Mains Practice Question

Q. "Despite having a strong IT services sector, India lags in developing deep-tech capabilities." Analyze the structural and institutional factors behind this gap and suggest measures to build a robust innovation ecosystem. **(250 words)**

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Approach

- Introduce the answer by briefing the significance of IT-Sector and highlighting that advancements, the deep tech sector still lags behind
- Give Structural and Institutional Factors Behind the Gap
- Suggest Measures to Build a Robust Innovation Ecosystem
- Conclude suitably.

Introduction

India's IT services sector has positioned the country as a global tech leader, **contributing significantly to GDP and exports.**

- However, India's performance in the deep-tech domain—characterized by cutting-edge technologies like **AI, robotics, and biotechnology**—remains suboptimal.

Body

Structural and Institutional Factors Behind the Gap:

- **Long Gestation Period and Funding Mismatch**
  - Deep tech ventures involve long R&D cycles and high capital requirements, often spanning **7–10 years,** unlike the quicker returns associated with IT services.
    - Venture capitalists (VCs) typically prefer shorter investment horizons of **3–5 years**
    - In 2023, Indian deep-tech startups saw a **77% drop in funding**, with global investors showing limited interest.
- **Talent Deficit and Brain Drain**
  - India produces over 1.5 million engineering graduates annually, but only **3% possess new-age technological skills** in areas like AI and quantum computing.
  - **Brain drain** to global innovation hubs like Silicon Valley and Canada exacerbates this talent gap, hindering domestic R&D capabilities.
- **Inadequate Infrastructure**
  - Deep tech requires specialized **research infrastructure**, such as supercomputing facilities and advanced testing labs.
    - However, India has **less than 2% of global computer infrastructure,** far behind the US and China, which dominate with 60% of resources.
  - The **slow pace of infrastructure development**, despite initiatives like the National Supercomputing Mission, increases costs for startups.
- **Regulatory Ambiguity**

- Emerging sectors like **drones, AI, and biotechnology** often face unclear or evolving regulatory frameworks.
  - For instance, **India's drone policy evolved significantly between 2018 and 2021**, delaying the adoption of drone technologies.
- Lack of **regulatory sandboxes** further impedes the experimentation and scaling of innovations.
- **Intellectual Property Challenges**
  - Filing and defending patents remains expensive and time-consuming.
    - India's patent grant process averages **58 months,** compared to 23 months in the US.

Measures to Build a Robust Innovation Ecosystem:

- **Deep-Tech Clusters**
  - Establish dedicated clusters for deep tech in major cities like **Bengaluru (AI and robotics) and Hyderabad (aerospace and defense).**
  - Provide **tax incentives** and **subsidized infrastructure** to encourage collaboration among startups, research institutions, and corporates.
- **Deep-Tech Focused Venture Funds**
  - Launch government-backed venture funds with **longer investment horizons (7–10 years)** tailored to deep tech.
  - Expand initiatives like the **₹10,000 crore Fund of Funds for Startups** to allocate a **percentage specifically to deep tech projects.**
  - Collaborate with private VC firms through **blended finance models** to de-risk investments.
- **Regulatory Sandboxes**
  - Implement sector-specific **regulatory sandboxes** for **AI, biotechnology, quantum computing, and autonomous systems.**
  - For instance, an autonomous vehicle sandbox could allow companies like Ather Energy to test innovations under controlled conditions, accelerating regulatory clarity.
- **Strengthening Talent Pool**
  - Partner with IITs and private institutions to introduce **specialized deep-tech curricula** and **industry-sponsored PhD programs** in advanced fields like quantum computing and energy storage.
  - Launch **national scholarships** for deep-tech entrepreneurs to incentivize the retention of skilled talent.
- **Open Innovation Platforms**
  - Create **national open innovation platforms** to connect startups, corporates, and academia. For instance:
    - An **AI for Healthcare platform** could link startups like Niramai with hospitals to co-develop solutions for cancer detection.
- **Deep-Tech Commercialization Fund**
  - Allocate **dedicated resources to transition academic research** into market-ready products. For example:
    - A commercialization fund could support solid-state battery startups emerging from IISc Bangalore.
- **Global Alliances**
  - Forge partnerships with global hubs like **Silicon Valley, Tel Aviv,** and Singapore through:
    - The **Indo-Israel Bilateral Workshop on Quantum Technologies** serves as a model for cross-border collaborations.
- **IP Ecosystem Strengthening**
  - Simplify and expedite the patent filing process to reduce average grant time from **58 months to global standards (23 months).**
  - Provide **subsidies for global patent filing costs** to make Indian startups more competitive internationally.

Conclusion

India's robust IT services sector and strong STEM foundation provide a **promising base for deep-tech**

development. By implementing measures like **specialized clusters, regulatory sandboxes, and global collaborations,** India can position itself as a global leader in deep tech, driving solutions for grand challenges like **climate change, healthcare, and sustainable development.**

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