

# Sectorial Report on Digitalisation: India

Market Analysis, Key Policy Initiatives, Growth Drivers, Key Challenges and Standardization

# Introduction

## Digitalisation in 21st Century:

- ✓ Reshaping **economies, societies, and governance** beyond IT adoption.
- ✓ Driving **competitiveness, resilience, and inclusivity** in the global landscape.
- ✓ Powered by **seamless connectivity, data-driven decisions, automation, and new business models**.

## Technologies Driving Digital Transformation:

- ✓ **5G/6G** – Ultra-reliable, low-latency connectivity
- ✓ **IoT/M2M** – Hyper-connected ecosystems
- ✓ **SatCom** – Bridging connectivity gaps
- ✓ **AI** – Intelligent, data-driven innovation.
- ✓ **Blockchain** – Trust and transparency
- ✓ **Quantum** – Next-gen computing & cryptography
- ✓ **Cybersecurity** – Ensuring trust & stability
- ✓ **Semiconductors** – Backbone of digital economy

## Policy Foundation: NDCP 2018

- ✓ **Vision:** Resilient, secure, affordable digital infrastructure.
- ✓ **Missions:**
  - *Connect India* – Broadband for all.
  - *Propel India* – Harness emerging technologies & innovation.
  - *Secure India* – Safeguard sovereignty, privacy, and digital trust.

# Digital India

Govt of India launched "Digital India" Program on 1<sup>st</sup> July 2015 to transform India digitally empowered society and knowledge economy.

## Three core components

1. Development of secure and stable Digital Infrastructure
2. Delivering government services digitally
3. Universal Digital Literacy

## Nine Pillars

1. Broadband Highways
2. Universal Access to Phones
3. Public Internet Access Programme
4. e-Governance - Reforming government through Technology
5. e-Kranti - Electronic delivery of services
6. Information for All
7. Electronics Manufacturing - Target NET ZERO Imports
8. IT for Jobs
9. Early Harvest Programmes

**[Read more about Digital India programme>>](#)**



# BharatNet Project and NBM (2.0)

## BharatNet Project

- ✓ World's largest rural broadband project, executed by Special Purpose Vehicle through Bharat Broadband Network Ltd.
- ✓ **Phase I (2017):** 100K Gram Panchayats (GPs - Cluster of Villages) to be connected via fibre.
- ✓ **Phase II (ongoing):** Expanding to **150K GPs** using fibre, radio, satellite.
- ✓ **Phase III (future-proofing):** Integrating **5G, higher capacity, last-mile connectivity**.
- ✓ **Amended BharatNet Program (2023):**
  - **26.4 Million GPs** in ring topology; Optical Fibre to non-GP villages on demand, Advanced features: **Internet Protocol Multi-Protocol Label Switching (IP-MPLS), Remote Fiber Monitoring System (RFMS), 10-year O&M, power backup.**

## National Broadband Mission (NBM) 2.0:2025–30

- ✓ Builds on **NBM 1.0** (focus: Rights of Way (RoW) issues, 5G rollout, *Call Before u Dig* app).
- ✓ Vision: India as a **global knowledge society** with universal high-speed broadband.
- ✓ Focus areas:
  - **Accelerated digital infrastructure growth.**
  - **Affordable, meaningful broadband** for rural areas.
  - **Narrowing the digital divide** for inclusive empowerment.

# Digital Public Infrastructure (DPI)

***DPI refers to foundational digital systems that are accessible, secure, and interoperable, supporting essential public services.***

## **DPI – India's Achievements**

- **Aadhaar** – World's largest digital ID system; 1.42 billion IDs issued (Apr 2025), enabling authentication & eliminating duplicates
- **Unified Payment Interface (UPI)** – Leading digital payments platform; 460M users, 65M merchants; India handled 49% of global real-time transactions (2023); live in 7+ countries
- **DigiLocker** – Digital issuance & verification; 540M users, 6.75B+ documents; widely used for fintech onboarding
- **UMANG** – One-stop mobile governance platform; access to central, state & local e-Gov services
- **GeM (Govt. e-Marketplace)** – Online procurement platform for govt. departments, PSUs & organizations

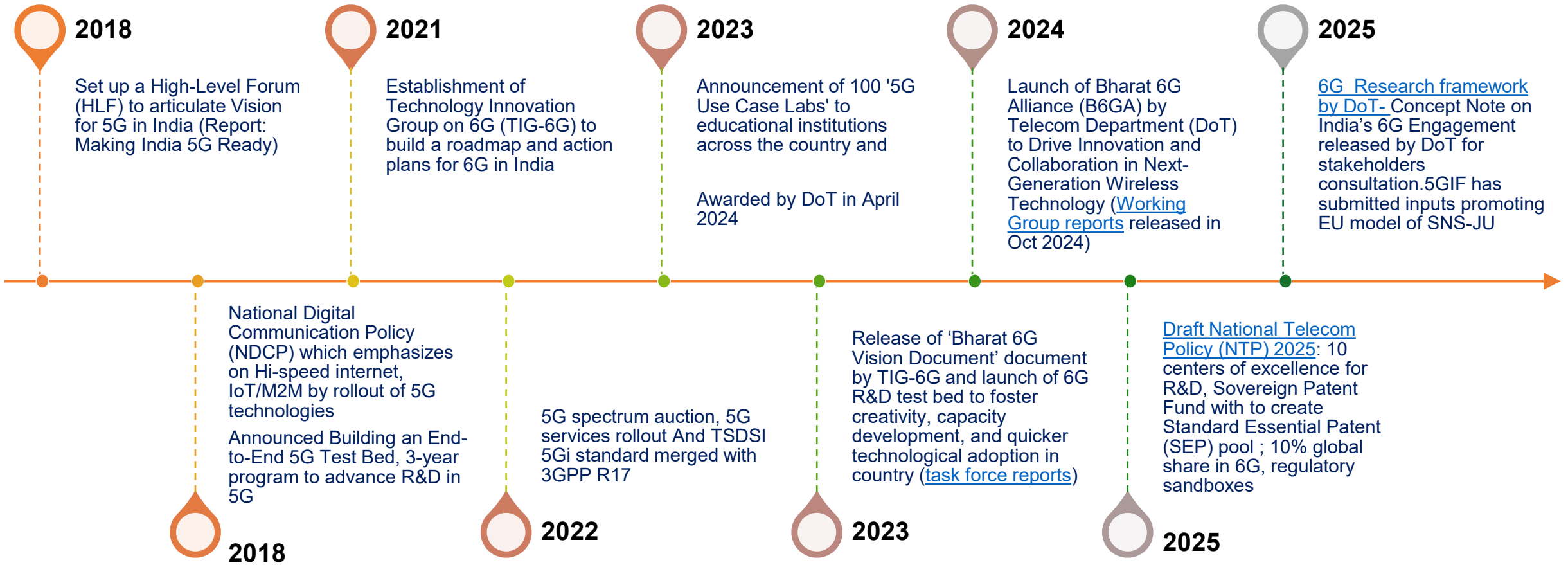
# Digital Technologies in India



# India's Digital tech landscape

|                                          |                                                                                                                                                                                                                                                                                |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>5G/6G</b>                             | 5G launched Oct 2022; coverage in <b>99.8% districts</b> , 4.86 lakh BTSs installed (Jun 2025).<br><b>5G subscriptions: 290M (2024) → 980M (2030)</b> , ~75% of all mobile users.<br>India targets <b>6G leadership by 2030</b> , with <b>10% share of global 6G patents</b> . |
| <b>Semiconductors</b>                    | Domestic market to grow from <b>\$38B (2023) → \$100–110B (2030)</b> .<br>Imports high (\$4.55B in 2022), but <b>first indigenous chip expected by 2025</b> .                                                                                                                  |
| <b>Artificial Intelligence (AI)</b>      | India's AI market: <b>\$28.8B by 2025, CAGR 45%</b> .<br>Ranked <b>#1 globally in AI skill penetration</b> ; 16% of world's AI talent.<br><b>1M AI professionals by 2026</b> , driven by MeitY, NITI Aayog, DST.                                                               |
| <b>IoT/M2M</b>                           | IoT market: <b>\$78.5M (2024) → \$366.7M (2033), CAGR 17.7%</b> .<br>Standards: TEC (oneM2M), TSDSI, BIS; R&D led by <b>C-DOT, C-DAC, IITs</b> .                                                                                                                               |
| <b>Quantum Technologies</b>              | Market: <b>\$1B (2024) → \$7B (2032), CAGR 27%</b> .<br>Focus: <b>computing, communications, cryptography</b> .<br>Led by DST, MeitY, with research from <b>C-DAC, IITs, IISc</b> .                                                                                            |
| <b>Blockchain</b>                        | Market: <b>\$657M (2024) → \$61.5B (2033), CAGR 65.6%</b> .                                                                                                                                                                                                                    |
| <b>Cybersecurity</b>                     | Market: <b>\$5.56B (2025) → \$12.9B (2030), CAGR 18.3%</b> .<br>Anchored by <b>MeitY, CERT-In, NCIIPC</b> ; standards by BIS, TEC.                                                                                                                                             |
| <b>Satellite Communications (SatCom)</b> | Market: <b>\$3.07B (2025) → \$6.81B (2030), CAGR 17.3%</b> .<br>Led by <b>ISRO, IN-SPACe, DoS</b> with private/global players (OneWeb, Jio-SES, Starlink).                                                                                                                     |

# 5G => 6G



# 5G/6G: Growth Drivers and key Challenges

## Growth Drivers:

- **Adoption of Emerging Tech** – IoT/M2M, AR/VR, AI, edge computing for efficiency & better experiences
- **High-Speed Data Demand** – Video streaming, cloud apps, remote work, IoT need ultra-fast connectivity
- **IoT & Industry 4.0** – Enabling automation, real-time data, smart systems across key sectors
- **Government Initiatives** – BharatNet, NBM, infra sharing, street furniture for smoother rollout
- **Innovation & Startups** – New services, business models, and thriving tech ecosystems

## Key Challenges:

- **Infrastructure** – Huge investments in towers, fiber networks; existing infra needs upgrades
- **High Costs** – Spectrum, deployment, and tech upgrades; balancing costs vs. revenues
- **Device Compatibility** – Limited 5G-ready devices; user upgrades add financial burden & slow adoption

# 5G/6G: Standardization

**India's 5G journey takes a unique turn with the development of 5Gi – a homegrown standard aimed at enhancing connectivity in rural and remote areas.**

- ✓ Jointly develop by IIT Madras, IIT Hyderabad, TSDSI, and CEWiT
- ✓ 5Gi/Radio Interface Technology (RIT), leverages Low Mobility Large Cell (LMLC) to extend 5G coverage.

**In December 2021, International Telecommunication Union (ITU) formally approved the 5Gi standard.**

- ✓ Integration with 3GPP Rel-17 NR specifications.
- ✓ Enables seamless interoperability with global 5G standards.

**TSDSI transposes 3GPP specifications to create Indian national standards.**

- ✓ Timely adoption of 3GPP technical specifications as National Standards by TEC.
- ✓ Ensures compliance with ITU-R and national requirements.

**Telecommunication Engineering Centre (TEC) spearheads India's standardization efforts on the ITU 6G Framework.**

- ✓ National Study Group (NSG) led by TEC.
- ✓ Extensive contributions to the development of ITU 6G framework.



# IoT/M2M: Key Policy Initiatives

- **National Telecom M2M Roadmap 2015:**
  - ✓ It seeks to assimilate various M2M standards, outline policy and regulatory approaches and measures for increased M2M proliferation.
- **New license for UL(M2M) and UL-VNO(M2M) under UL and UL-VNO licenses** introduced and accordingly the guideline for UL and UL (VNO) were amended on 17th Jan. '22.
- **Telecom Department (DoT) issued "Guidelines for registration of M2MSP Service Providers and WPAN/WLAN Connectivity Providers" on Feb 8, 2022:**
  - ✓ This will help in addressing concerns like connectivity with TSPs, KYC, traceability and encryption.
- **DoT set up two M2M committees on 16 February 2022**
  - ✓ To discuss, analyse issues and suggest initiatives relating to the M2M ecosystem.
- **Addition of 1MHz spectrum to unlicensed 865-867 MHz band:**
  - ✓ To have additional availability of spectrum for M2M/IoT applications - 1 (one) MHz additional spectrum is added in the earlier unlicensed 865-867 MHz band, making it 865-868 MHz. Also radiated power, channel bandwidth and duty cycle have been defined for different use cases.
- **Released 13-digit numbering plan exclusively for M2M/IoT devices** connected through mobile networks.
- Telecom Engineering Centre (TEC) released [recommendations on IoT/ M2M security](#) in January 2019, [Code of Practice for securing consumer IoT](#) in August 2021, Technical report on [Framework of National Trust Centre for M2M/ IoT Devices and Applications](#) in March 2022 and Technical Report on [Security by design for IoT device manufacturers](#) in March 2023.
  - ✓ TEC code of practice for securing consumer IoT is developed based on **EN 303 645**.
- ✓ In April 2025, TRAI released **"Recommendations on the Issues Related to Critical Services in the M2M Sector and the Transfer of Ownership of M2M SIMs"**.

# IoT/M2M: Growth Drivers and Key Challenges

## Growth Drivers:

- ✓ **Increasing adoption of Smart technologies across industries** such as healthcare, transportation, and manufacturing etc.
- ✓ **Development of Smart cities and Smart homes:** Adoption of M2M/IoT communications enables the integration of various systems, such as lighting, heating, and security, to improve the quality of life for citizens.
- ✓ **Low-cost sensors:** declining cost of connectivity as well as reduced cost and time of processing will play a key role in rise and adoption of IoT.
- ✓ **Increasing usage of big data analytics and cloud computing** enables processing and analysis of unstructured data to move from insights to foresights.
- ✓ **Growing consumer interest** in IoT technologies is also rising due to increased reliance on mobile devices and other connected devices.

## Key Challenges:

- ✓ **Robust connectivity:** very important for timely transmission of the data. Latency, availability, coverage and cost are some of the factors deciding the appropriate communication technology.
- ✓ **Security and Privacy:** security challenges include various aspects of IoT such as authentication, confidentiality, privacy, access control etc.
- ✓ **Lack of standardization:** Interoperability, security, data sharing, changing vendors etc.
- ✓ **Technologies** for sustainability/ long life batteries are required for sensors.

# IoT/M2M: Standardization

## Bureau of Indian Standards (BIS):

**BIS LITD 27 on IoT and digital twin** is developing standards in the field of IoT and Digital Twin related technologies including sensor networks. It is a mirror committee of ISO/IEC/JTC1 TC 41 / SC 41 - Internet of Things and related technologies. TC has adopted following standards:

- ✓ **IS/ISO/IEC/TR 22417 : 2017**: Information Technology Internet of Things ( IOT ) Use Cases
- ✓ Series of **IS/ISO/IEC 30118 standards (Part 2 to Part 18)** on Information technology Open Connectivity Foundation OCF Specification

## TEC and TSDSI:

TEC has adopted TSDSI transposed [Release 2 and Release 3](#) oneM2M specifications as national standards.

- ✓ These specifications address the need for common M2M service layer that can be readily embedded within various hardware and software, relied upon to connect the myriad of devices in the field with M2M application servers worldwide.
- ✓ These transposed documents cover M2M functional architecture, requirements, service layer control protocols, Management enablement etc. oneM2M provides a fast-track and future proof IoT based smart city.
- ✓ Few of these TEC standards have also been included by BIS in its standards on IoT Reference Architecture released in June 2021.

# SatCom: Key Policy Initiatives

- **Satellite Communication Reforms (2022):**

- Simplified regulatory procedures.
- Reduced financial charges on licensees.
- Enabled wider participation of private/non-government entities in satellite services.

- **DoT Guidelines (Oct 2022):**

- Framework for establishing satellite-based communication networks.
- Licensing regime & approval process streamlined.
- Divided into two parts: licensing and approval procedures.

- **TRAI Recommendations (May 2025):**

- Proposed **administrative allocation** of spectrum.
- Suggested **4% AGR fee** for five years.
- Aligned with **ITU international standards** (favoring assignment over auctions).

# SatCom: Growth drivers and key challenges

- **Growth Drivers**

- Govt. support through reforms & streamlined regulations
- Rising private sector investment (domestic & global)
- Growing demand for high-speed internet in remote areas

- **Key Challenges**

- High initial costs (though declining with tech & competition)
- Need for clearer regulatory & policy framework
- Limited spectrum availability

# SatCom: Standardization

In India, standardization activities for Satcom are driven by a mix of government agencies, standards bodies, and industry associations, ensuring interoperability, safety, and alignment with global best practices.

- **Bureau of Indian Standards (BIS):**

- BIS technical committee LITD7: Audio, Video And Multimedia Systems And Equipment has developed many standards for Satellite Receiver.

- **Telecommunication Engineering Centre (TEC):**

- TEC has mandated the testing and certification of satcom equipment, including gateways and user terminals.

- **Telecommunication Standards Development Society, India (TSDSI):**

- TSDSI works on incorporating satellite communication standards into the Indian telecom ecosystem, ensuring compatibility with 3GPP specifications and enabling integration with terrestrial networks such as 5G and beyond.

- **Indian Space Research Organisation (ISRO):**

- While ISRO focuses on R&D and deployment, it also contributes to standardization through mission-specific specifications and by participating in international forums like the ITU.

# AI: key policy initiatives

## 2017: Task Force on Artificial Intelligence (AI):

On 24<sup>th</sup> August 2017, Ministry of Commerce and Industry had constituted a [Task Force on Artificial Intelligence \(AI\)](#) for India's Economic Transformation.

- ✓ In its report on 19<sup>th</sup> January 2018, recommended setting up an Inter-Ministerial National Artificial Intelligence Mission to act as a nodal agency for coordinating AI related activities in India. The recommendations of the Task Force were shared with various Ministries and Departments of the Government of India.

## 2018: National Strategy for Artificial Intelligence (AI):

- ✓ Released by Govt. think tank - NITI Aayog in June 2018 with an aim to guide research and development. Identified five sectors — healthcare, agriculture, education, smart cities and infrastructure and transportation — to focus its efforts on implementation of AI.
- ✓ As a follow up to its National Strategy for AI, NITI Aayog also published various discussion papers on Responsible Artificial Intelligence (RAI)

**Ministry of Electronics and Information Technology (MEITY) had created four committees to create a policy framework and to develop the ecosystem for Artificial Intelligence:**

- ✓ Committees released [four reports](#) covering all the aspects of AI.

## 2024: India AI Mission: National Program on Artificial Intelligence

- ✓ In March 2024, Government of India approved an allocation of over Rs 10,300 crore (approx. €1.03 billion) for the IndiaAI Program, marking a significant step towards bolstering India's AI ecosystem.
- ✓ Program aims to build a comprehensive ecosystem that fosters AI innovation by democratizing computing access, enhancing data quality, developing indigenous AI capabilities, attracting top AI talent, enabling industry collaboration, providing startup risk capital, ensuring socially impactful AI projects, and promoting ethical AI.
- ✓ Mission drives responsible and inclusive growth of India's AI ecosystem through seven pillars: **IndiaAI Innovation Centre, IndiaAI Application Development Initiative, AIKosh Platform, IndiaAI Compute Capacity, IndiaAI Startup Financing, IndiaAI FutureSkills, Safe & Trusted AI**



# AI: Growth Drivers and key Challenges

## Growth Drivers:

- **Rising Enterprise Adoption** – 80% of Indian firms see AI as a core priority; 69% plan higher tech spends in 2025 (1/3 investing >USD 25M)
- **Abundant Data** – Expanding digital ecosystem generates diverse datasets, strengthening AI model development
- **Growing AI Talent** – Demand for AI professionals projected to reach 1M by 2026
- **AI Startup Ecosystem** – 7,000+ startups, \$23B funding; innovation in healthcare, agri, fintech, education
- **Government Support** – Initiatives such as **National AI Strategy** promoting adoption, research & responsible AI

## Key Challenges:

- ✓ **Data quality:** impacts the performance, accuracy, and reliability of AI models.
- ✓ **Data security and privacy:** AI brings a range of security and privacy vulnerabilities, which can subsequently exacerbate any organizations exposure to cyber risk and geopolitical risk.
- ✓ **Limited AI expertise:** India need to focus on AI expertise in coming years.
- ✓ **Insufficient AI and cloud computing infrastructure:** AIRAWAT is a starting step
- ✓ **Lack of integrity and ethics with AI/ML solutions:**
  - With the advent of AI products and algorithms and their increasing role in decision making, ethics and morality have emerged as a major challenge for the AI solution providers.

# AI: Standardization

## **Bureau of Indian Standards (BIS) LITD TC 30: Artificial Intelligence Sectional Committee:**

- ✓ Responsible for AI and Big Data standardization and National Mirror Committee for ISO/IEC JTC1/SC42.
- ✓ Adopted following Standards:
  - IS/ISO/IEC/TR 24028: 2020: Information technology AI Overview of trustworthiness in artificial intelligence.
  - IS/ISO/IEC/TR 24029-1: 2021: AI Assessment of the robustness of neural networks Part 1: Overview
  - IS/ISO/IEC/TR 24030: 2021: AI Use cases.
  - IS/ISO/IEC/TR 24368: 2022: AI Overview of Ethical and Societal Concerns
  - IS/ISO/IEC/TR 24372: 2021: AI Overview of computational approaches for AI systems
  - IS/ISO/IEC 24668: 2022: AI Process management framework for big data analytics
  - IS/ISO/IEC 38507: 2022: Information technology Governance of IT Governance implications of the use of artificial intelligence by organizations.

## **Telecommunication Engineering Centre (TEC), Department of Telecom (DoT), Ministry of Communications:**

- ✓ DoT formed a committee for "Standardisation in AI technologies".
  - Committee released its [Indian AI Stack discussion paper](#) on September 2, 2020, with the intention of mitigating impediments in AI deployment and essentially make AI uniform for application across sectors.
  - The AI Stack paper highlighted five major horizontal pillars and one main vertical pillar covering some of the most crucial aspects in AI deployment including security, data storage, privacy, customer experience and computing.
- ✓ In July 2023, Telecommunication Engineering Centre (TEC), DoT has unveiled a [Standard \(No. TEC 57050:2023\) for "Fairness Assessment and Rating of Artificial Intelligence Systems"](#).
  - This Standard enumerates detailed procedures for accessing and rating artificial intelligence systems for fairness.

# Quantum Technologies: Key Policy Initiatives

## National Quantum Mission (NQM) 2023:

- ✓ At a total cost of Rs.6003.65 crore (approx. €680 Million) from 2023-24 to 2030-31 approved by Govt. of India, aiming to seed, nurture and scale up scientific and industrial R&D and create a vibrant & innovative ecosystem in Quantum Technology (QT).
- ✓ Four Thematic Hubs (T-Hubs) will be set up in top academic and National R&D institutes on the domains – Quantum Computing, Quantum Communication, Quantum Sensing & Metrology and Quantum Materials & Devices.

## **National Supercomputing Mission (NSM) 2015:**

- ✓ It envisages empowering the academic and R&D institutions spread over the country by installing high-performance computing facilities.
- ✓ **Application areas:** Climate Modelling, Weather Prediction, Disaster Simulations and Management, Big Data Analytics, Computational Chemistry, Computational Material Science and Nanomaterials, Large Complex Systems Simulations and Cyber Physical Systems, Information repositories/ Government Information Systems, among others.
- ✓ As of March 2025, a total of 34 supercomputers with a combined compute capacity of 35 Petaflops have been deployed

## **Quantum-Enabled Science & Technology (QuEST) program:**

- ✓ In 2018, Department of Science & Technology set up QuEST program to develop quantum technology
- ✓ India established a national quantum hub — the [I-HUB Quantum Foundation or I-HUB QTF](#) in Pune in 2020 under [National Mission on Interdisciplinary Cyber-Physical Systems \(NM-ICPS\)](#) dedicated to the development of QT.

## Quantum Computing Applications Lab (QCAL):

- ✓ Launched by [MeitY](#) in collaboration with AWS with aims to accelerate the adoption of quantum computing by providing access to quantum computers, tools, and resources to researchers and developers.

## QSim- Quantum Computer Simulator Toolkit:

- ✓ Launched by MEITY to allow researchers and students to write and debug Quantum Code for developing Quantum Algorithms

## **Centre of Excellence (CoE) in Quantum Technology**

- ✓ MEITY has established a Centre of Excellence (CoE) in Quantum Technology and has also deployed the Metro Area Quantum Access Network (MAQAN) in Chennai, establishing a secure quantum communication testbed.

# Quantum Technologies: Growth Drivers and Key Challenges

## Growth Drivers:

- ✓ **Increasing adoption quantum technology in various sectors:** Manufacturing, high tech, banking, and defense sectors are driving the adoption of quantum technologies for critical and large-scale use cases.
- ✓ **Favorable Government policies and support:** Policy initiatives such as National Quantum Mission will help to create a vibrant & innovative ecosystem in Quantum Technology (QT).
- ✓ **Awareness and Education:** Academic & industry programs building skilled workforce.
- ✓ **Global Collaboration** – Partnerships under EU–India TTC & others accelerating R&D, funding & knowledge sharing

## Key Challenges:

- ✓ **Research and Development:** High need for funding, expertise & advanced infrastructure
- ✓ **Skilled Workforce Gap** – Shortage of trained quantum scientists, engineers & researchers
- ✓ **Insufficient Infrastructure and Resources:** Establishing and maintaining required infrastructure for quantum technology is a challenge, as it requires substantial investments and ongoing upgrades to keep pace with advancements in the field.
- ✓ **Lack of Standardization and Interoperability** among different quantum systems and ensuring compatibility across platforms
- ✓ **Ethical and Societal Implications:** Concerns around data privacy, cybersecurity & societal disruption

# Quantum Technologies: Standardization

## Bureau of Indian Standards (BIS):

- ✓ Recently BIS established a new technical committee **LITD-38 on Quantum Technologies and Applications** which is responsible for Standardization in the field of quantum technologies, including quantum information technologies (quantum computing and quantum simulation), quantum metrology, quantum sources, quantum detectors, quantum communications, and fundamental quantum technologies.
- ✓ This technical committee is a national mirror committee of ISO/IEC JTC3 - Quantum technologies.

Telecom Engineering Centre (TEC), DoT has released following standards in the field of quantum technologies.

- ✓ **TEC 91020:2024: Quantum Random Number Generator**
  - ✓ This document describes the generic requirements and specifications for Quantum Random Number Generator.
- ✓ **TEC 91010:2023: Standard for Generic Requirements- Quantum-Safe and Classical Cryptographic Systems:**
  - The standards for Post Quantum Cryptography system provide the specifications for a cryptographic mechanism to ensure secured communication against vulnerabilities posed with the advent of Quantum computing.
- ✓ **TEC 91000:2022: Standard for Generic Requirements- Quantum Key Distribution System:**
  - This document describes the generic requirements and specifications for Quantum Key Distribution (QKD) systems as per, ITU-T Y.3801-3804 Recommendations for use in Indian telecom network.

# Blockchain: Key Policy Initiatives

## National Strategy on Blockchain:

- ✓ Ministry of Electronics and Information Technology (MEITY) released **National Strategy on Blockchain** in December 2021.
- ✓ **Vision:** create trusted digital platforms through shared Blockchain infrastructure; promote R&D, innovation, technology and application development; and facilitate state of the art, transparent, secure and trusted digital service delivery to citizens and businesses.
- ✓ Strategy lays out overall vision towards development and implementation strategies for a National Blockchain Platform covering the technology stack, legal and regulatory framework, standards development, collaboration, human resource development and potential use cases.
- ✓ It provides necessary guidance and support for realizing the vision and creating a nationwide ecosystem for creating the National Blockchain Platform and development of relevant applications using this platform in various domains.

## Discussion Paper on Blockchain: The India Strategy

- ✓ Released by Indian Think Tank - NITI Aayog, recognizes many crucial areas blockchain technology can significantly benefit the country
- ✓ It covers the basics of distributed technology, its potential framework for India, the implementation challenges, lessons from NITI Aayog's own PoCs, its use cases, and recommendations.

## Centre of Excellence for Blockchain Technology

- It operates as a coordinated, interoperable blockchain ecosystem across the country.
- It is a gateway to test and develop best solutions for projects undertaken by National Informatics Centre (NIC) at Centre and State levels.



# Blockchain: Growth Drivers and key challenges

## Growth Drivers:

- ✓ **Digital Transformation Initiatives:** Businesses are increasingly focusing on digital transformation initiatives. Blockchain, with its ability to provide secure and transparent digital transactions, aligns well with these efforts.
- ✓ **Government Support and Initiatives** such as the National Strategy on Blockchain aim to leverage blockchain for various sectors, including governance, finance, and supply chain.
- ✓ **Rising no. of Blockchain Startups and Innovation** are driving experimentation and adoption across various industries.
- ✓ **Enterprise Adoption** – BFSI, logistics & manufacturing using blockchain for fraud prevention, trade finance & supply chain transparency

## Key Challenge:

- ✓ **Regulatory Gaps** – Lack of clear compliance frameworks; unresolved issues on smart contracts, cross-border data & legal recognition
- ✓ **Low Awareness** – Limited understanding among businesses, policymakers & consumers slows adoption
- ✓ **Security & Privacy Concerns** – Uncertainty around how blockchain ensures data privacy reduces trust and adoption
- ✓ **Talent Shortage** – Limited availability of skilled blockchain professionals; need for training & development programs

# Blockchain: Standardization

## Bureau of Indian Standards (BIS):

- BIS Technical committee (TC) "[LITD 29: Blockchain and Distributed Ledger Technologies](#)" is responsible for developing standards for Blockchain and Distributed Ledger Technologies.
- It is a National Mirror committee for ISO TC ISO TC 307 - Blockchain and Distributed Ledger Technologies Sectional Committee.
- Following Standards are Published by this TC:
  - ✓ **IS/ISO/TS 23635 : 2022:** Blockchain and distributed ledger technologies Guidelines for governance
  - ✓ **IS/ISO/TR 3242 : 2022:** Blockchain and distributed ledger technologies- Use cases
  - ✓ **IS/ISO 23257 : 2022:** Blockchain and distributed ledger technologies Reference Architecture
  - ✓ **IS/ISO/TS 23258 : 2021:** Blockchain and distributed ledger technologies Taxonomy and Ontology

# Electronic/Digital Signature: Key Policy Initiatives

Electronic/Digital signatures are regulated by **IT Act, 2000** in India and following rules made under this Act:

- ✓ [Information Technology \(Certifying Authorities\) Rules, 2000](#);
- ✓ [Digital Signature \(End Entity\) Rules, 2015](#); and
- ✓ [Information Technology \(Use of Electronic Records and Digital Signature\) Rules, 2004](#).

**IT Act** also distinguishes between **electronic signatures** and **certificate-based digital signatures**, but both have same status as handwritten signatures under Indian law.

- ✓ Digital signatures are preferred for certain government transactions such as e-filing with the Ministry of Corporate Affairs, and goods and service tax filings.
- ✓ Valid electronic signatures must include an electronic authentication technique or procedure specified in the Second Schedule of the IT Act.

For an electronic signature to be considered reliable and presumptively valid under the IT Act:

- ✓ Signer certificates must be issued by a **certifying authority (CA)** recognized by **Controller of Certifying Authorities** appointed under the IT Act. A list of licensed CAs is available at [http://www.cca.gov.in/licensed\\_ca.html](http://www.cca.gov.in/licensed_ca.html).

# Electronic/Digital Signature: Growth Drivers and Key Challenges

## Growth Drivers:

- ✓ **Paperless Transactions** – Rising shift from paper-based to digital processes
- ✓ **Consumer Awareness** – Growing adoption due to trust in secure e-signatures
- ✓ **Cost & Time Efficiency** – Cuts printing, mailing, courier & storage costs
- ✓ **Cross-Border Recognition** – Trade agreements to boost e-governance and cross-border trade
  - More recently, India and the EU agreed to work towards advancing mutual recognition of e-signatures to enhance cross-border transactions and economic growth.

## Key Challenges:

- ✓ **Low Awareness & Digital Literacy** – Many SMEs & citizens lack understanding of digital signatures and certificates
- ✓ **Security & Privacy Concerns** – Risks of unauthorized access, data breaches, forgery & identity theft; need stronger encryption & safeguards

# Electronic/Digital Signature: Standardization

## Bureau of Indian Standards (BIS):

- ✓ **BIS SSD10: IT & IT enabled Services** is responsible for Standardization in the field of Services, Processes, Supporting Frameworks, Management and Governance for the provisioning of IT and IT Enabled Services in areas such as (but not limited to), contract management, performance management, procurement management, customer satisfaction, contact center, covering existing and emerging digital and automation technologies.
- ✓ This technical committee through its panel 4 on digital signature is in the process of adopting the complete library of ETSI standards on digital signature and has adopted the following ETSI standards as national standards:
  - **IS 18595:2024/ ETSI TS 119 101** - Electronic Signatures and Infrastructures (ESI) Policy and Security Requirements for Applications for Signature Creation and Signature Validation
  - **IS 19155:2025/ ETSI EN 319 401** - Electronic Signatures and Infrastructures (ESI) General Policy Requirements for Trust Services Providers
  - **IS 19156:2025/ ETSI TS 119 312** - Electronic Signature and Infrastructure (ESI) Cryptographic Suites

# e-Accessibility: Key Policy Initiatives

## National Policy for Persons with Disabilities, 2006

- ✓ It outlines specific measures and strategies for ensuring protection of rights of PwDs and their inclusion in the society

## MEITY Guidelines for Indian Government Websites, 2009

- ✓ Guidelines ensure that government websites are accessible to people with disabilities.
- ✓ These Guidelines are based on International Standards including ISO 23026, W3C's Web Content Accessibility Guidelines (WCAG 2.0), Rights of Persons with Disabilities Act 2016 as well as IT Act of India.

## Accessible India Campaign (Sugamya Bharat Abhiyan):

- ✓ Department of Empowerment of Persons with Disabilities (DEPwD) launched Accessible India Campaign (Sugamya Bharat Abhiyan) as a nation-wide Campaign for achieving universal accessibility for Persons with Disabilities (PwDs) on December 3, 2015.
- ✓ It has three important verticals, namely - the Build Environment, the transportation sector and the ICT ecosystem.

## Rights of Persons with Disabilities (RPwD) Act, 2016

- ✓ RPwD Act mandates equal rights and opportunities for PwDs and requires government to take measures to promote accessibility.
- ✓ It covers various aspects, including physical infrastructure, transportation, and ICT.

# e-Accessibility: Growth Drivers and Key Challenges

## Growth Drivers:

- ✓ **Digital Economy Expansion** – 26M+ PwDs in India; accessibility opens new markets & user base
- ✓ **Government Push** – Digital India & related policies promoting inclusive digital access
- ✓ **Global Standards Influence** – WCAG, ISO 30071-1, EU Accessibility Act shaping domestic policies & practices
- ✓ **Advocacy & Awareness** – Disability rights groups driving policy, visibility & inclusion efforts
- ✓ **Tech & Assistive Innovation** – Startups/localized solutions enabling accessible platforms in Indian languages & contexts

## Key Challenges:

- ✓ **Non-Compliant Platforms** – Many websites & apps not aligned with WCAG 2.1; poor navigation, alt-text, labeling & contrast
- ✓ **Limited Assistive Tech** – Tools like screen readers & Braille displays scarce, costly, and not localized for Indian languages
- ✓ **Low Developer Awareness** – Lack of training on accessibility standards; inclusive design seen as optional or costly
- ✓ **Economic & Social Barriers** – High cost of devices/internet, unemployment & stigma limit adoption among PwDs
- ✓ **Low Digital Literacy** – Many PwDs, especially in rural areas, lack training to use digital tools & assistive tech

# e-Accessibility: Standardization

## Bureau of Indian Standards (BIS):

**BIS LITD-35: Active Assisted Living (AAL):** is responsible for standardization in the area of accessibility, interoperability of AAL systems, services, products and components; and standardization of system level aspects of AAL such as safety, security and privacy.

- ✓ IS 17802 (Part 1): 2021: Accessibility for the ICT Products and Services Part 1: Requirements
- ✓ IS 17802 (Part 2): 2022: Accessibility for the ICT Products and Services Part 2: Determination of Conformance
  - The IS 17802 (part 1 and 2) is based on the European Standard EN 301 549 v 3.2.1.
- ✓ IS 1885 (Part 89): 2023/IEC 60050-871: 2021: Electrotechnical vocabulary Part 871: Active assisted living AAL
- ✓ IS/IEC/TS 63134: 2020: Active assisted living AAL use cases.

## Ministry of Social Justice and Empowerment:

In May 2023, **Department of Empowerment of Persons with Disabilities (Divyangjan)**, under the Ministry of Social Justice and Empowerment [mandated](#) the implementation of IS 17802 (Part 1 & Part 2) for Public Procurement.

# Semiconductor: Key Policy Initiatives

## India Semiconductor Mission (ISM) 2021:

- With an outlay of INR 76,000 crore (approx. €7.6 billion), the programme aims to build a strong semiconductor and display ecosystem, positioning India as a global hub for electronics manufacturing and design, while serving as the nodal agency for the efficient and seamless implementation of semiconductor and display schemes.

## **Objectives of ISM:**

- **Strategy:** Formulate a long-term strategy for developing sustainable semiconductors and display manufacturing facilities and semiconductor design eco-system in India.
- **Supply Chain:** Facilitate the adoption of secure microelectronics and developing trusted semiconductor supply chain, including raw materials, specialty chemicals, gases, and manufacturing equipment.
- **Design & Startups:** Enable a multi-fold growth of Indian semiconductor design industry by providing requisite support in the form of Electronic Design Automation (EDA) tools, foundry services and other suitable mechanisms for early-stage start-ups.
- **Intellectual Property:** Promote and facilitate indigenous IP generation.
- **Partnership:** Enabling collaborations and partnership programs with national and international agencies, industries and institutions for catalysing collaborative research, commercialization and skill development.

**India Semiconductor Mission operates under the guidance of Ministry of Electronics and Information Technology (MeitY) and other relevant government bodies.**



# Continue...

## Schemes under ISM:

### Semiconductor Fabs Scheme:

- Provides up to 50% fiscal support for setting up semiconductor wafer fabrication (fab) units in India
- Targets advanced nodes such as 28nm or below, as well as mature technologies
- Goal is to establish high-tech, large-scale fabs that serve both domestic and global demand

### Display Fabs Scheme:

- Offers financial assistance of up to 50% of project cost to set up display fabrication units in India
- Covers technologies such as AMOLED and LCD displays, aiming to reduce import dependence and promote domestic innovation in next-gen display manufacturing

### Compound Semiconductors and ATMP/OSAT Scheme:

- Supports setting up units for compound semiconductors, silicon photonics, MEMS/sensors, and discrete semiconductors
- It also includes ATMP/OSAT facilities (chip packaging and testing), with up to 50% capital support, to complete the downstream value chain.

### Design Linked Incentive (DLI) Scheme:

- With a total outlay of Rs. 1000 Crore (approx. €100 million), promotes semiconductor design startups and MSMEs by offering financial support across product development stages.
- Scheme includes reimbursement of R&D costs, access to state-of-the-art design tools.
- Incentives up to ₹15 crore (approx. €1.5 million) per company to encourage innovation in chip design.



# Semiconductor: Growth Drivers and key Challenges

## Growth Drivers:

- ✓ **Government Support** – ISM, PLI/DLI schemes, and state incentives driving fabs, ATMP, OSAT, and design startups.
- ✓ **Large Investments** – Tata, Micron, Foxconn, HCL, etc., with 10 approved projects worth ₹1.6 lakh crore (~€16B) across key states.
- ✓ **Rising Domestic Demand** – Growth in smartphones, EVs, 5G, AI, and the digital economy boosting chip consumption.
- ✓ **Global Partnerships** – Collaborations with Lam Research, NXP, Renesas, Foxconn, plus EU-India TTC enabling tech transfer & resilient supply chains.
- ✓ **Skilled Workforce & R&D** – Strong STEM base, IITs/IISc, and design startups under DLI scheme fostering innovation.

## Key Challenges:

- ✓ **High Fab Cost** – Multi-billion investment, long gestation, production and quality risks.
- ✓ **Infrastructure Gaps** – Power, water, and logistics still underdeveloped.
- ✓ **Bureaucratic Delays** – Multiple approvals and complex procedures slow projects.
- ✓ **Talent Shortage** – Strong design base, but limited fabrication and packaging skills.
- ✓ **Import Dependence** – Reliant on wafers, gases, chemicals, and ultrapure water.
- ✓ **Global Competition** – Competing with established hubs (Taiwan, South Korea, Singapore, Malaysia, China).

# Semiconductor : Standardization

BIS LITD 5 : Semiconductor And Other Electronic Components And Devices is responsible for developing Indian standards relating to: a) Semiconductor devices & integrated circuits. b) Capacitors, resistors, allied component c) Discrete semiconductor devices & micro-electromechanical systems d) Electronic assembly technologies and printed board assemblies. e) Capacitors resistors and inductors for use in electronics equipment.

- It is mirror technical committee of IEC TC 40 (P), **IEC TC 47 (O)**, TC 47/SC 47A (O), IEC TC 91 (P)

|                                                |                                                                                                                                                  |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| IS 12970 (Part 1) : 2010                       | Semiconductor devices integrated circuits: Part 1 general                                                                                        |
| IS 12970 (Part 2) : 2021<br>IEC 60748-2: 1997  | Semiconductor devices - Integrated circuits : Part 2 Digital integrated circuits essential ratings and characteristics Sec 1 General             |
| IS 12970 (Part 3) : 2021<br>IEC 60748-3: 1994  | Semiconductor devices Integrated circuits Part 3 Analogue integrated circuit                                                                     |
| IS 14901 (Part 1) : 2010<br>IEC 60747-1: 2006  | Semiconductor devices - Discrete devices and integrated circuits: Part 1 general (First Revision)                                                |
| IS 14901 (Part 2) : 2020<br>IEC 60747-2: 2016  | Semiconductor Devices Part 2 Discrete Devices — Rectifier Diodes ( First Revision )                                                              |
| IS 14901 (Part 3) : 2016<br>IEC 60747-3 : 2013 | Semiconductor Devices Discrete Devices Part 3 Signal, Switching and Regulator Diodes                                                             |
| IS 14901 (Part 5) : 2004<br>IEC 60747-5        | Semiconductor devices - Discrete devices and integrated circuits: Part 5 optoelectronic devices                                                  |
| IS 14901 (Part 7) : 2020<br>IEC 60747-7 : 2010 | Semiconductor Devices — Discrete Devices Part 7 Bipolar Transistors ( First Revision )                                                           |
| IS 14901 (Part 8) : 2020<br>IEC 60747-8 : 2010 | Semiconductor Devices — Discrete Devices Part 8 Field-Effect Transistors ( Second Revision )                                                     |
| IS 5001 : 2018<br>IEC 60191-1 : 2007           | Mechanical standardization of semiconductor devices - General rules for the preparation of outline drawings of discrete devices (First Revision) |
| IS 5001 (Part 1) : 1969<br>Reviewed In : 2021  | Guide for Preparation of Drawings of Semiconductor Devices                                                                                       |

# Smart City/Urbanization: Key Policy Initiatives

## Smart City Mission:

- ✓ Indian Government introduced "[Smart Cities Mission](#)" initiative on 25th June 2015 to develop 100 smart cities and drive economic progress and boost the quality of life by fueling local development and harnessing technology to create smart outcome for the citizens.
- ✓ As of July 2025, a total of 7,549 projects—93.58% of the total 8,067 projects—have been completed, amounting to INR 1,51,258 crore (approx. €15.12 billion). Additionally, 518 projects worth INR 13,142 crore (approx. €1.31 billion) are in the advanced stages of implementation. This amounts to overall 8,067 multi-sectoral projects valued at ₹1.64 lakh crore (approx. €16.4 billion).

## [National Urban Digital Mission:](#)

- ✓ Launched by MoHUA and MEITY, to establish a digital infrastructure & formalize a citizen-centric and ecosystem-driven approach to urban governance and service delivery in cities.

## Open Data Platform/India Urban Data Exchange (IUDX):

- ✓ [IUDX initiative](#) is a collaboration between Smart Cities Mission and Indian Institute of Science (IISc), Bengaluru to facilitate secure and authenticated exchange of data amongst various data platforms, 3rd party applications, data producers and consumers, both within a city to begin with, and scaled up across cities eventually at a national level, in a uniform & seamless way.
- ✓ First software platform to fully adhere to the Architecture and API Specifications set by Bureau of Indian Standards (BIS) for data exchange platforms.

## CCSP (C-DOT Common Service Platform):

- ✓ Developed by Centre for Development of Telematics (C-DOT), the oneM2M standards compliant [common service platform](#) can be deployed on any off-the-shelf generic server platforms or cloud infrastructure.

***Ministry of Housing and Urban Affairs (MoHUA), Government of India has also initiated several other programmes to support the Smart City Mission and Urbanization in the country. Please [click here](#) for the more details***

# Smart City/Urbanization: Growth drivers and Key challenges

## Growth Drivers:

- ✓ **Economic Growth & Urbanization** – Rising urban population demands efficient & sustainable infrastructure and services
- ✓ **Tech Adoption** – Use of AI, IoT/M2M, Big Data & cloud for improved urban efficiency
- ✓ **Government Support** – Smart Cities Mission & major investments to modernize cities & enhance quality of life
- ✓ **Sustainability Focus** – Green infra, renewable energy, EV charging, smart grids & energy-efficient buildings supporting Net Zero 2070 goals
- ✓ **PPP & Investments** – Public-private partnerships driving mobility, clean energy, waste mgmt. & smart utilities

## Key challenges:

- ✓ **Privacy & Data Security** – Protecting sensitive citizen data from misuse, breaches & unethical use
- ✓ **Interoperability & Standards** – Lack of common frameworks limits seamless integration of diverse systems
- ✓ **Technology Complexity** – Limited technical expertise among practitioners impacts effective implementation & oversight of IoT, AI/ML, and data-driven systems
- ✓ **Aging Infrastructure** – Legacy systems, high upgrade costs & resource constraints (water, energy, waste mgmt.) hinder large-scale deployment

# Smart City/Urbanization: Standardization

## Bureau of Indian Standards (BIS):

**LITD 28: Smart Infrastructure Sectional Committee:** Standardization in the field of Smart Cities (Electro-technical and ICT aspects).

- ✓ **IS 18000:2020** Unified Digital Infrastructure – ICT Reference Architecture (UDI-ICTRA)
- ✓ **IS 18003 (Part 1):2020** Unified Data Exchange Part 1 Architecture.
- ✓ **IS 18003 (Part 2):2021** Unified Data Exchange Part 2 API Specifications
  - It includes NGSI-LD (ETSI CIM).
- ✓ **IS 18004 (Part 1):2021** IoT System Part 1 Reference Architecture
  - It is based on oneM2M CSF
- ✓ **IS 18006 (Part 1):2021** Municipal Governance Part 1 Reference Architecture
- ✓ **IS 18006 (Part 3/Sec 1):2021** Municipal Governance Part 3 Property Tax Section 1 Taxonomy
- ✓ **IS 18008 (Part 1):2021** Smart Cities — GIS Part 1 Reference Architecture

**CED 59: Smart Cities Sectional Committee:** Standardization in the field of Smart Cities terminology, components, planning, design, integration, implementation, operation, maintenance and assessment.

- ✓ **IS 17738: 2022:** Sustainable development of habitats - Indicators for smart cities

## TEC & TSDSI:

- ✓ Telecommunication Engineering Centre (TEC) has adopted TSDSI transposed oneM2M Release 2 and Release 3 specifications as national standards
- ✓ These standards will be quite useful for the development of interoperable ecosystem for IoT domain, especially for Smart cities.



# Data: Key Policy Initiatives

## Digital Personal Data Protection (DPDP) Act, 2023

- India's first comprehensive data privacy law (enacted Aug 2023)
- Applies to digital personal data in India & cross-border processing linked to Indian services
- Key rights: consent, correction/deletion, grievance redressal, nomination in case of death/incapacity
- Differences vs GDPR: covers only digital data, no sensitive data distinction
- [\*Draft DPDP Rules 2025 released\*](#)

## Draft National Data Governance Framework Policy (2022)

- Focus: safe access to **non-personal & anonymized data** for R&D and innovation.
- Establishes **India Data Management Office (IDMO)** under MeitY.
- Sets standards, rules, and guidelines for non-personal data sharing.

## Draft India Data Accessibility & Use Policy (2022)

- Harnesses **public sector data** for social transformation.
- Objectives: maximize data use, enhance service delivery, streamline inter-government data sharing, protect privacy, and enable public digital platforms.

## Open Government Data (OGD) Platform

- NIC-hosted platform for **machine-readable & human-readable data**.
- Promotes proactive government data access, transparency, and national development.

## Draft Data Centre Policy (2020)

- Aims to position India as a **global data centre hub**.
- Focus on investment, incentives, indigenous manufacturing, network improvements, and standardization.

# Data: Growth drivers and Key challenges

## Growth Drivers:

- ✓ **Accelerated Digital Transformation:** Rapid digitization in finance, healthcare, education, adoption of cloud, AI, IoT, Big Data → surge in data generation → demand for scalable, high-performance data centers.
- ✓ **Surging Digital Consumption:** Affordable data + smartphone penetration → rise in video streaming, social media, e-commerce, gaming → massive increase in data traffic & bandwidth needs.
- ✓ **Next-Generation Infrastructure:** Rollout of 5G & IoT proliferation → need for edge data centers to support low-latency, real-time applications.
- ✓ **Supportive Government Policies:** Digital India + data localization rules → increased investment & stronger domestic data center ecosystem.

## Challenges:

- ✓ **Infrastructure & Power Deficit:** Unreliable power supply in key hubs (Mumbai, Chennai), Limited land availability & weak last-mile fiber connectivity.
- ✓ **High Capital & Operational Costs:** Expensive land acquisition & imported equipment, High electricity tariffs + cooling demands in tropical climate → rising OPEX, reduced profitability.
- ✓ **Complex Regulatory Environment:** Multi-agency approvals (land, environment, power, construction) delay projects, Compliance burden from evolving data protection & privacy laws.
- ✓ **Talent Shortage & Sustainability Demands:** Lack of skilled professionals for high-density data centres, Sustainability pressure: PUE optimization, renewable energy, water efficiency → requires investment & expertise.

# Data: Standardization

**Bureau of Indian Standards (BIS):** BIS, through its various Technical Committees, is actively developing standards related to data, data exchange, and data quality etc., in alignment with international practices to support India's digital transformation.

**LITD 15 Data Management System:** LITD 15 is responsible for preparing Indian Standards relating to: a) Data Management and Interchange b) Document Description and Processing Languages c) Programming languages, their environments and system software interfaces

- IS/ISO/IEC 11179 (part 1 to part 6): Information Technology — Metadata Registries (MDR)
- IS 18743: 2024 / ISO/IEC TR 9789: 1994 Information technology - Guidelines for the organization and representation of data elements for data interchange Coding methods and principles
- IS/ISO/IEC 21778: 2017 Information Technology The JSON Data Interchange Syntax

**LITD 16 Identification & Data capture techniques, Cards and Security Devices:** LITD 16 is responsible for standardization in the area of:

a) Smart Cards, Identification cards, security devices and interface associated with their use in inter-industry applications and international interchange. b) Data formats, data syntax, data structures, data encoding, and technologies for the process of automatic identification and data capture and of associated devices utilized in inter-industry applications and international business interchanges and for mobile applications.

- IS 14202 (Part 6): 2018/ ISO/IEC 7816-6:2016 Identification cards — Integrated circuit cards — Part 6: Interindustry data elements for interchange
- IS/ISO/IEC 18004:2015: Information technology Automatic identification and data capture techniques QR Code bar code symbology specification

**LITD-25 Digital Governance:** LITD 25 is responsible for developing Indian standards related to Software applications for seamless sharing of data and services for e-Governance namely data, security, network, semantics, metadata and language and ensuring their integrity.

**LITD 31- Cloud Computing, IT and Data Centres Sectional Committee:** LITD 31 is responsible for standardization in the field of a) Cloud Computing and Distributed Platforms including Foundational concepts and technologies, Operational issues, and Interactions among Cloud Computing systems and with other distributed systems b) Assessment methods, design practices, operation and management aspects to support resource efficiency, resilience and environmental sustainability for and by information, data centres and other facilities and infrastructure necessary for service provisioning

- IS/ISO/IEC 19944-1:2020: Cloud computing and distributed platforms — Data flow, data categories and data use — Part 1: Fundamentals
- Parts of IS/ISO/IEC 22237: Information Technology Data Centre Facilities and Infrastructures
- Parts IS/ISO/IEC 30134: Information Technology Data Centers Key Performance Indicators



# Cyber Security: Key Policy Initiatives

## Information Technology Act 2000:

- ✓ [IT Act, 2000 \(amendment ACT 2008\)](#) is the primary law in India for matters related to cybercrime and e-commerce.
- ✓ Establishment of **National Critical Information Infrastructure Protection Centre (NCIIPC)** for protection of critical information infrastructure in the country (Section 70A of IT Act, 2000)

## Indian Computer Emergency Response Team (CERT-In):

- ✓ In IT Amendment ACT 2008, CERT-In has been designed to serve as the national agency to perform various functions around cyber security.
- ✓ CERT-In issued "[Guidelines on Information Security Practices](#)" for [Government Entities for Safe & Trusted Internet](#), a roadmap for Government entities and industry to reduce cyber risk, protect citizen data and continue to improve the cyber security ecosystem in the country.

## National Cyber Security Policy-2013:

- ✓ NCSP 2013 aims (1) facilitating the creation of secure computing environment (2) enabling adequate trust and confidence in electronic transactions and (3) guiding stakeholders' actions for the protection of cyberspace.

## Cyber Swachhta Kendra (Botnet Cleaning and Malware Analysis Centre), 2017:

- ✓ Part of **India's Digital India initiative** under **MEITY** to create a secure cyber space by detecting botnet infections in India and to notify, enable cleaning and securing systems of end users so as to prevent further infections.

## Cyber Surakshit Bharat, 2018:

- ✓ to ensure awareness about cybercrime and adequate safety measures for Chief Information Security Officers (CISOs) and frontline IT staff across all government departments.

# Cyber Security/Data Privacy: Growth Drivers and Key Challenges

## Growth Drivers:

- **Thriving Startup Ecosystem** – Rising no. of cybersecurity startups with global potential
- **Increasing use of technology in various sectors** – Finance, healthcare, energy, transport & manufacturing driving demand
- **India as GCC Hub** – 1,800+ GCCs (\$46B+) leveraging talent, cost advantage & infra strength
- **Increased contribution of private sector** – DSCI & industry leading policies, standards & capacity-building initiatives

## Key Challenges:

- ✓ **Ransomware Surge** – 51% rise in 2023; widespread system vulnerabilities exploited
- ✓ **Lack of Infrastructure and Cyber security Regulations**
- ✓ **Emerging Tech Risks** – IoT, AI, cloud introducing new vulnerabilities
- ✓ **Talent Shortage** – Need 1M+ professionals; current supply less than half
- ✓ **Low Awareness** – Many SMEs & individuals lack cybersecurity knowledge & resources

# Cyber Security/Data Privacy: Standardization

- **Bureau of Indian Standards (BIS): [BIS LITD 17](#) on Information Systems Security and Privacy:** is responsible for standards in the field of Security and Privacy aspects of Information Systems. It is a National mirror committee for ISO/IEC TC-JTC 1 SC-27 (P) on Information security, cybersecurity and privacy protection. TC has adopted following standards:
  - **ISO 27000 series of standards** for Information technology - Security techniques - information: Security management systems
  - **Series of IS 14990/ISO/IEC 15408:** Information Security, Cybersecurity and Privacy Protection - Evaluation Criteria for IT Security
  - **IS/ISO/IEC 27400:2022:** Cybersecurity - IoT Security and Privacy – Guidelines
  - **IS/ISO/IEC 27402:2023:** Cybersecurity - IoT Security and Privacy - Device Baseline Requirements
  - **IS/ISO/IEC 27032 : 2012:** Information Technology - Security Techniques - Guidelines for Cyber Security
  - [IS/ISO/IEC 24745 : 2022](#): Information security cybersecurity and privacy protection Biometric information protection
  - [IS/ISO/IEC/TR 27103 : 2018](#): Information Technology - Security Techniques - Cybersecurity and ISO and IEC Standards
- **Telecommunication Engineering Centre (TEC):** Security requirements for telecom equipment under MTCTE
  - Notified [Essential Requirements \(ERs\)](#) for: Secure routers, IoT Gateway etc.

# Major “Make in India” initiatives by Indian Government



# Production Linked Incentive (PLI) Scheme

## PLI Scheme for Large Scale Electronics Manufacturing:

- ✓ **PLI Scheme** for Large Scale Electronics Manufacturing (LSEM), launched by MEITY, is a flagship initiative to enhance domestic manufacturing of mobile phones and components, attract investment, and boost exports.
- ✓ **Impact (till June 2025): Investment:** INR 12,390 Cr (approx. €1.23 billion), **Production:** INR 8,44,752 Cr. (approx. €84.47 billion), **Exports:** INR 4,65,809 Cr. (approx. €46.58 billion), **Employment:** 1,30,330 direct jobs

## PLI scheme for Promoting Telecom & Networking Products Manufacturing in India:

- ✓ to boost domestic manufacturing, investments and export in the telecom and networking products
- ✓ Financial Incentive: INR 12,195 Crores (approx. 1.2 €billion) for 5 years (FY 2021-22 and FY 2026-27)

## PLI Scheme 2.0 for IT Hardware:

- ✓ **Approved in May 2023**, PLI 2.0 for IT Hardware aims to enhance India's manufacturing capabilities and promote self-reliance (Atmanirbhar Bharat).
- ✓ **Key Features:**
  - Incentives ~5% on net incremental sales (over base year) for 6 years
  - Target segments: Laptops, Tablets, All-in-One PCs, Servers, Ultra Small Form Factor (USFF) devices
  - Incentivises semiconductor design, IC manufacturing, and packaging
- ✓ **Impact (till June 2025):** Investment: ₹717.13 Cr (~€71.8 Mn), Production: ₹12,195.84 Cr (~€1.2 Bn), Employment: 5,056 direct jobs

## Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS)

- ✓ SPECS scheme aims to strengthen the electronics manufacturing ecosystem and reduce import dependency by supporting high-value-added domestic manufacturing.
- ✓ Financial Incentive: 25% on capital expenditure for: Electronic components, Semiconductor/display fabs, ATMP (Assembly, Testing, Marking & Packaging) units, Specialized sub-assemblies & capital goods.



# Key EU projects / Instruments & Initiatives in India



# Key EU Projects & Initiatives in India 1(2)

## EU-India Strategic Partnership: A Roadmap to 2025

- Focuses on trade, future technologies, standards, and sustainable development
- The roadmap emphasizes working together on **harmonizing standards** across domains such as **security, pharmaceuticals, environment (circular economy), ICT, and transport (railways)**.

## EU-India TTC WG-01

- Focuses on Strategic Technologies, Digital Governance, and Digital Connectivity.
- MoU on semiconductors, signed in November 2023

## EU-India Global Gateway

- Strategic partnership under **EU's Digital & Connectivity Strategy with** Priorities around **Emerging tech, Cybersecurity, DPI, Trusted digital infra, Online platforms**
- Initiatives:
  - **EU-India Global Gateway Conference for Connectivity Investments in North-Eastern India (Shillong Conference-2023)** – Digital, Energy & Transport sectors
  - **Trilateral cooperation** in Africa, Indo-Pacific, Central Asia
  - **India-Middle East-Europe Economic Corridor (IMEC)** → Transport, energy & **digital connectivity**

## New Strategic EU-India Agenda'

- The Joint Communication is a roadmap of activities with emphasis on:
  - Standards & Interoperability
  - Advancing a conducive digital environment
  - Sustainable Green Development
  - Strengthening regional connectivity etc.



# Key EU Projects & Initiatives in India 2(2)

## SESEI Project (Phase VI: 2024–2027)

- Managed by **CEN, CENELEC, ETSI, EC-DG INTPA, EFTA**
- Enhances visibility of **European Standardization System (ESS)** in India
- Supports EU–India alignment in **standards, regulations, policies**
- Priority Areas are aligned with EU-India TTC topics:
  - **Digitization:** AI, 5G/6G, IoT, Quantum, Smart Manufacturing, e-Signature, e-accessibility etc.
  - **Green & Clean Tech:** Clean Energy, EVs, Green Hydrogen, Circular Economy etc.

## InDiCo-Global (2024–2027)

- Consortium: ETSI, CEN, CENELEC, Trust-IT, Martel, COMMpla
- Promotes EU **digital policies & ICT standards** globally
- Focus: **AI, 5G/6G, IoT, Cybersecurity, Quantum, Smart Cities, Circular Economy** etc.
- Outreach: **India, China, South-east Asia, African Union, Western Balkans, Eastern Partnership and Latin America and Caribbean (LAC).**

## EU Project INPACE (2024–2027)

- Coordinator: G.A.C. Group (France)
- Indian Partners include Indian Institute of Technology Guwahati and Centre for Development of Advanced Computing (CDAC)
- **Five thematic clusters:** Digital Dialogues, Policy and Education, Innovation and Entrepreneurship for Sustainable Well-being Trustworthy Decision Support Chips of the Future and Future Networks

**Together, these initiatives deepen EU–India cooperation in Digitalization, Sustainability & Connectivity.**

# Conclusion

- India's digital journey is evolving into a resilient, inclusive, and future-ready ecosystem, powered by **emerging technologies such as 5G, AI, IoT, Blockchain, Cloud, Quantum, and** strengthened by **Digital Public Infrastructure**.
- Government initiatives emphasize digital infrastructure, **inclusivity, and innovation-led growth**.
- **Policy frameworks and standards** are key enablers, though challenges remain in adoption and scale.
- PLI schemes (**Atmanirbhar Bharat**) support domestic manufacturing, reducing import reliance.
- **EU–India cooperation** (IndiCo-Global, TTC, Global Gateway, SESEI) strengthens standards, innovation, and connectivity.
- Sustained global cooperation, especially with the EU, will ensure technologies foster innovation, sustainability, and trust.

Thank you!

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