Daily Mains Practice Question 24-06-2026

GS III - Science and Technology

Despite demonstrating technological foresight through initiatives such as SCL (Semi-Conductor Laboratory), ECIL (Electronics Corporation of India Limited), and the Simputer, India has often struggled to scale innovation into globally competitive industries. Examine the reasons for this trend and discuss the measures required to position India as a global leader in emerging technologies such as AI, quantum computing, and space technology. **(15 Marks, 250 Words)**

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Answers

Introduction

India often anticipated future technologies early, but struggled to scale innovation into globally competitive industries because of lack of funding and Red tapism which slows down industrial growth. Fixing these Gaps would lead India to Modern Global innovation.

Main Body

• India showed remarkable technological foresight through
• **ECIL (1967)** – Developed indigenous computers, strategic electronics, and control systems during an era of technology denial regimes.
• **SCL (1970s)** – Recognized the importance of semiconductors decades before they became the foundation of the digital economy.
• **Simputer (1998)** – Conceived an affordable handheld computing device with features that later became common in smartphones and tablets.
• Despite these pioneering efforts, India has often struggled to transform innovation into globally dominant industrial ecosystems comparable to TSMC in Taiwan, Samsung in South Korea, or Apple in the United States.

What are the reasons for failure to scale innovation?

• **Limited commercialization** – Innovations remained confined to research institutions and public-sector organizations without effective market pathways.
• **Weak industrial ecosystems** – Lack of integration among manufacturers, suppliers, investors, research institutions, and consumers hindered scaling.
• **Inadequate risk capital** – Insufficient venture capital and long-term financing constrained deep-tech growth.
• **Brain Drain** – Skilled researchers migrate abroad due to better research infrastructure and incentives.
• **Policy and regulatory bottlenecks** – Frequent policy changes and weak integration with global value chains reduced competitiveness.
• **Low R&D Investment** – India spends less than 1% of GDP on R&D, far below leading technology nations.
• **Dependence on Foreign Technology** – Reliance on imported semiconductors, cloud infrastructure, and critical software limits technological sovereignty.
• **Public-sector-led approach** – Excessive dependence on state-led enterprises limited commercial orientation and global market expansion, as seen in SCL and ECIL.
• **Ecosystem deficit** – The Simputer failed because supporting ecosystems—software platforms, supply chains, venture funding, and consumer markets—were underdeveloped.

What are the measures need to take to position India as a global technology leader?

• **Increase R&D spending** (at least 2% of GDP) through public-private partnerships.
• **Strengthen innovation ecosystems** via IndiaAI Mission, National Quantum Mission, and semiconductor initiatives.
• **Promote industry-academia collaboration** through innovation clusters and technology-transfer offices sovereign testbeds.
• **Expand patient capital** through venture funds, sovereign funds, and PPPs.
• **Encourage greater private-sector participation** in AI, space, and quantum technologies.
• **Develop indigenous technology** stacks in AI, semiconductors, cloud computing, and cybersecurity to ensure strategic autonomy.
• **Leverage existing strength** like Digital Public Infrastructure (UPI, Aadhaar, ONDC), software talent, frugal engineering, and cost-effective space missions to create scalable global solutions.

Conclusion

India's challenge is no longer inventing technologies but scaling them into globally competitive industries. By combining scientific innovation with strong ecosystems, capital, and policy support, India can emerge as a leader in AI, quantum computing, and next-generation space technologies.



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