Transforming S&T Landscape of India

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Department of Science and Technology
Government of India

In Memory

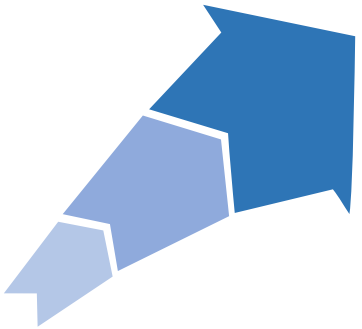
Dr. R. Chidambaram

(11 November 1936 – 4 January 2025)

A tribute to his legacy in advancing India's scientific and technological leadership

R&D Growth Story of India

Global Innovation Index



39th Rank (2024)

81st Rank (2014)

Patents Filed

42,951 (2014)

90,300 (2023)

Publications

3rd Rank (2022)

2,07,390

7th Rank (2012)

78,135

PhDs in Science and Engineering

~25,000 (2022)

3rd Rank (2022)

Startups Success Stories

Startup Ecosystem

3rd largest

Exponential Growth from 2016 to 2022

15X	9X	7X
increase in the total funding of startups	increase in the number of investors	increase in the number of incubators

5,000 angel investors

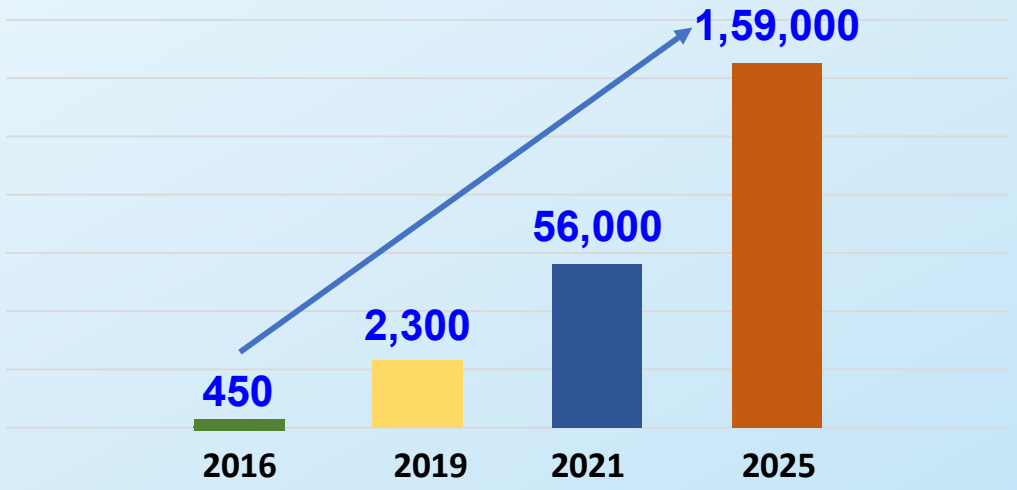
1,400 venture capitals firms

1,100 private equity firms

1,200 incubators and accelerators

Startups

3rd Rank



Unicorns

(>US $1 bn valuation)

3rd Rank

Critical Technologies- Large Opportunities

Leading Countries in 64 critical technologies based on high impact research

India ranks within Top 5 in 45 of the 64 critical technologies

China leads in 57 of the 64 critical technologies

US leads in rest 7

Global Share of High-impact Publications (2019-23)

	Rank 1	2	3	4	5
Biofuels	23%	17%			
Biological Manufacturing	29%	10%			
Advanced Composite Materials	45%	11%			
Artificial Intelligence Algorithms & Natural Language Processing	31%	14%	6%		
Quantum Cryptography	34%	12%	6%		
Cybersecurity	22%	14%	8%		
Quantum Sensing	24%	24%	8%	4%	
Drones and Robotics	38%	10%	5%	5%	4%

Source: Australian Strategic Policy Institute, August 2024

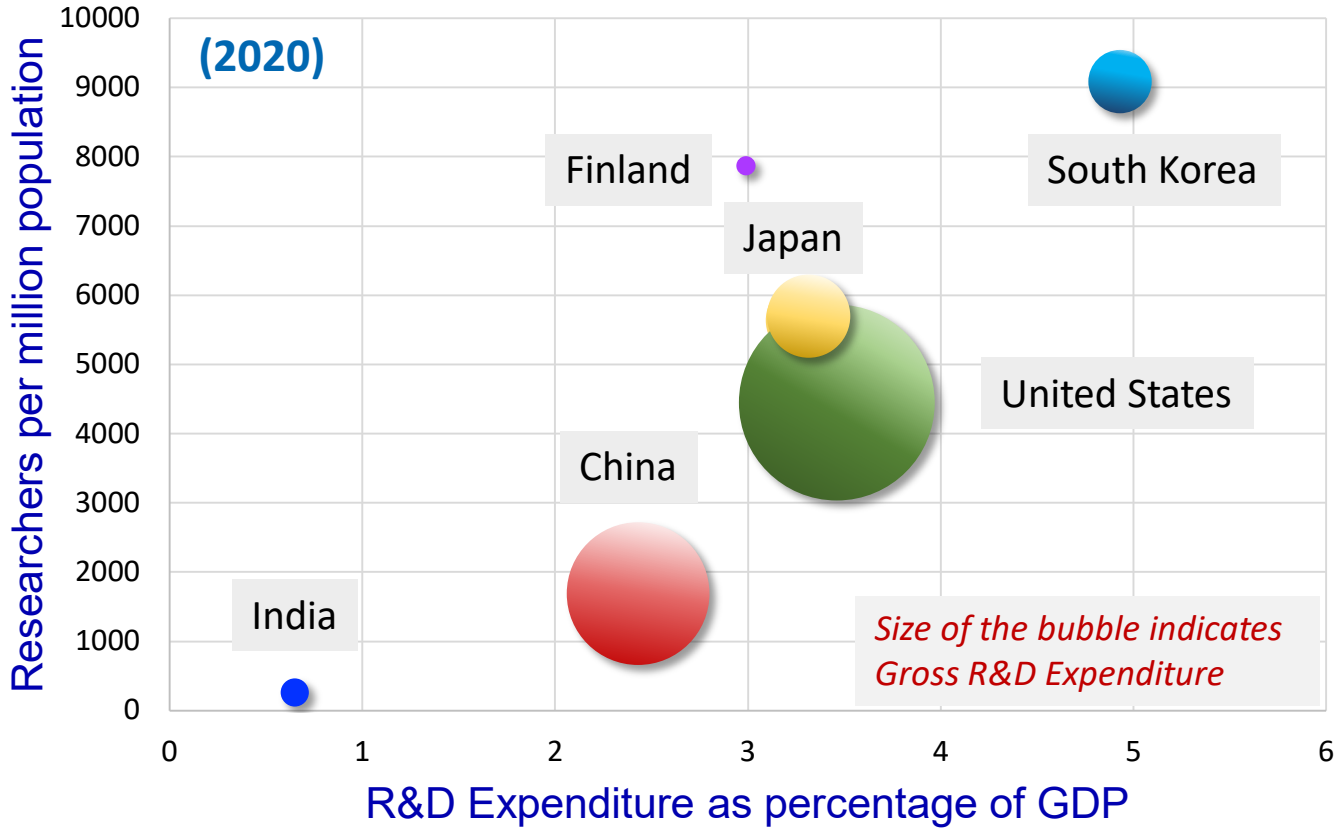
Areas to be Strengthened

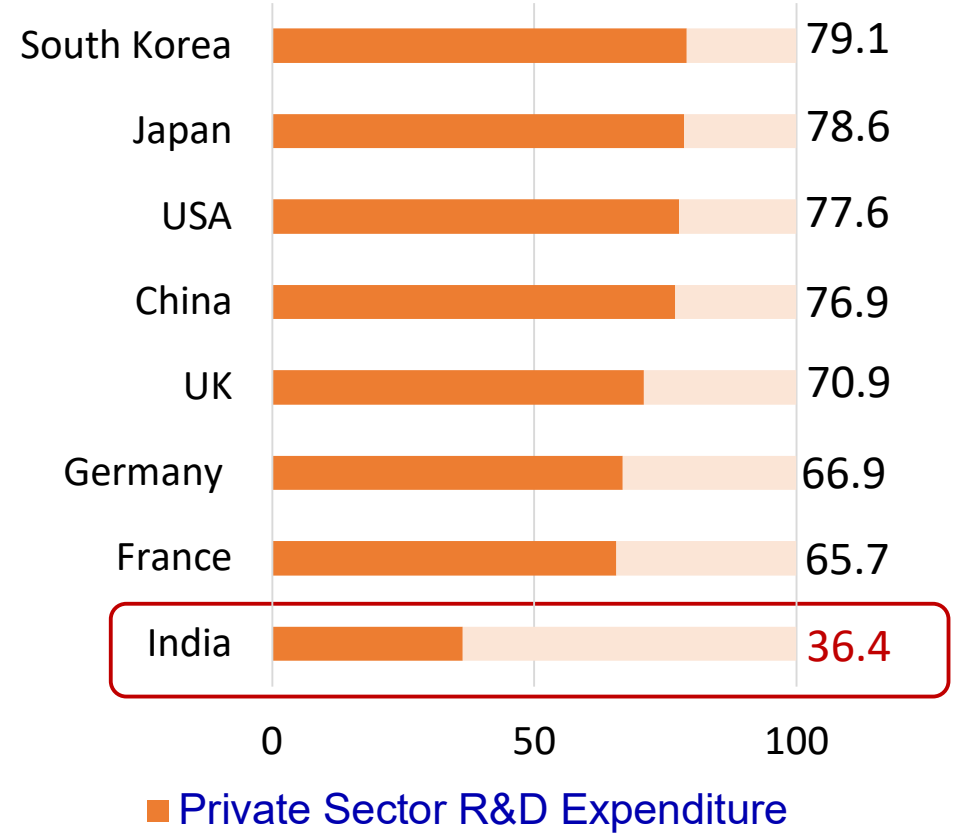
Gross R&D expenditure as percentage of GDP: **0.7%**

Full-time R&D personnel per million population: **262**

Deep Tech Startups **<10,000** in 2024

R&D expenditure by private sector, **36.4%** in 2020-21

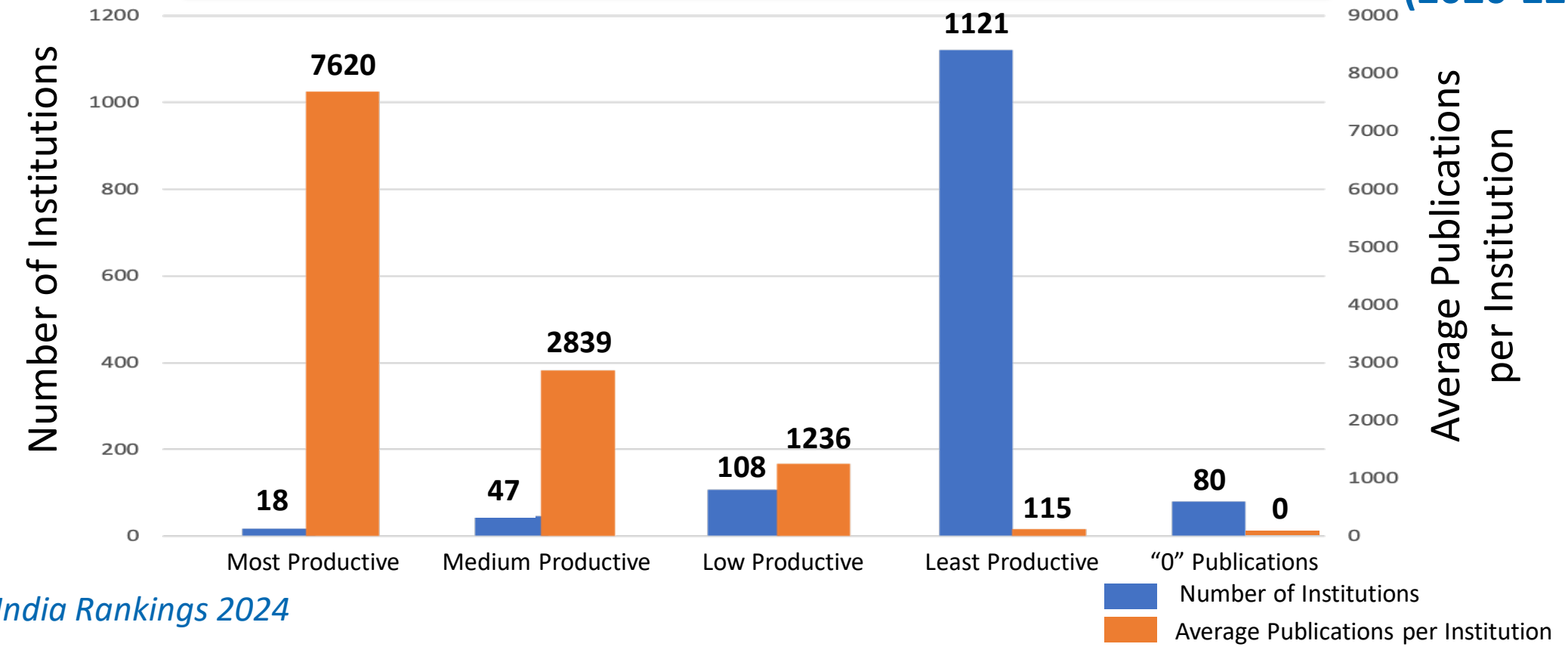




Areas to be Strengthened

Research output concentrated in few institutions

(2020-22)



NIRF: India Rankings 2024

R&D infrastructure in several universities and colleges limited

Challenges in India’s S&T Ecosystem

A Structural Barriers

Regional Disparities in Research

- Limited research capabilities in universities, restricting nationwide innovation

Industry-Academia Linkages

- Challenges in collaboration and translating research into market-ready innovations

B Technology & Innovation Deficits

Strategic Technologies

- Need for accelerated progress in AI, cyber security, quantum computing, & green technologies

Deep-Tech Ecosystem

- Limited investment in Deep-tech startup activities, hindering India's goal of becoming a Product Nation

Focus on Supply Chain

- Limited control on supply chains

Govt's Strategic Actions for Technology & Innovation Leadership

A Institutional Reforms & Strategic Initiatives

- Anusandhan National Research Foundation
- Research, Development & Innovation Fund
- Institutional and Governance Reforms

B Sectoral Focus Areas

- Quantum Technologies, Cyber Physical Systems, Artificial Intelligence
- Electric Mobility, Semiconductor & Electronics, Telecom Technologies
- Bio Manufacturing
- Weather Technologies, Blue Economy
- Space Technologies

Genesis of ANRF

- **National Education Policy 2020** envisions a comprehensive approach to transforming the quality and quantity of research in India. Research and innovation at education institutions in India, particularly those that are engaged in higher education, is critical.
- To build on these various elements in a synergistic manner, and to thereby truly grow and catalyze quality research in the nation, NEP 2020 envisions the establishment of a National Research Foundation (NRF).

***ANRF Act**, 2023 notified on February 05, 2024*
and erstwhile Science and Engineering Research Board dissolved

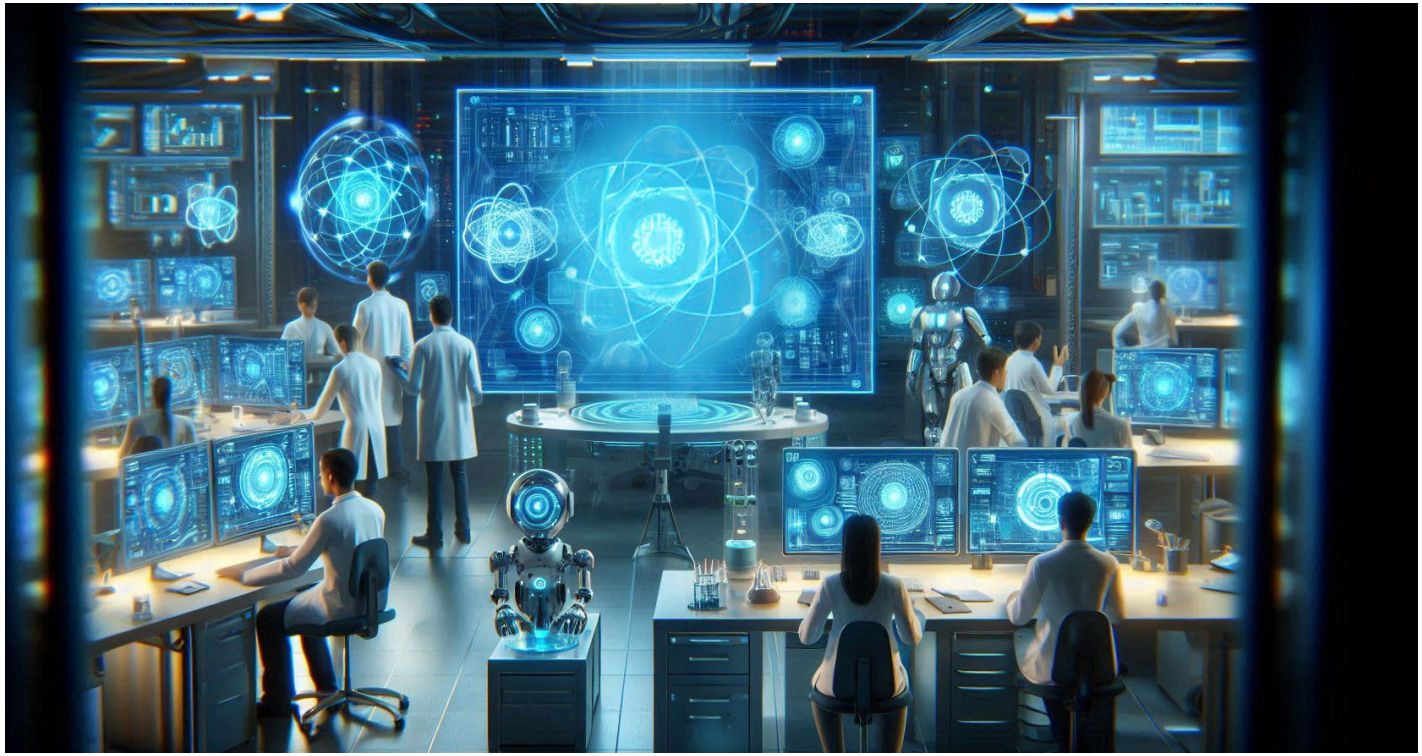
Strategic Interventions of ANRF

Hub and Spoke Framework for uplifting S&T ecosystem of Universities and Colleges	→ Boosting Research Capabilities in Universities
Mission Mode Research: Sectoral Investments, and Translational Research	→ Propelling India's Global Competitivenes in Priority Areas
Centres of Excellence	→ Improving Global Ranking of India in top 100 Institutions
PM Early Career Grant, Advanced Research Grant, PM Professorship	→ Highly Skilled Workforce

Quantum Technologies

To harness the Quantum power for a smarter, safer, and more connected world

1. **National Quantum Mission** - 4 Thematic Hubs
   - Quantum Computing- **IISc Bangalore**
   - Quantum Communication- **IIT Madras & C-DoT**
   - Quantum Sensing & Metrology – **IIT Bomba y**
   - Quantum Materials & Devices- **IIT Delhi**



2. **R&D Focus**
   - Indigenous **1000 Qubit Quantum Computer**
   - Satellite & Fibre-optic **Quantum Communication**
   - Ultra-precise **Quantum Sensors** and measurement tools
3. **Unbreakable quantum encryption** for banking, defense & governance
4. Quantum-driven breakthroughs in **drug discovery, new materials and climate modelling**

Cyber Physical Systems

Bridging the physical and digital worlds for a smarter, autonomous, and interconnected future

1. Established 25 Technology Innovation Hubs (TIHs) across India

2. **Key Technology Domains & Sectoral Applications**

- AI & ML, Robotics, Cyber Security, Data Analytics, Quantum Technologies, Internet of Things, Big Data
- Advanced Manufacture &Industry 4.0, Smart Cities, Autonomous Transportation Systems
- Healthcare, Agriculture & Water

Artificial Intelligence

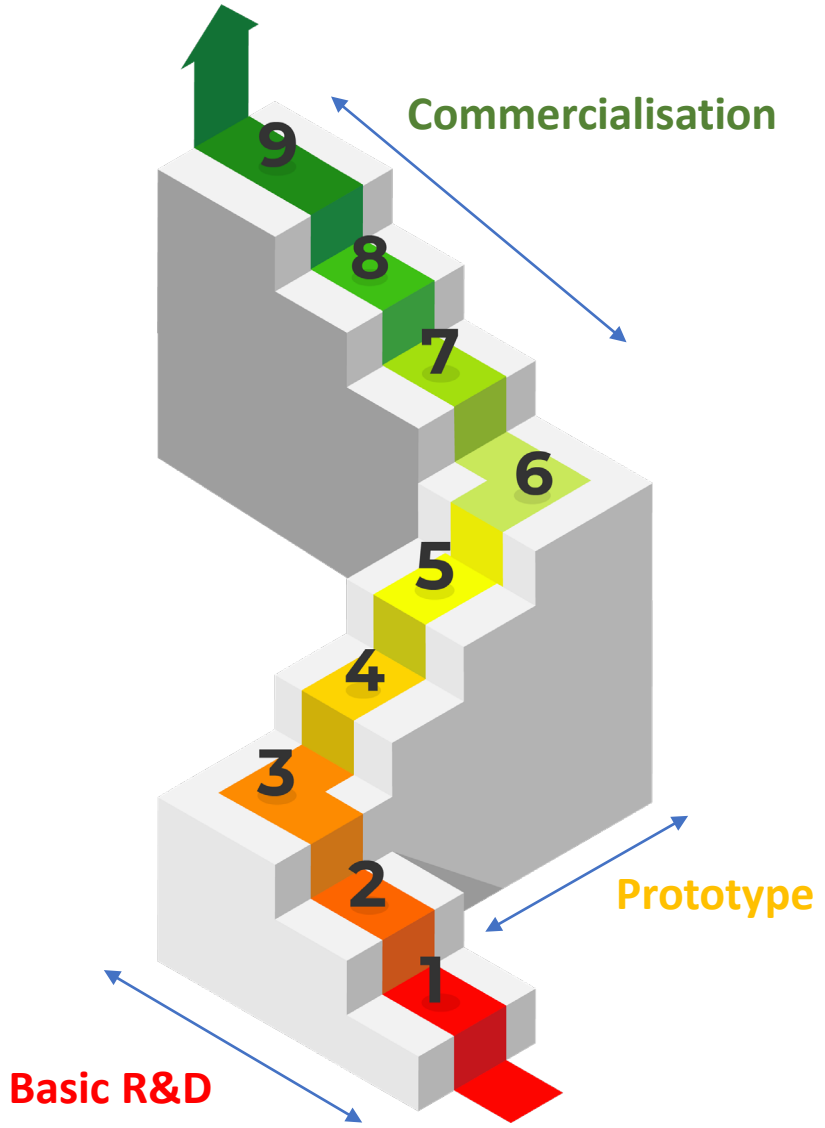
Driving AI Innovation to Power India's Digital and Economic Future

1. **India AI Mission**:
   - AI compute infrastructure of more than 10,000 GPU
   - Sector specific foundational models
   - Safe and trusted AI tools

2. **BharatGen:** Large Language Model (LLM) for Indian Languages being supported by DST

Research, Development & Innovation Fund

Technology Readiness Level (TRL)



Private Sector R&D Fund

ANRF

Rs.1 Lakh Crore Corpus

Objectives

- Foster R&D and innovation in the private sector to build a product-driven economy and achieve strategic autonomy
- Provide long-term concessional financing for start-ups, corporate, and FROs engaged in R&D and innovation in sunrise sectors
- Promote product-led businesses, value-added manufacturing, and domestic capability-building in critical and emerging technologies

India’s Path to Global S&T Leadership

The Government of India is implementing institutional and sectoral reforms across various fields to position India as a Global Leader in cutting-edge technology

- **Building a World-Class S&T Ecosystem** – Advancing through strategic investments, strong collaborations, and globally competitive research framework
- **Empowering Talent & Innovation** – Strengthening human capital and R&D infrastructure to drive breakthrough advancements
- **Accelerating Disruptive Technologies** – Focusing on AI, Quantum Computing, Semiconductors, Green Hydrogen, and Telecom Technologies to achieve technological sovereignty
- **Technology for a Sustainable Future** – Leveraging innovation to address climate change, resource efficiency, and urban challenges while ensuring inclusive growth

India’s vision for **Viksit Bharat 2047** is to emerge as a future-ready, self-reliant global leader driven by science, technology, and innovation

Thank you!