

TECHNOLOGICAL DEVELOPMENTS IN INDIA

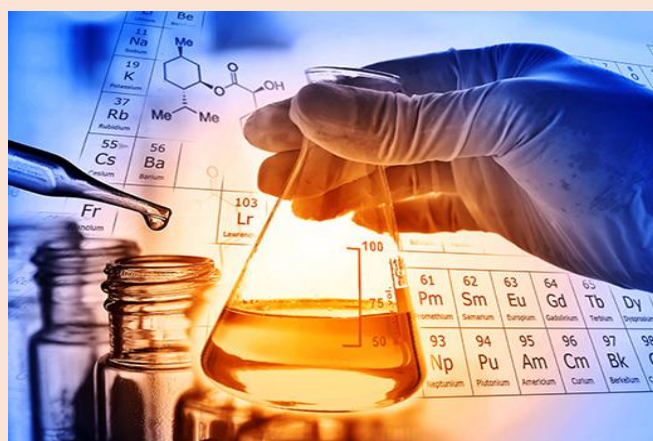
Introduction

Modern India has had a strong focus on science and technology, realizing that it is a key element for economic growth. India ranks third among the most attractive investment destinations for technology transactions in the world. With more and more multinational companies setting up their R&D centres in India, the sector has seen an uptrend in investment in recent years.

India is among the top countries globally in the field of scientific research, positioned as one of the top five nations in the field of space exploration. The country has regularly undertaken space missions, including missions to the moon and the famed Polar Satellite Launch Vehicle (PSLV). India is likely to take a leading role in launching satellites for the SAARC nations, generating revenue by offering its space facilities for use to other countries.

The government has introduced multiple policies aimed at projecting India as a science and technology powerhouse and promoting both public and private sector involvement in the R&D practice. As a result, India's gross expenditure on R&D (GERD) has been consistently increasing over the years. The government has also implemented several fellowship schemes to nurture the human capacity for advanced research in the country.

Spending in the Indian information technology (IT) sector is projected to reach US\$ 138.9 billion in 2024, compared to US\$ 122.6 billion last year, with a double-digit growth rate of 13.2%.



Market size

The engineering R&D and product development market in India is forecast to post a CAGR of 12% to reach US\$ 63 billion by 2025, from US\$ 31 billion in 2019. As per the Economic Survey 2022, India's gross domestic expenditure on R&D (GERD) as a percentage of GDP stood at 0.66%.

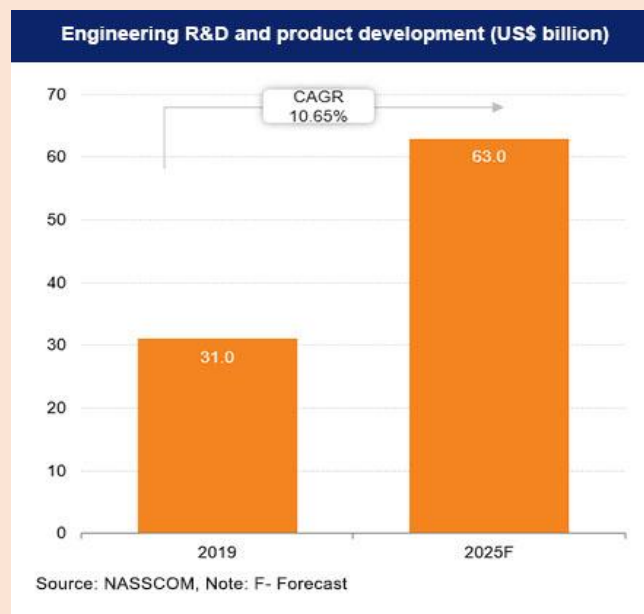
There are 153,795 recognized start-ups as on November 2024 start-ups from 350 in 2014. India has witnessed an investment of over Rs. 1,000 crore (US\$ 120.21 million) in Space Start-ups in the last nine months between April to December 2023.

India's gross expenditure on R&D (GERD) as a percentage of GDP has remained stagnant at around 0.7% for about a decade, lower than Brazil (1.16%), South Africa (0.83%) and others.

IT spending in India will grow 10.7% YoY to reach US\$ 124.6 billion in 2024, as forecasted by Gartner. India's bio-economy was valued at US\$ 137 billion in 2022 and aims to achieve US\$ 300 billion mark by 2030.

In FY21, the science and technology sector added 1,497,501 employees, becoming India's top employment generator.

Under the Interim Budget 2024-25, the government announced an allocation of Rs. 8,029 crore (US\$ 966 million) to the Department of Science and Technology and Rs. 16,604 crore (US\$ 2 billion) to the Ministry of Science and Technology.



In the Interim Budget 2024-25, the government announced corpus of Rs. 1 lakh crore (US\$ 12 billion) to promote Innovation and StartUps coupled with a new scheme for Deep Tech Start-Ups in Defence.

According to Commerce and Industry Minister, Mr. Piyush Goyal, the Indian patent office has granted the "highest" number of 41,010 patents till November 15th, 2023.

The Indian Patent Office has crossed the one lakh mark for the first time this year, with 1,01,311 patents being granted by the department between March 15, 2023, to March 14, 2024, reflecting the government efforts to enhance the intellectual property rights framework.

India is ranked in 7th position in terms of Resident Patent Filing activity in the world.

In India, there are more than 1,580 Global Capability Centres (GCCs), where companies can outsource their product development and receive product engineering services, with the GCC market size crossing US\$ 46 billion (as of FY23). These GCCs are home to some of the largest companies, many of which have their largest or second-largest R&D centres located in the country.

Accenture offers a framework for assessing the economic effect of AI for selected G20 countries in its latest AI research studies and forecasts that AI will raise India's annual growth rate by 1.3% by 2035. India's National Artificial Intelligence Strategy prepared by NITI Aayog outlined a way forward to harness the potential of Artificial Intelligence (AI) in different fields. State University Research Excellence (SERB-SURE) to create a robust R&D ecosystem in state universities and colleges; Fund for Industrial Research Engagement (SERB-FIRE) to support research and development to solve critical problems that are relevant to industries in a public-private partnership mode.

Developments / Investments

Some of the recent developments in the field of science and technology in India are as follows:

- India is poised to establish itself as a global hub for drone technology, a development that is anticipated to significantly enhance the Indian economy. This initiative aligns with the government's Make in India and Atmanirbhar Bharat programs, as emphasized by Union Minister of Defence, Mr. Rajnath Singh.
- India's space ambitions include plans to establish its own space station, the "Bharatiya Antariksh Station," by 2035, along with aspirations for an Indian lunar

landing by 2040. This announcement was made by the Union Minister of State (Independent Charge) for Science and Technology.

- Researchers have developed a novel technology for the precise detection of the HIV genome by targeting G-Quadruplex (GQ) structures, which are unique four-stranded DNA formations. Utilizing tailored fluorogenic tests, this diagnostic platform enhances reliability and significantly reduces false positives in HIV detection, improving overall diagnostic accuracy.
- Union budget FY25 announces venture capital fund of US\$ 119.5 million (Rs. 1,000 crore) will be established to expand the space economy by 5 times over the next decade.
- Union Minister Mr. Jitendra Singh announced that India will establish a National Research Foundation (Anusadhan NRF) to transform research and development. Once operational, it will bridge public and private sectors, fostering collaboration between industry and academia.
- As per Bain and Company healthcare innovation in India is currently a US\$ 30 billion and Poised to become an approximately US\$ 60 billion opportunities by FY28.
- Tata Electronics, with Powerchip Semiconductor Manufacturing Corp (PSMC) Taiwan, will establish a US\$ 11 billion (Rs. 91,000 crore) semiconductor unit in Gujarat, generating 20,000 skilled jobs. Additionally, Tata's TSAT, along with two large American conglomerates, will invest US\$ 3.3 billion (Rs. 27,000 crore) in a semiconductor plant in Assam, creating 27,000 jobs. CG Power, in partnership with Renesas Electronics Corporation, Japan, and Stars Microelectronics, Thailand, will set up a semiconductor unit in Gujarat with an investment of ~US\$ 915 million (Rs. 7,600 crore).
- In November 2023, Lupin Ltd. unveiled world's first fixed-dose triple combination drug for managing chronic obstructive pulmonary disease (COPD).
- In October 2023, Glenmark Pharmaceuticals introduced Zita, a cost-effective triple combination drug for Type 2 diabetes treatment, enhancing glycemic control in diabetic patients.
- Under the National Mission on Interdisciplinary Cyber Physical System (NM-ICPS), 25 Technology Innovation Hubs (TIHs) have been established in the areas of advanced technologies which carry out their activities under 4 major categories, i.e. Technology Development, Human Resource Development, Entrepreneurship Development and Industrial Collaborations. Mission has developed 311 technologies, 549 technology products, 63000+ Human Resource,

1200 Jobs creation and nearly 124 international collaborations till December 2023.

- A total of 192 training programs were organized under this Scheme during the year 2022 and around 8,573 researchers have been trained under Synergistic Training program Utilizing the Scientific and Technological Infrastructure (STUTI).
- In October 2023, the Anusandhan National Research Foundation (NRF) will promote the culture of research and innovation throughout India's universities, colleges, research institutions, and R&D laboratories and give further impetus to clean energy research in India and Mission Innovation, according to Union Minister, Dr. Jitendra Singh.
- In September 2023, Agri-start-ups were recommended for technical & financial support from pool of Rs. 20 crore (US\$ 2.40 million).
- The National Centre for Good Governance (NCGG) and the Indian National Science Academy (INSA) have joined hands and have launched the 'NCGG – INSA Leadership Programme in Science & Technology (LEADS). Recognizing the critical role played by the scientific leadership in driving scientific progress, this joint initiative seeks to empower them with the tools and capabilities required to effectively lead and navigate the rapidly evolving landscape of science and technology.
- In November 2022, Norwest Venture Partners agreed to invest US\$ 32 million in Cerebral Technologies, which specialises in AI, big data, and enterprise cloud among other technologies. In exchange, Norwest Venture Partners will acquire a minority stake in the company.
- In August 2022, a centre of excellence (CoE) for the Metaverse and Web3 technologies was opened in India by Coforge, a provider of digital services and solutions. Over 1,000 people will be trained and upskilled by the company.
- In August 2022, Samsung announced that it was expanding its industry-academia program PRISM (Preparing and Inspiring Student Minds) across 70 engineering colleges in India. The program will help educate students in the domains of artificial intelligence, machine learning and IoT.
- Technology incubator T-Hub launched the semiconductor companion of the AIC T-Hub Foundation programme to develop innovation and entrepreneurship across the semiconductor sector start-ups.
- Actis, a global investor in sustainable infrastructure, is planning to invest over US\$ 700 million to acquire and expand assets for its platform aimed at offering real estate to tenants in the life sciences and allied sectors in India.

- In March 2022, Toyota launched its Mirai hydrogen fuel cell car in India. The Indian Oil Corporation would be supplying hydrogen to power the car.
- India's Top 5 IT firms (TCS, Infosys, Wipro, HCL and Tech Mahindra) added more than 122,000 employees in the first six months of FY22, nearly matching the 138,000 employees hired in the entirety of FY21.
- In October 2021, Biz2Credit, a fintech company, announced a plan to invest US\$ 100 million in India over the next five years in research and development activities and expansions.
- From 2014 to 2021, India recorded a 572% growth in patent approvals.
- To accelerate digital innovation in India, NITI Aayog, Amazon Web Services and Intel have come together to develop a new experience studio to boost problem-solving and innovation between government stakeholders, start-ups, enterprises, and industry experts. The new experience studio will use technologies such as artificial intelligence, machine learning, Internet of Things, augmented reality, virtual reality, block chain and robotics to accelerate their use in the public sector.
- TechnoPro, a Japanese tech firm, plans to hire 10,000 engineers and researchers in India by 2022-23.
- Qualcomm plans to invest US\$ 8.5 million on design initiatives in India, which would include funding its innovation labs at Hyderabad and Bangalore for R&D.

Government Initiatives

Some of the recent initiatives taken by the Government of India to promote science and technology in India are:

- In the Interim Budget 2024-25, the government announced corpus of Rs. 1 lakh crore (US\$ 12 billion) to promote Innovation and Start-Ups coupled with a new scheme for Deep Tech Start-Ups in Defence.
- In 2023, The National Quantum Mission (NQM) was launched with a budget of ~US\$ 726 million (Rs. 6003.65 crore) spanning from 2023-24 to 2030-31 aimed at fostering scientific and industrial R&D in Quantum Technology, propelling India's leadership in Quantum Technologies & Applications.
- In October 2023, Union Minister Dr. Jitendra Singh launched state-of-art latest National Survey Network; the nationwide "Continuously Operating Reference Stations" (CORS) Network that will be operated by the Survey of India. The Survey of India has set up more than 1,000 CORS stations across India.

- Union Minister of Chemicals and Fertilizers, Dr Mansukh Mandaviya launches National Policy on Research and Development and Innovation in Pharma-MedTech Sector in India and Scheme for promotion of Research and Innovation in Pharma MedTech Sector (PRIP) in September 2023.
- The Indian Space Policy-2023: It was approved by the Cabinet Committee on Security on April 6, also permits non-government entities (NGEs) to offer national and international space-based communication services, through self-owned, procured or leased geostationary orbit (GSO) and non-geostationary satellite orbit (NGSO) satellite systems. NGSO is a reference to low earth orbit or medium earth orbits that are home to satellites providing broadband internet services from space.

The policy also encourages NGEs to establish and operate ground facilities for space object operations, such as telemetry, tracking and command (TT&C) Earth Stations and Satellite Control Centres (SCCs).

- In 2023, Strengthening, Upscaling & Nurturing Local Innovations for Livelihood (SUNIL) Programme
 - Technology delivery & enterprise creation model for improving the efficiency of the livelihood system.
 - Technology interventions for Addressing Societal Needs (TIASN).
 - Capacity Building of Community-based organizations (CBOs), NGOs, Knowledge Institutions (KI) & Social Start-ups.
- The Technology Interventions for Disabled and Elderly (TIDE) programme is a unique initiative of DST to create inclusiveness and universal accessibility for Divyangjan and the Elderly, through the promotion and development of various assistive tools, technologies, techniques, affordable & adaptable to the Indian milieu.
- In November 2022, India announced an additional contribution of US\$ 5 million to the ASEAN-India Science and Technology fund to increase cooperation in sectors of public health, renewable energy, and smart agriculture.
- In November 2022, the Department of Science and Technology (DST) and the Centre for Science and Environment (CSE) decided to work together to build a platform to support the development of new electric vehicle (EV) batteries that meet Indian regulations.

- A MoU was signed between the Department of Science and Technology (DST), the Ministry of Science and Technology & Earth Sciences, and the Ministry of Ayush. The MoU outlines potential research areas to investigate collaboration, convergence, and synergy for an evidence-based scientific intervention in the Ayush sector and further integration of these into the public health care system.
- The Indian Council of Medical Research (ICMR) has received 31 bids from manufacturers showing interest in developing the vaccine for the monkey pox virus after the medical body put out an Expression of Interest (EOI) for the development of vaccine and diagnostic kits.
- In 2021-22, African Centres of Excellence in a few specific scientific fields were strengthened by twinning with Indian institutes to carry out the Africa-India S&T Initiative Program by the Department of Science and Technology.
- The Department of Science & Technology (DST) has revamped the FIST (Fund for Improvement of S & T Infrastructure in Universities and Higher Educational Institutions) programme to align it with the objective of Atmanirbhar Bharat by developing R&D infrastructure for use by start-ups, manufacturing companies, and MSMEs, in addition to R&D operations in academic organisations.
- The Women Science programme of DST has started a new initiative to support women PG colleges under the CURIE (Consolidation of University Research for Innovation and Excellence in Women Universities) Program and invited proposals for the same.
- Under the Union Budget 2023-24, the government announced the allocation of Rs. 16,361 crore (US\$ 1.99 billion) to the Department of Science and Technology.
- To further India with High-Performance Computing (HPC), four new Supercomputers have been installed since July 2021 - one each at IIT-Hyderabad, NABI-Mohali, CDAC-Bengaluru, and IIT Kanpur.
- Synergistic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI), a new initiative, was recently unveiled to enhance human resource development and capacity building through nationwide open access to science and technology infrastructure.
- The Science and Engineering Research Board (SERB) has partnered with Intel India to launch a first-of-its-kind initiative to advance deep tech-based research in India.
- In November 2021, the Ministry of Science and Technology and Ministry of Earth Sciences, in association with Vijnana Bharati (VIBHA), launched the India International Science Festival 2021, a unique platform, with its theme being a

celebration of creativity in science, technology and innovation for a prosperous India.

- In November 2021, Atal Innovation Mission and Vigyan Prasar collaborated to drive synergies between Atal Tinkering Labs and Vigyan Prasar's unique platform, Engage with Science.
- In October 2021, the government announced plans to establish 75 science technology & innovation hubs in India for scheduled castes (SCs) and scheduled tribes (STs) and empower them to contribute to the socio-economic improvement of the country.
- In October 2021, the government launched the Indian Space Association (ISpA) to accelerate technology advancements and strengthen the space sector in the country.
- In October 2021, India and Denmark agreed to a five-year plan to implement a green strategic partnership for enhancing collaboration in various areas including science and technology.
- In October 2021, India and Europe held discussions to review the progress of science and technology bilateral cooperation and strengthen efforts on research and innovation.

The Road Ahead

India ranks third among the most innovative lower-middle-income economies in the world. Rising per capita income in India will bring a boom in R&D investment in the country with multiple foreign players shifting R&D bases to India. R&D investment and multiple government policies have helped Indian companies overcome tight competition with affordable products internationally.

India plans to move forward with developing its science and technology sector by collaborating with other countries. India has active bilateral science and technology (S&T) programs of cooperation with more than 45 countries, including dedicated programs for Africa, ASEAN, BRICS, EU and neighbouring countries. In 2021, India also collaborated with Denmark and agreed to a five-year plan to implement a green strategic partnership for enhancing partnerships in various areas, including science and technology.

India is aggressively working towards establishing itself as a leader in industrialization and technological development. Significant developments in the nuclear energy sector are likely as India looks to expand its nuclear capacity.



Moreover, nanotechnology is expected to transform India's pharmaceutical industry. The agriculture sector is also likely to undergo a major revamp with the government investing heavily in a technology-driven green revolution. The Government of India, through the Science, Technology, and Innovation (STI) Policy-2013, among other things, aspires to position India among the world's top five scientific powers.

References - Media Reports, Press Releases, Press Information Bureau (PIB), Union Budget 2022-23/ 2023-24

Source : <https://www.ibef.org/industry/science-and-technology>

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