



DAILY EDITORIAL ANALYSIS

TOPIC

**INDIA'S DEEP-TECH PUSH &
BUREAUCRATIC HURDLES**

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Context

- Recently, during India's Independence Day address, the Prime Minister urged the nation to shed its dependency and embrace technological sovereignty to lead in deep-tech innovation — spanning artificial intelligence, quantum computing, semiconductors, and space technology.

About the Deep Technology

- It refers to innovations rooted in advanced scientific and engineering breakthroughs such as AI, quantum computing, biotechnology, and space tech and of its disruptive nature.
- It often requires long development cycles, high capital investment, and rigorous validation.
- Deep tech start-ups **differ from traditional start-ups** primarily in their technology-driven approach, longer development cycles, and higher risk factors.
 - Traditional start-ups often rely on business model innovation, such as e-commerce, SaaS, or consumer services.

India's Strengths

- Talent Pool:** India has world-class engineers and scientists. Many global tech firms rely on Indian talent for core R&D.
 - India ranks **third globally** in scientific research and has climbed from 81st to **39th in the Global Innovation Index**.
- Cost Efficiency:** Indian startups can innovate at lower costs, making them attractive for global partnerships.
- Government Push:** Initiatives like the **PLI Scheme** for semiconductors and green hydrogen are helping build indigenous capabilities.

Concerns & Issues in India's Deep-Tech Ecosystem

- Bureaucratic Bottlenecks:** India's bureaucratic machinery, rooted in colonial legacy, remains one of the biggest hurdles, as it was designed for control, not innovation.
 - Slow Decision-Making:** Regulatory approvals for R&D, IP filings, and funding disbursements are often delayed.
 - Fragmented Oversight:** Deep-tech spans **multiple ministries** — **MeitY, DST, DBT, ISRO, DRDO** — leading to coordination challenges.
 - Risk Aversion:** Bureaucrats are often hesitant to back experimental technologies, fearing audit scrutiny or political fallout.
- Funding Gaps & Market Failure:** Deep-tech requires patient capital and long gestation periods.
 - CSR Funds Underutilized:** India's 15,000 crore annual CSR budget could support strategic tech, but remains largely untapped.
 - Investor Hesitancy:** Many investors lack the technical understanding or appetite for long-term risk.
 - India lacks a dedicated strategic fund to bridge this gap. Government missions like **IndiaAI** and **National Quantum Mission** are underfunded compared to global peers.
- Talent Drain & Research Deficit:** India produces top-tier engineers and scientists, but many leave for better opportunities abroad. Domestic research budgets are meagre, and academia-industry linkages remain weak.
 - Universities don't produce research at scale.
 - IP creation is low; India often serves as the back office for global tech giants.
 - GPU clusters and advanced computing infrastructure are scarce, limiting AI and quantum research.
- Legal & Ethical Concerns:** India's push into AI and surveillance tech raises serious questions about **privacy and civil liberties**.
 - The **Digital Personal Data Protection Act (DPDPA)** has been criticized for granting broad exemptions to the government, undermining individual rights.
 - AI-powered surveillance lacks proportional safeguards.

- ♦ Facial recognition systems are being deployed without robust legal frameworks.
- ♦ Citizens face heightened scrutiny while the state enjoys unchecked data access.
- **Cultural & Strategic Misalignment:** India's tech culture often prioritizes execution over invention. Quick commerce and fintech dominate, while frontier technologies remain underexplored.
 - ♦ Nationalism and proxy culture wars with tech companies distract from the real work of building foundational capabilities.
 - ♦ Deep-tech is treated as a promising sector, not core infrastructure.
 - ♦ Political theatrics sometimes overshadow policy delivery.
 - ♦ Strategic technologies are still seen as the burden of commercial industry alone.

Related Efforts & Initiatives

- **Union Budget (2025-26):** India is positioning itself as a hub for sunrise technologies with initiatives like the **Indian Semiconductor Mission** and increased R&D funding.
- **Prime Minister's Research Fellowship (PMRF):** The government is tripling intake under PMRF, aiming to support 10,000 scholars over five years.
- **National Deep Tech Startup Policy (NDTSP):** It is spearheaded by the Office of the Principal Scientific Adviser. It outlines over 80 policy interventions and has consulted nearly 200 experts to build a robust framework for deep-tech growth. It aims to:
 - ♦ Strengthen India's economic future through tech sovereignty;
 - ♦ Transition to a knowledge-driven economy;
 - ♦ Promote ethical innovation;
 - ♦ Support startups with funding, infrastructure, and IP protection;
- **National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS):** It was launched by the Department of Science & Technology (DST) with focus on AI, robotics, autonomous systems, IoT, drones.
- **Electric Vehicle Solutions Led by Startups (EVolutionS):** To accelerate EV component development and build a robust supply chain.
 - ♦ **Technology Business Incubators (TBIs)** help startups move from prototype to product.
- **Climate, Energy and Sustainable Technology (CEST) Initiatives** with focus on advanced hydrogen and fuel cells, methane mitigation, carbon capture and utilization, and AI/ML-based climate prediction models etc.
- **Biotechnology Industry Research Assistance Council (BIRAC) Program:** It promotes biotech innovation and commercialization.
- **Anusandhan National Research Foundation (ANRF):** For high-priority deep-tech research; focusing on Electric vehicles, climate tech, and foundational science.

Road Ahead

- A dedicated '**India Strategic Fund**' to bridge the gap between academic research and industrial application, similar to models in the US and Israel.
- India has the ingredients—talent, market, and policy momentum—but must overcome structural inertia. To truly compete with the US and China, it needs:
 - ♦ A cultural shift toward bold, research-driven entrepreneurship;
 - ♦ Streamlined governance and regulatory reform;
 - ♦ Stronger academia-industry linkages;
 - ♦ Deep investment in foundational technologies.

Source: IE

Mains Practice Question

- Q. Critically examine how India's bureaucratic structure impacts the growth of its deep-tech ecosystem. In your view, what reforms are necessary to align governance with the demands of frontier innovation?

