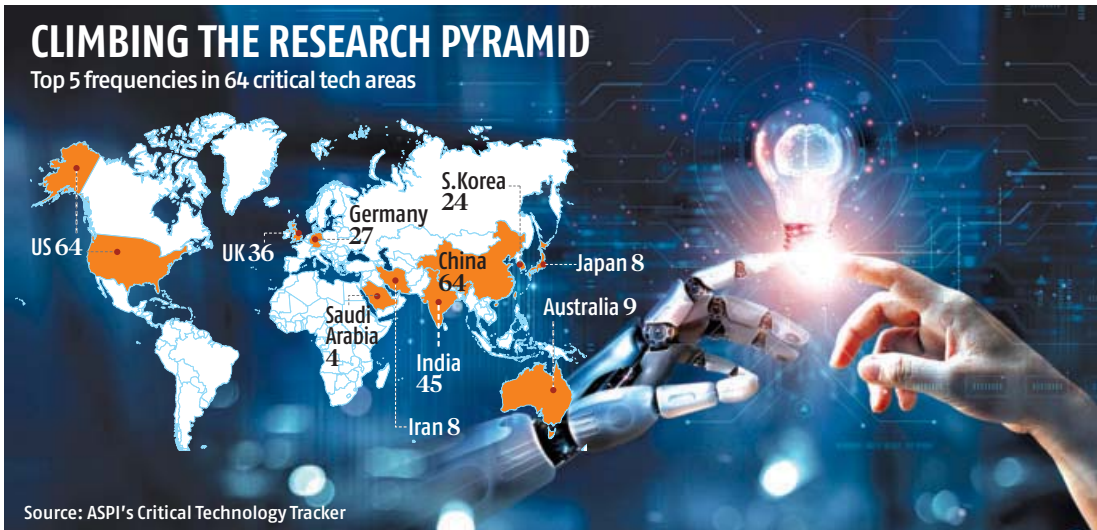


India among critical tech leaders, behind only US and China in AI

Among top five countries in 45 of 64 critical technologies



SURAJEET DAS GUPTA
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India has emerged as a global research powerhouse, ranking among the top five countries in 45 out of 64 critical technologies in 2023, up from 37 a year before. According to the *Critical Technology Tracker* report by the Australian Strategic Policy Institute, the country has secured the second position in seven technologies.

In 2023, India also overtook the US to claim the second spot in two emerging fields of technological research: biological manufacturing and distributed ledger technology.

In the fast-evolving field of artificial intelligence (AI), India ranks just behind the US and China in various key segments, including advanced data analytics, AI algorithm, hardware accelerator, machine learning, advanced integrated circuit design and fabrication, natural language processing, and adversarial AI.

This marks a big leap from 2003–2007, when India ranked in the top five for only four technologies, according to the report. The tracker covers critical technologies across a wide range of fields, including space, defence, energy, environment, AI, robotics, biotechnology, cybersecurity, advanced computing, advanced material, and quantum technology. It compiles data spanning from 2003 to 2023, tracking high-impact research — defined as the top 10 per cent of the most-cited papers — as an indicator of a country's research performance, strategic goals, and future technological potential.

China tops the global research charts, dominating in

57 out of 64 critical technologies. In contrast, the US, which led in 60 technologies between 2003 and 2007, now holds the top spot in just seven areas (based on 2019–2023 rankings), including quantum computing and vaccine and medical countermeasures.

The UK has also seen a decline in its standing, now ranking in the top five in 37 technologies, down from 44 last year. The European Union, counted as a bloc, leads in two areas — small satellite and gravitational force sensor — and ranks second in 30. Germany remains strong, placing in the top five for 27 technologies.

Although India has yet to lead in any critical technology, it has secured the second position in areas such as high-specific machine process, advanced composite material, mesh and infrastructure-independent network, smart material, and biofuel.

India also ranks third in several key technologies, including electronic warfare, autonomous underwater vehicle, sonar and acoustic sensor, photonic sensor, post-quantum cryptography, photovoltaic, nuclear waste management, supercapacitor, and advanced aircraft engine.

However, the report highlights a big drawback of India's research efforts: the lack of standout research performers. Only five Indian institutions feature in the top five across the 64 technologies over the past two decades (2003–2023).

"This lack of standout performers (where research is very fragmented) may be limiting India's ability to attract foreign research talent and motivate Indian scientists and technologists to stay at, or come back to Indian institutions," the report observes.