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Deep Tech Drought: Why India's Startups Are Avoiding Hard Tech

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Abstract

Deep tech, also known as hard tech, refers to innovations based on scientific discoveries and engineering advancements, such as artificial intelligence (AI), biotechnology, quantum computing, and semiconductors. Despite India's growing startup ecosystem, deep tech ventures remain rare, receiving only 6% of venture capital funding in 2024 compared to 13% in 2023. This paper highlights the reasons behind the "deep tech drought" in India, focusing on cultural, financial, infrastructural, and policy challenges.

Keywords

Deep Tech, Startups, Venture Capital, Research and Development (R&D), Innovation, India

Introduction

Deep tech requires long development timelines, advanced infrastructure, and significant investment. In India, however, most startups focus on consumer technology sectors such as e-commerce, food delivery, and fintech, where scalability and financial returns are quicker. This paper analysis the challenges that hinder India's deep tech growth and explores systemic issues preventing the country from becoming a global leader in hard tech innovation.

Preference for Quick-Win Sectors

Indian entrepreneurs and investors prefer industries that promise faster growth and returns, such as logistics, food delivery, and digital payments. Deep tech requires patient research and years of investment, making it less attractive. Many first-generation entrepreneurs from middle-class families face pressure for financial stability, which leads them to replicate successful business models rather than pursue deep tech innovations.

Limited R&D Investment and Poor Infrastructure

India spends only 0.64–0.7% of its GDP on R&D, far behind China and the US. A large share of this funding is directed toward strategic sectors like defence and space, leaving limited scope for startups in other areas. Publicly funded laboratories often lack incubation facilities, modern labs, and resources. Only about 25% of R&D institutions support startup incubation, with very few focusing on deep tech.

Lack of Patient Capital and Weak Policy Support

Deep tech requires long-term capital to sustain research and development. However, venture capital firms in India prefer short-term returns, leading to a funding gap. Though initiatives such as the Startup India Seed Fund, the Draft National Deep Tech Policy, and the India AI Mission exist, they face weak implementation and bureaucratic challenges. The absence of the government as an early buyer further limits the validation and growth of deep tech startups.

Cultural and Talent Challenges

Cultural factors such as preference for job security discourage young talent from taking entrepreneurial risks. Many researchers migrate abroad for better opportunities, resulting in a brain drain. Collaboration between universities, industries, and international institutions is also limited, restricting knowledge transfer and innovation.

Conclusion

The slow growth of India's deep tech sector reflects systemic issues such as low R&D spending, weak funding support, regulatory barriers, and cultural resistance. To strengthen deep tech innovation, India must increase R&D expenditure to at least 2% of GDP, simplify regulatory processes, provide patient capital, and encourage government procurement of deep tech products. Without these changes, India risks missing the global deep tech revolution, thereby weakening its long-term technological independence.

Thankyou

(Mohd Amaan)