

3. Deep Tech Start-Ups- Governance

The Union Government has officially defined “Deep Tech Start-ups” through a gazette notification issued by the Department for Promotion of Industry and Internal Trade (DPIIT)

What is Deep Technology (Deep Tech)?

Deep technology (Deep Tech) refers to innovation driven by substantial scientific or engineering breakthroughs, rather than incremental improvements or digital-platform business models.

It typically involves-

1. Fundamental research-based innovation
2. High technological uncertainty
3. Long development cycles
4. Significant capital intensity
5. Strong intellectual property (IP) creation

Deep tech ventures are differentiated from consumer-tech startups because their value proposition is rooted in scientific discovery, patents, and engineering depth, rather than market arbitrage or software aggregation.

Core Domains of Deep Tech

Deep tech encompasses frontier and interdisciplinary domains such as-

1. Artificial Intelligence (AI) and Machine Learning
2. Quantum technologies (Quantum Computing, Quantum Communication)
3. Semiconductors and advanced chip design
4. Nanotechnology
5. Biotechnology and synthetic biology
6. Advanced materials and material sciences
7. Robotics and automation
8. Data sciences and high-performance computing
9. Additive manufacturing (3D printing)
10. Space technologies
11. Clean energy technologies (Green Hydrogen, Battery storage)

These sectors typically operate at higher Technology Readiness Levels (TRLs) before commercialization.

Eligibility Criteria for Deep Tech Start-up (DPIIT Framework)

As per notification by the Department for Promotion of Industry and Internal Trade, a deep tech start-up must-

Research and Development Intensity

1. Spend a substantial portion of funds on R&D activities.
2. Demonstrate scientific or technological innovation.

Intellectual Property Creation

1. Own or be in the process of developing **novel intellectual property** (patents, proprietary technologies).
2. Show credible commercialisation plans.

Risk and Gestation Profile

1. Face extended development timelines.

2. Operate under high scientific or technical uncertainty.
3. Require significant capital and infrastructure support.

Modified Start-up Definition for Deep Tech

While a general start-up in India must-

1. Be less than 10 years old
2. Have annual turnover below ₹200 crore

A deep tech company may-

1. Be considered a start-up for up to 20 years
2. Have turnover up to ₹300 crore

This extended recognition reflects longer gestation cycles in sectors like semiconductors or biotech.

Certification Mechanism

To qualify as a deep tech start-up- Companies must apply for certification from DPIIT.

Evaluation is guided by the Inter-Ministerial Board of Certification, comprising-

1. Joint Secretary, DPIIT (Convener)
2. Representative from Department of Science and Technology
3. Representative from Department of Biotechnology

Restrictions

Certified deep tech start-ups are restricted from investing in activities unrelated to their core innovation mandate.

Prohibited investments include-

1. Real estate speculation
2. Non-core financial assets

This ensures focus on knowledge creation and commercialization.

Significance of India's Deep-Tech Ambitions

Global Strategic Positioning

1. Positions India as a trusted R&D hub in the "China+1" global supply chain diversification.
2. Enables leadership in frontier domains such as Quantum Computing and 6G.

Technological Sovereignty

Reduces dependence on foreign imports in-

1. Defence systems
2. Semiconductor supply chains
3. Space technologies

Enhances resilience against geopolitical supply disruptions.

Solving India-Specific Challenges

1. AI for rural healthcare diagnostics
2. Precision agriculture for food security
3. Green hydrogen for energy independence
4. Climate-resilient materials and battery innovation

Moving Up the Value Chain

Transition from-

1. Low-cost service outsourcing
2. Assembly-based manufacturing

Toward-

3. High-value R&D
4. Patent generation
5. Indigenous product development

Deep tech strengthens India's position in the global innovation economy.

Structural Challenges

Capital Constraints

1. Requires high upfront capital.
2. Venture capital prefers quick returns; deep tech demands long horizons.

Infrastructure Gaps

Limited access to-

1. Supercomputing facilities
2. Semiconductor fabrication plants
3. Advanced testing labs

Infrastructure deficit slows prototyping and scaling.

Talent Bottlenecks

1. Shortage of specialised PhD-level researchers.
2. Industry-academia R&D linkages remain weak.
3. India's Gross Expenditure on R&D (GERD) remains relatively low as % of GDP.

Regulatory Barriers

1. Emerging technologies face unclear regulatory pathways.
2. Delays in approvals slow commercialisation.

Way Forward

Strengthen Public and Private R&D Spending

1. Increase GERD through public funding and private incentives.
2. Encourage corporate R&D investments.

IP Ecosystem Reform

1. Faster patent processing.
2. Stronger enforcement mechanisms.
3. Global IP filing support.

Industry-Academia Integration

1. Co-funded research labs.
2. Translational research centres.
3. Incentives for faculty-led start-ups.

Global Partnerships

1. Joint research programmes.
2. Technology transfer agreements.
3. Participation in global innovation consortia.

Demand-Side Support

1. Government procurement of indigenous deep tech solutions.
2. Regulatory sandboxes.
3. Standards and certification support.

Research Development and Innovation (RDI) Scheme Fund

Financial Outlay

1. ₹1 lakh crore over 6 years.
2. ₹20,000 crore allocated for FY 2025–26.
3. Funded from the Consolidated Fund of India.

Nodal Department– Implemented by the Department of Science and Technology.

Key Objectives

Private Sector Scaling– Encourage private investment in sunrise sectors. Promote RDI in areas linked to economic security and strategic autonomy.

Financing Higher TRL Projects– Support projects transitioning from lab stage to market deployment.

Strategic Technology Acquisition– Enable acquisition of critical technologies.

Deep-Tech Fund of Funds– Facilitate structured venture capital ecosystem. Reduce early-stage financing risks.

Strategic Outlook– Deep tech represents the next frontier of industrial and technological transformation. For India, it is not merely an economic choice but a strategic imperative to–

1. Achieve technological sovereignty
2. Strengthen national security
3. Build resilient supply chains
4. Transition toward knowledge-driven growth

Source– [https://www.thehindu.com/sci-tech/technology/centre-expands-definition-for-startups-with-official-term-for-deep-tech-companies/article70599087.ece#~~~text=It%](https://www.thehindu.com/sci-tech/technology/centre-expands-definition-for-startups-with-official-term-for-deep-tech-companies/article70599087.ece#~~~text=It%20represents%20the%20next%20frontier%20of%20industrial%20and%20technological%20transformation%20for%20India%2C%20it%20is%20not%20merely%20an%20economic%20choice%20but%20a%20strategic%20imperative%20to%20)

