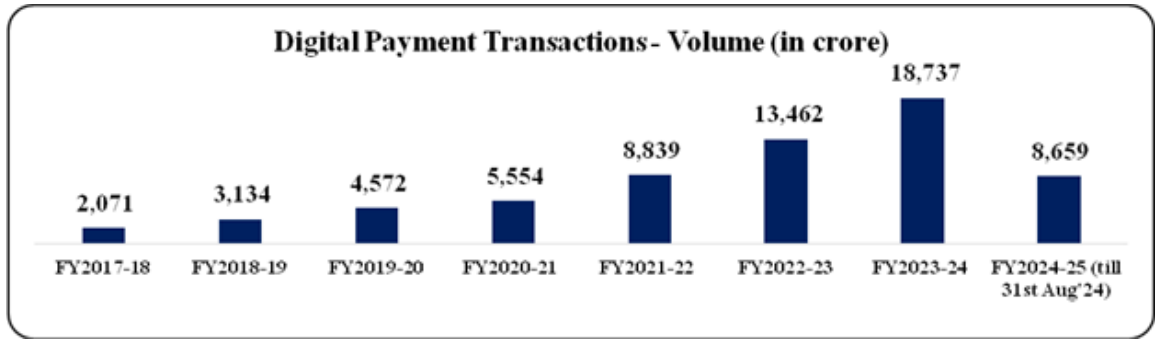
- People use Unified Payment Interface (Like Paypay in Japan but promoted by Government of India)
- They use No Cash and No Credit card. Even vegetable sellers on the street use UPI by smart phones to sell and buy.

Instant Credit Access

- People (even living in rural areas) can borrow money from finance company within 15 minutes, using their bank account information to certify their credit scores.

Huge potential to expand the economy of India !

Numbers that surprises us!



Current population of India Population: Approx 1.4 billion

1 billion smartphone users

Internet subscribers: 0.96 billion (0.4 billion: Rural)

1.35 billion including children has Aadhaar Card (As of Sep 2023)

More than 2200 social benefits are given through Aadhaar under 4 major government subsidies scheme.

500 financial/telecom companies use Aadhaar

Increase in Bank account holders from 150M (2014) →540M (2024).

300M: Female holders, 83% are because of Aadhaar

Numbers for Cashless India!

- Digital payment transactions volume grew to 18,737 crore in FY 2023-24 from 2,071 crore in FY 2017-18 at Compounded Annual Growth Rate (CAGR) of 44%
- UPI transactions volume grew to 13,116 crore in FY 2023-24 from 92 crore in FY 2017-18 at CAGR of 129%
- UPI now seamlessly facilitates live transactions in 7 countries, including key markets such as UAE, Singapore, Bhutan, Nepal, Sri Lanka, France, and Mauritius

About Dr. Pramod Varma

Early Life & Education:

- Born near Trivandrum, Kerala
- He holds a Master's and Ph.D. degree in Computer Science along with a second Master's in Applied Mathematics. He is passionate about technology, science, society, and teaching

Chief Architect of India's Digital Public Infrastructure (DPI):

- eSign: Interoperable digital signature protocol
- Unified Payments Interface (UPI, 2016)
- DigiLocker: Digital credentialing and wallet system

Additional Contributions:

- Designed India's indirect tax (GST) framework
- Co-founder & Creator of Beckn Protocol: An Open-source decentralized transaction network supports initiatives like : ONDC: Open Network for Digital; Commerce; Namma Yatri: Decentralized Mobility and UEI: Unified Energy Initiative

Visionary Initiatives:

- The Finternet vision envisions a universal infrastructure centered on users. It enables the unification and verification of assets and facilitates the participation of billions in the global financial system.User-centered universal infrastructure

Leadership & Advisory Roles:

- Co-chair, Global Center for DPI (CDPI)
- Advisor to multiple global and Indian initiatives

Story of Aadhaar/UPI/India Stack

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In Japan

Why Aadhaar in India?

The foundation of India's digital infrastructure was laid in 2010 with the launch of Aadhaar, a biometric digital ID system (*Aadhaar* means **"Foundation"** in Hindi)

Purpose:

- Promote happiness and economic activity for all citizens
- Establish a comprehensive ID system
- Implement a financial score certification system for every individual

Design Principles:

- User-Friendly: Simple to use for all demographics
- Sustainable: Long-term viability and scalability
- Easy to Maintain: Streamlined operations and updates
- Cost-Effective: Minimal operational expenses

Strategic Importance:

- Acts as the foundation of India's IT infrastructure
- Enables future development of a wide range of administrative and business activities
- Supports the integration and growth of various economic sectors

Impact:

- Facilitates seamless access to government and financial services
- Enhances security and trust in digital transactions
- Drives innovation and efficiency across multiple industries

Initial history in the Government of India

Before Aadhaar

Prior to Aadhaar, patchy record-keeping meant that nearly half the population lacked a nationally accepted ID card.

Only Driver's licenses, voter ID cards, and the like could provide authentication for a patchwork of services

Conceptualization of Aadhaar by GOI

2006: The Ministry of Communications and Information Technology approves a Unique ID (UID) scheme for poor families

2009: The Unique Identification Authority of India (UIDAI) is established and Nandan Nilekani is appointed as the first chairman

2010: The Aadhaar logo and brand name are launched

After 5 years of court battle over constitutionality of Aadhaar its was deemed constitutionally valid by Supreme court of India on **2017**

Volunteer team was Established

In 2009, when Dr Manmohan Singh invited Mr Nandan Nilekani, Founder of Infosys, to do an `identity project`. Mr. Nilekani devised a core team.

Core Team Included:

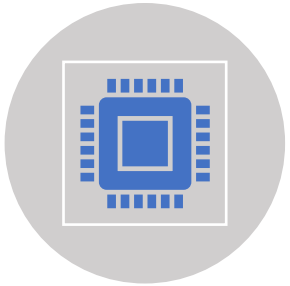
- Mr. Srikanth Nadhamuni, an engineer who had spent a decade and more in the Silicon Valley and ran e-Government Foundation
- Mr. T. Koshy, who ran India's premier securities depository, the NSDL
- Mr. Sriram Raghavan of Comat Technologies, all of whom knew the chalenges of inducting technology to improve the delivery of government services.
- Mr. Ram Sewak Sharma, IAS officer
- Mr. M.S. Srikar, IAS officer
- Ms. Ganga K., liberal arts major and a technology buff
- **Dr. Pramod Varma joined the project as a full-time volunteer in July 2009 leaving a cushioned job in Boston**

(Source: Shankkar Aiyar's book Aadhaar: A Biometric History of India's 12-Digit Revolution, which traces the history of this ambitious project.)

`All I had was one page saying, 'Give every Indian a unique ID.' It didn't say how… Just, 'Do it,`

What is Aadhaar Key: Key Concept

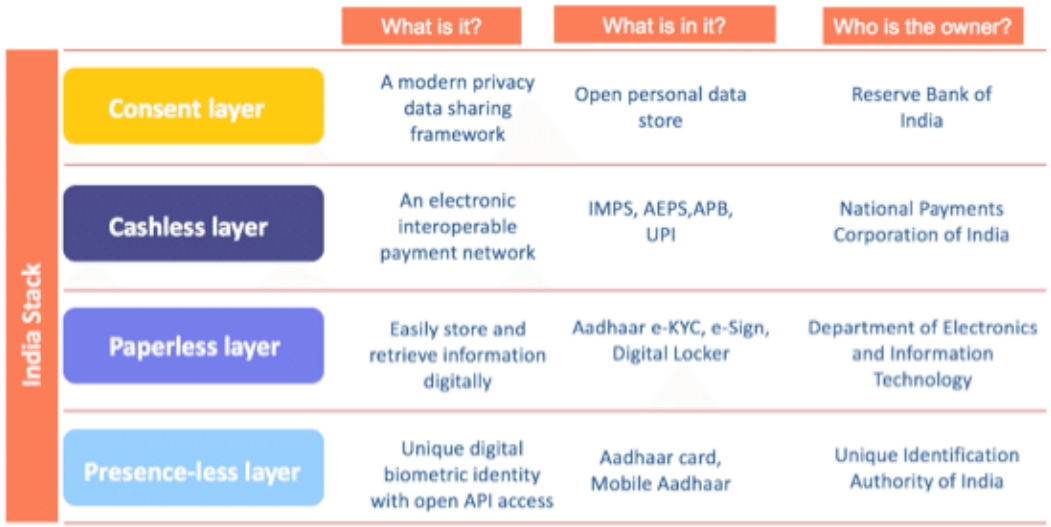
All Indian citizens should receive certified identification cards with biometric verification to ensure secure and accurate identity confirmation.



Leveraging these biometric IDs, robust systems can be developed to facilitate seamless and trustworthy financial activities.

In strict adherence to the Constitution of India, individual privacy will be rigorously protected, ensuring that personal data remains confidential

Even the Government of India will be prohibited from accessing or using these biometric facilities without explicit permission from the individuals.



What is India Stack?

India Stack is the shortform for a set of open Application Programming Interface (API) and digital public goods that aim to unlock the economic primitives of identity, data, and payments at population scale. Although the name of this project bears the word India, the vision of **India Stack** is not limited to one country; it can be applied to any nation. It includes the following:

- Unified Payment Interface (UPI)
- Data empowerment and Protection Architecture (DEPA)
- eSign
- Digital Locker
- Account Aggregator & Sahamati
- Open Network for Digital Commerce (ONGC)
- Digital Public Infrastructure (DPI)

What is UPI?

Unified Payments Interface (UPI) is **an Indian instant payment system** as well as protocol developed by the National Payments Corporation of India (NPCI) in 2016.

UPI stands for Unified Payments Interface, a system that allows users to make payments and transfer money between bank accounts using a mobile app.

Features

- **Real-time reversals**: If a transaction fails, the money is immediately refunded to the payer's account
- **QR code**: Users can scan a QR code displayed on the beneficiary's UPI app
- **Peer-to-peer requests**: Users can schedule and pay collect requests
- **Credit card payments**: Users can make credit card payments using UPI

Other systems

Data Empowerment and Protection Architecture (DEPA):

- Facilitates seamless sharing of financial data across various sectors, enhancing data accessibility and protection.

eSign:

- Promotes paperless transactions by providing online electronic signature services for Aadhaar holders.

Digital Locker:

- Enables secure management of digital documents, reducing reliance on physical storage.

Account Aggregator & **Sahamati**:

- Account Aggregator enables simple and secure data exchange between financial institutions. Sahamati is the technological infrastructure for the Account Aggregator ecosystem, streamlining essential network processes.

Open Network for Digital Commerce (ONDC):

- A network based on open protocols, facilitating commercial transactions across various sectors such as mobility, grocery purchases, and food ordering at the regional level.

Digital Public Infrastructure (DPI):

- Dr. Varma is part of a global team of DPI designers who co-design digital solutions like the ones mentioned above.

Further Development planned

- Dr. Varma co-founded the **Beckn Protocol**, an open-source initiative that enables decentralized, peer-to-peer transaction networks
- **Beckn** underpins India's ONDC (decentralized commerce), Namma Yatri (decentralized mobility), and the new UEI decentralized energy network. Additionally, the protocol is being adopted globally in Europe, Brazil, Africa, the US, and other regions.

ONDC (Open Network for Digital Commerce):Initiative by the Indian government to democratize e-

Open Network Creation:

- Enables buyers to access multiple sellers across various platforms through a single interface.

Comparable to UPI:

- Functions similarly to the Unified Payments Interface (UPI) for digital payments.

Support for Businesses:

- Levels the playing field for all businesses, particularly small and medium enterprises (SMEs).

Consumer Benefits:

- Provides consumers with greater choice and easier access to local sellers.

Finternet Vision

He contributed to the Finternet vision and co-authored the Finternet architecture paper.

This vision imagines a user centric, universal, and unified infrastructure for any real world or digital asset tokenization that will enable billions of people to participate in the global financial system.

Use of this system in other countries…

India’s DPI has been endorsed by multiple countries and international organizations, such as the International Monetary Fund and most recently the G20

Comparison with Japanese My-Number

Equivalent Systems in Japan

- While Aadhaar and PayPay serve different primary functions, Japan has its own systems that parallel some aspects

My Number System

- **Overview:** Similar to Aadhaar, Japan's **My Number** system assigns a unique 12-digit number to residents for social security, taxation, and disaster response purposes.
- **Purpose:** Streamlines administrative processes and ensures accurate delivery of social benefits.
- **Privacy Measures:** Stringent regulations to protect personal information, though it has faced challenges related to data security and privacy concerns.

Mobile Payment Platforms:

- In addition to PayPay, Japan boasts several other mobile payment services like **LINE Pay**, **楽天ペイ (Rakuten Pay)**, and **メルペイ (Merpay)**.
- **Features:** Similar to PayPay, these platforms offer QR code payments, mobile wallets, and various incentives to promote cashless transactions.

Aspect	Aadhaar (India)	PayPay (Japan)
Primary Function	Biometric-based digital identity and authentication system	Mobile payment and digital wallet service
Implementation	Nationwide mandatory identity system for residents	Voluntary adoption for digital transactions
Data Utilization	Stores demographic and biometric data for various services	Handles financial transaction data and user preferences
Government Integration	Strong integration with government services and subsidies	Limited direct government integration
Privacy and Security	Concerns over data privacy and potential misuse	Focus on transaction security, less sensitive data stored
Adoption Drivers	Necessity for accessing subsidized services and banking	Convenience, incentives, and push towards cashless society
Technology Used	Biometric scanners, centralized database	Smartphone apps, QR code technology
Challenges	Plausible privacy issues, data breaches, mandatory enrollment debates	Competition with other payment platforms, user trust
Impact on Society	Streamlined access to services, inclusion of marginalized	Reduction in cash usage, increased convenience