Research ecosystem within Indian higher-education sector: strategic pillars of reform across academic and industry research

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FICCI

EY Parthenon

Building a better working world

FICCI Foreword

India's higher education landscape is poised for a transformative shift, with research emerging as a key driver of growth and innovation. While significant strides have been made, the nation's research output and impact still lag behind global leaders. The National Education Policy (NEP) 2020 provides a roadmap for addressing these challenges and fostering a vibrant research ecosystem.

Innovation in research will be critical to this transformation, requiring not just incremental advancements but groundbreaking ideas that challenge conventional boundaries. By adopting emerging technologies, encouraging risk-taking, and cultivating an entrepreneurial mindset, India’s research institutions can drive solutions to the most pressing global challenges.

FICCI EY-Parthenon report 2024, "Research ecosystem within Indian higher-education sector: strategic pillars of reform across academic and industry research," delves into the multifaceted challenges and opportunities facing India's research landscape. The report analyzes the current state of research, research models, and discusses the critical role of government policies and institutional factors.

We would like to acknowledge the rich insights shared by senior education and industry leaders while developing the report. Some of the key findings include the need for increased investment in research infrastructure and faculty development, fostering interdisciplinary collaboration, and promoting a culture of intellectual curiosity. Government policies should focus on providing adequate funding, streamlining regulatory processes, and incentivizing industry-academia partnerships.

With more focus and a concerted approach from all stakeholders, India can position itself as a global leader in innovation and knowledge creation. This knowledge report should serve as a catalyst for action, providing insights and recommendations to guide policymakers, university administrators, researchers, and industry leaders in their efforts to build a vibrant and impactful research ecosystem.

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EY-Parthenon Foreword

Research and innovation lie at the heart of any nation's growth, and India is no exception. Over the past few decades, we have witnessed significant strides in the research ecosystem, with a growing number of papers published and patents filed. India now ranks fourth globally in research output, and the number of patents has surged, particularly in fields like technology, healthcare, and renewable energy.

However, while the quantity of research has risen over the years, the quality remains a significant challenge. Indicators such as the H-index and citations per paper lag behind global peers. This quality gap is compounded by low funding and sponsorships, which hinder the ability of research to translate into actionable outputs, ultimately reducing its contribution to the economy and industry.

Recognizing these challenges, the Government of India has introduced critical initiatives such as the National Research Foundation (NRF), conceptualized under the 2020 NEP, and central grants to foster a stronger research culture. While the NRF marks an important step toward strengthening the research culture, its true impact will depend on how effectively the funds are distributed and whether research is prioritized in the right areas. Successful execution will be essential to ensure a broader impact on the economy.

These initiatives, combined with increased collaboration between industry and academia, signal a promising future for research in India. However, aligning R&D expenditure with the nation's long-term economic aspirations is essential if India is to secure its position as a global research leader.

Despite these efforts, the research landscape in India remains fragmented, with institutions and sectors often operating in isolation. To truly unlock our potential, we must unite these fragmented pieces and work toward a common goal. A cohesive approach will not only amplify our output but also help address pressing global challenges and contribute meaningfully to the Sustainable Development Goals (SDGs).

Strategic reforms–monetary, operational, policy-driven, and personnel-based–are essential to internationalizing research within our higher education institutions. By strengthening these pillars, India can build a robust ecosystem that not only enhances academic excellence but also drives innovation and social development.

This report delves into these challenges and opportunities, exploring the path forward for Indian research over the next few years. It aims to provide a clear direction for stakeholders, emphasizing the importance of quality, collaboration, and investment to unlock India's full research potential.

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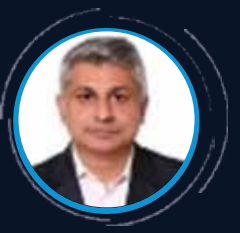

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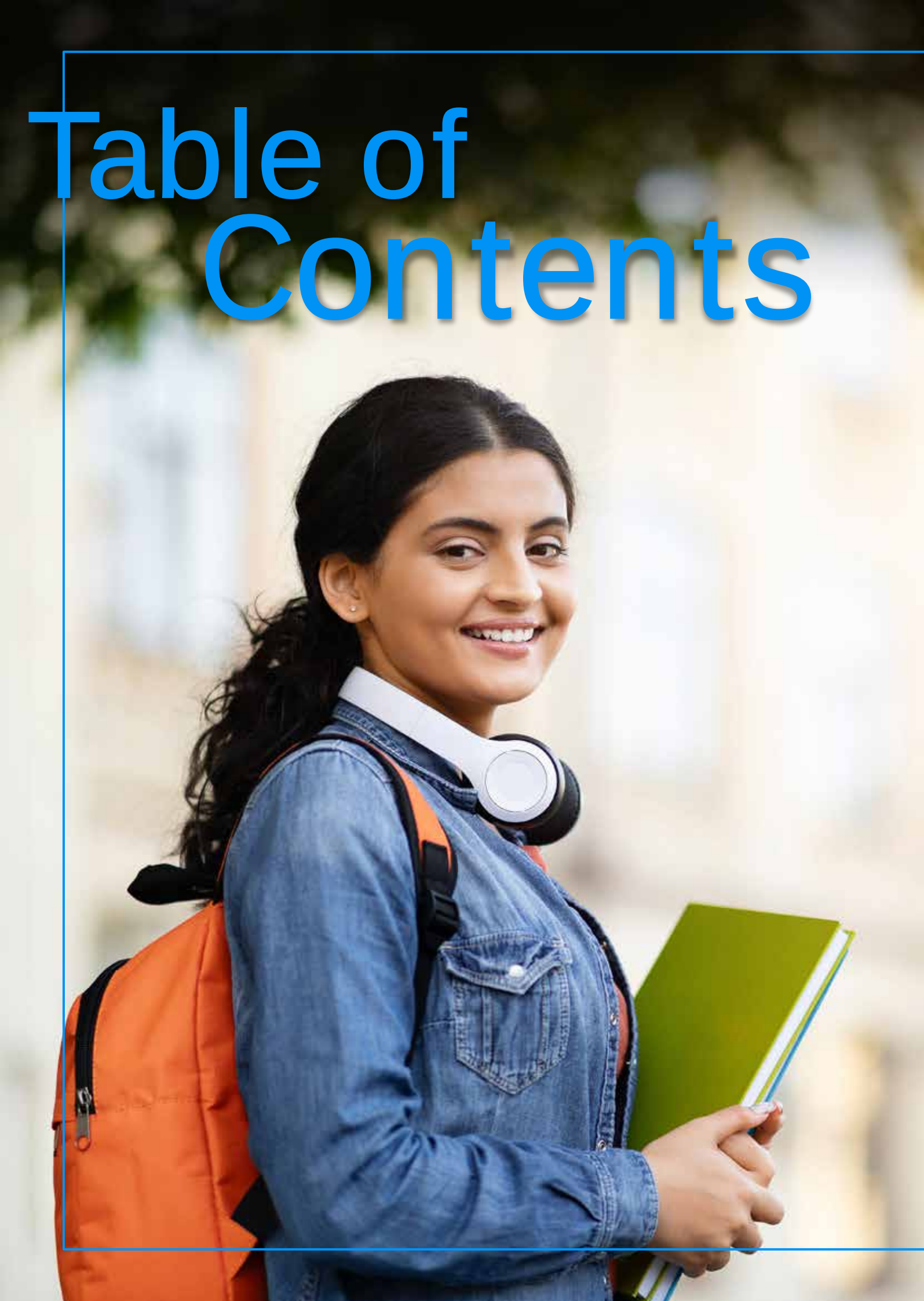


01

Executive summary

Executive summary

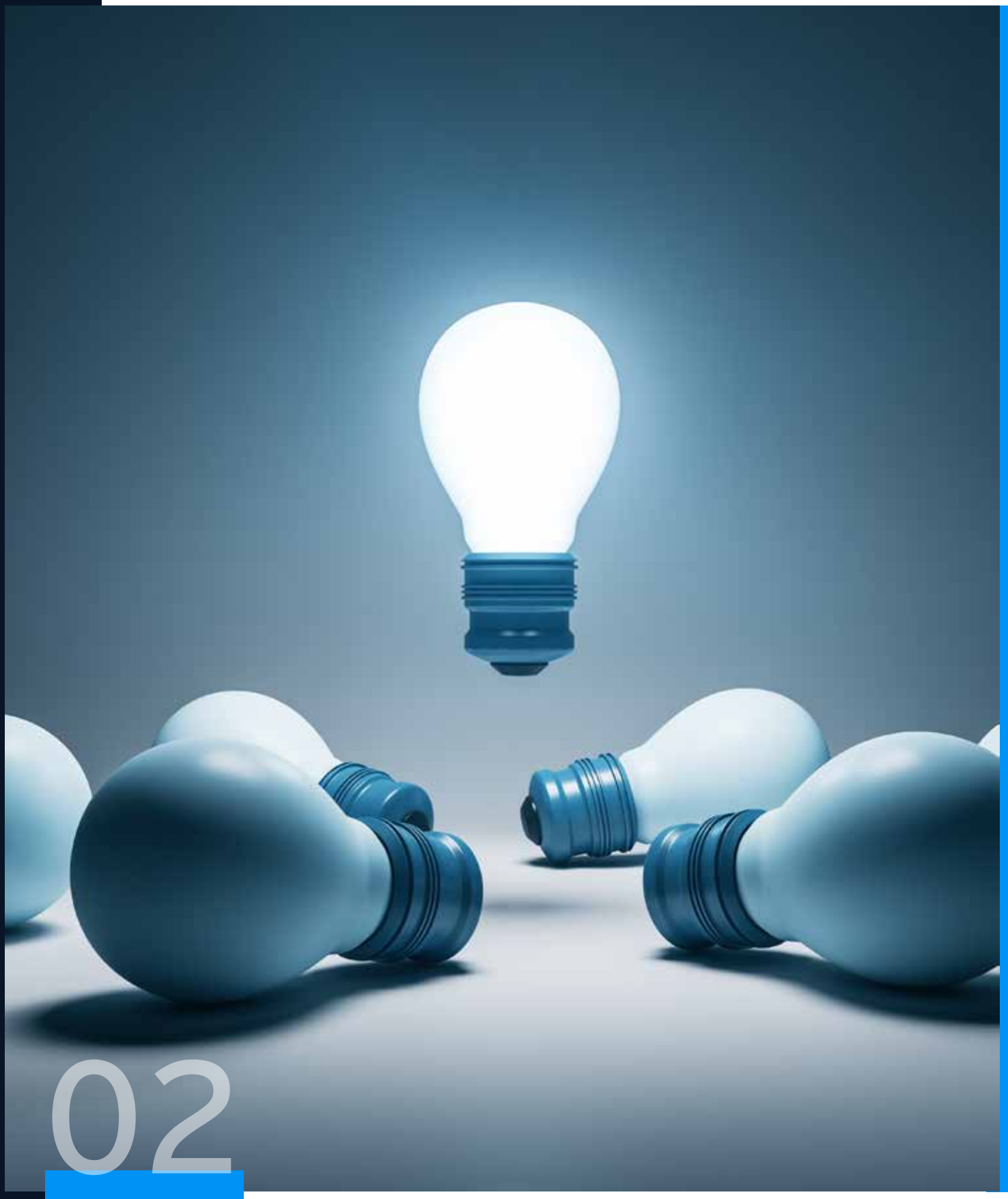
- The report offers a comprehensive analysis of research in HEIs in India, highlighting its significance for both HEIs and the country. It emphasizes how strengthening research infrastructure can help India achieve Vision 2047 and the SDGs.
- The document further gives a detailed overview of the current scenario in the Indian HEI and points out challenges faced by the research ecosystem.
- The report categorizes research into academic, industry, and industry-academia models based on who is conducting it, how it is funded and the purpose of the research. It analyzes each model's current state, global comparisons, trends, challenges and research demand, along with relevant government policies.

Key area	Current scenario
Research ecosystem	The research ecosystem is fragmented and there is lack of strong coordination between different entities. This limits cross disciplinary research and collaboration.
R&D spending and innovation	India's R&D expenditure, driven mainly by the government, is lower (0.65% of GDP) than developed nations, leading to weak research infrastructure and quality. Corporate R&D spending (41% of Gross Expenditure on Research & Development) is also low, limiting innovation.
Research output	India ranks fourth in paper publications, but quality indicators like H-index and citations per paper lag behind global peers. Fields like AI and data science have progressed due to lesser reliance on infrastructure.
Motivation and incentives for faculty and students	In India, there is often a deficiency in motivation among teachers and students to engage in research activities, resulting in substandard research outcomes.
Funding and sponsorships of institutes	Indian institutes are not able to attract the level of sponsorships and funding through consultancy and research projects as their global counterparts.
Internationalization of education	Internationalization of education is in its early stages, but NEP 2020 is encouraging cross-border collaborations by attracting international faculty and students.

Key area	Current scenario
 Industry-academia collaboration	India is witnessing a gradual increase in collaboration between industry and academia. However, this trend primarily favors top-tier institutes, while Tier 2 and 3 institutes struggle to forge such collaborations.
 Regulatory framework	While the government has promoted research, innovation and startups through NEP, there is still work to be done on IPR laws, patents etc. to make it more streamlined and transparent.

Further, the report identifies key gaps in the Indian research ecosystem for each model of research and highlighted certain best practices undertaken by global and Indian institutes. It uses the five-pillar strategic framework (monetary, operational, policy, personnel and innovation) to provide action-oriented recommendations on the gaps with timeframe within which it needs to be achieved, to enhance India's global research stature.

- The recommendations for various stakeholders in the research ecosystem that should help drive the research industry into the pinnacle.
  - For academia – restructure course and credits system to incentivize research, quality focussed research grants, strengthen incubation programs, and integrating interdisciplinary research into curriculum
  - For industry – focus on developing innovative technology, increase spending on research through CSR Programs, and establish dedicated liaison offices with HEIs for funding of research
  - For government – streamline the IPR process, equitable research funding for all colleges and not just the premium reputed HEIs, develop tools to correctly assesses the impact of research and mandate framework on research ethics



02

Introduction and context

Many factors have made research very important and significant in Indian higher education

- Objective: This chapter discusses the significance of research in higher education, the status of Indian HEIs in the global context, the strategies employed by leading universities that India can learn from, and the potential role of Indian universities in driving national vision @2047 and sustainable development goals.
- Vision India 2047 envisages transformation of the country into a developed nation with a US$30 trillion economy by the time the country completes hundred years of independence. The plan aims to make the country a global leader in innovation and technology, build world-class infrastructure and foster green growth.
- If India is to become a leader in emerging and critical areas, and truly achieve the potential of its vast talent pool to again become a leading knowledge society in the coming years and decades, the nation will require a significant expansion of its research capabilities and output across disciplines.

Why is research Important for India?

Social development

- Research provides evidence-based insights that shape effective social policies and programs. It helps in identifying and addressing social challenges such as poverty, inequality and social justice
- Research into microfinance models in Bangladesh by Muhammad Yunus led to the development of Grameen Bank, which has lifted many out of poverty[2]

Economic development

- Research leads to new technologies and innovations that drive industrial growth and enhance productivity
  (E.g.: UPI as a means of digital payments)
- Research initiatives and resultant industries create new job opportunities and skill development

Global competitiveness

- Develops skilled, ethical and innovative human resources
- A strong research ecosystem attracts global partnerships, funding and expertise
- This enhances the India's competitive edge and reputation
- Research and innovation ecosystems in India have led to a 30% increase in domestic patent filings, with over 83000 patents filed in 2023[3]

Healthcare advancements

- Research helps in understanding and addressing public health challenges, improving overall health outcomes
- India's research in vaccine development, particularly through the ICMR and Bharat Biotech, led to the indigenous creation of Covaxin, that helped counter and manage the COVID-19 pandemic.

Environmental sustainability

- Research develops strategies and technologies to combat climate change and its impacts. (E.g.: IISc's research relating to climate change impacts on the Indian monsoon)[4]
- It promotes sustainable management of natural resources, reducing environmental degradation

Knowledge expansion

- Quality research expands the knowledge base through empirical studies
- This knowledge base is an essential springboard to future scientific endeavours
- Research at ISRO led to the Mangalyaan achieving orbit at a low cost of $74 million. This mission has expanded global knowledge in space exploration and is cited as a model for cost-efficient space missions[5]

Source: 1. Lok Sabha Document, 2. Brittanica, 3. Nasscom , 4. IISC website 5. NBC News, EYP analysis

Despite the vastness of India's research ecosystem, there is a noticeable fragmentation, with various constituents operating in isolation

- The research ecosystem should bring in the HEIs, industry and the government together to collaborate to potentials ways to harness research capabilities of the country by pooling together resources, expertise and technologies.
- Promote open access to research findings and knowledge sharing among researchers, policymakers and students to strengthen collaboration between all stakeholders.
- Researchers should be encouraged to do research on NEP 2020 to understand its impact on the overall education system. Inputs from researchers can help the government make improvements to the policy, as the policy looks to transform the Indian education system.

Research ecosystem

Private sector companies	• Conduct research that is typically focused on product development and innovation that can lead to commercialization • Invest in R&D to stay competitive, improve processes, and bring new products
Research foundations and NGOs	• Invest in R&D to stay competitive, improve processes, and bring new products • Research activities can be both independent and collaborative with academic or government institutions
Science and technology parks	• Support the commercialization of research by providing infrastructure, resources and services to startups and established companies
Government agencies and departments	• Responsible for setting the research agenda at the national level • They cover a broad spectrum of disciplines, including science and technology, atomic energy etc.
Academic institutions (HEIs)	• They are the backbone of the research ecosystem, providing education and training for future researchers • They conduct both fundamental and applied research

Focus of NEP Vision 2020

Research is the cornerstone for HEIs in fostering education, innovation and social development

- Research benefits not only an institution but also the students and faculty members involved.
- Knowledge creation and research are critical in growing and sustaining a large and vibrant economy, uplifting society, and continuously inspiring a nation to achieve ever greater heights, contributing in this way to nation-building.

Why is research important for various higher education stakeholders in India

Importance for universities

- **Reputation and prestige**: Conducting high-quality research enhances the university's reputation, helping to attract top-tier students, faculty, and research funding. IISc, IIT-B, IIT-D rank among the top 200 universities globally in the QS ranking 2023[1], reflecting their strong research output and reputation. IISc scored the highest in the world in the citations per faculty metric[2]
- **Advancement of knowledge**: Universities are at the forefront of generating new knowledge and technologies, which drives societal progress and addresses global challenges.
- **Economic impact**: Research activities often lead to innovations that stimulate economic growth, create jobs and foster partnerships with industry

Importance for students

- **Enhanced learning experience**: Research involvement allows students to engage with the latest knowledge and methodologies, enriching their educational experience beyond traditional classroom learning.
- **Skill development**: Participating in research helps students develop critical thinking, problem-solving, and technical skills, preparing them for future careers in academia, industry, or other fields.
- **Career preparation**: Research experience is highly valued by employers and graduate programs, giving students a competitive edge in the job market and further educational opportunities

Importance for faculty

- **Professional growth**: Engaging in research enables faculty to stay at the cutting edge of their fields, contributing to their professional development and academic advancement
- **Contribution to academic community**: Faculty research contributes to the body of knowledge within their disciplines, fostering intellectual growth and collaboration within the academic community.
- **Funding and resources**: Successful research projects can attract grants and funding, providing resources that support further research, teaching, and institutional development. IIT-B received INR700 crore in research grants in 2024, a ~22% jump from last year. 35% of this grant is through industry partnership[3]
- **Combine theory with practice**: Research provides faculty with opportunities to bridge the gap between theoretical concepts and practical applications. By engaging in research, faculty can incorporate real-world data and experiences into their teaching, making learning more experiential and relevant

Source: 1. Indian Express, 2. IISC Website 3. TOI, EYP analysis

India is the third largest higher education system in the world, trailing only behind the United States and China

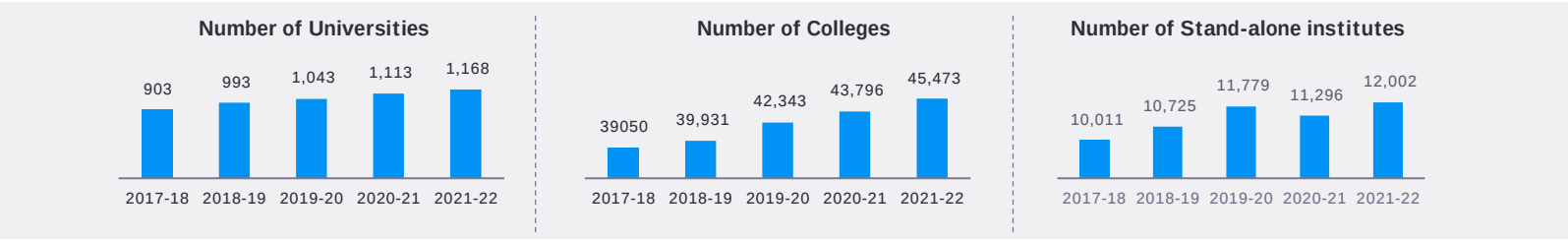
Overview of Indian HEIs

Academic institutions:

India has one of the world's largest higher education system in the world consisting of **58,643** institutes, most of them are privately owned.

The institutes can be categorized into three major categories:

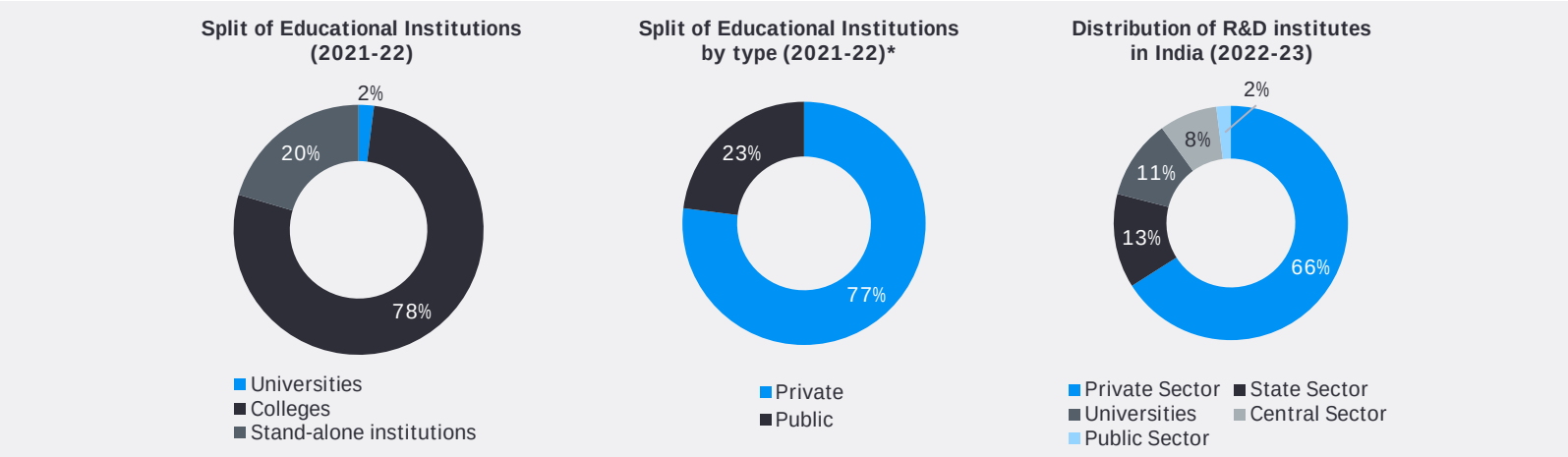
- **Universities:** HEIs that are empowered to award degrees under a state or a central act
- **Colleges:** HEIs that are not empowered to grant their own degrees and need to be affiliated with universities
- **Stand-alone institutes:** Institutions that run diploma or PG diploma level programs, for which they require recognition from a statutory body



Source: AISHE Reports

Structure of institutes:

- The number of universities, colleges and stand-alone institutes in India have grown at a modest rate only, reflecting a clear lack of investment in education at the country level, especially in government institutions.
- Government expenditure on education as percentage of GDP is around 4.6%[1], well below the recommended 6% in the NEP 2020.
- India's higher education system is dominated by the private sector due to this limited spending from the government on public institutes and better quality of teaching by private institutes.
- There are ~850 universities which are counted as R&D institutes, which means only 1.5% of all educational institutes in the country are research oriented.



* Percentages based on institutes responding to the AISHE survey

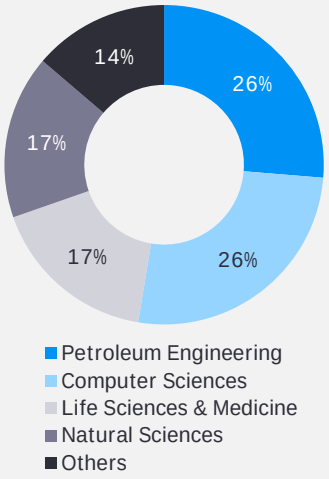
Source: AISHE Report 2021-22

Source: Department of Science & Technology Report2022-23

Many Indian HEIs have set themselves apart by outperforming global institutes in average research output

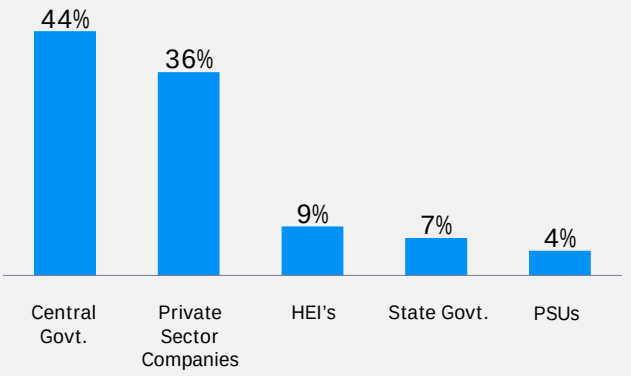
Overview of Indian research ecosystem

Research output in India (2017-22)



Source: TOI

Share in GERD (2020-21)



Source: R&D Statistics 2023, Department of Science & Technology

Research KPIs:

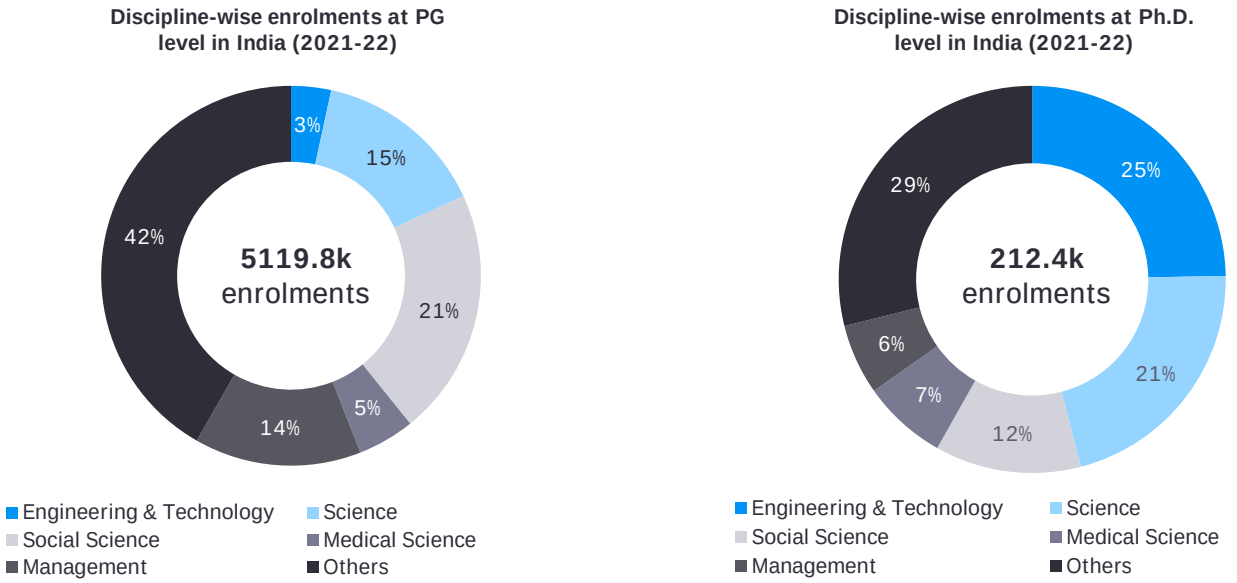
- India's 11 public and private institutes of eminence have produced more than 150K academic papers, generated and recorded in an average research growth rate of 35% since 2017[1]
- The institutes of eminence have maintained a growth rate that is 13% higher than even the global average in growth of research output[1]
- India produced 19% of its research output along with international collaborators, slightly lagging the international average of 21%[2]

Funding sources:

- Government funding has traditionally been the backbone of Indian research but there has been a significant shift in recent years with private sector investment growing, signalling a more balanced and dynamic R&D ecosystem in India
- SERB-SURE is one of many govt schemes that provides research support to active researchers belonging to state universities and colleges, including private universities and colleges across India to undertake research and development in frontier areas of science, engineering and quantitative social science[3]
- India has a total of 7,888 research institutes, with private sector accounting for around 66%. However, even private sector institutes use schemes like SERB-SURE to secure government grants for their research, using that as a driver for growth in research[4]
- More than 1000 multinational corporations, including Texas Instruments, Intel, Yahoo!, Microsoft, SAP, LinkedIn, Google, and Uber have invested heavily in Indian R&D, having both direct and indirect research centres in the country
- Companies without a direct R&D presence in India still participate in R&D projects through contractual collaborations with startups in cutting-edge fields like AI, data privacy and cybersecurity as part of their strategic approach[5]

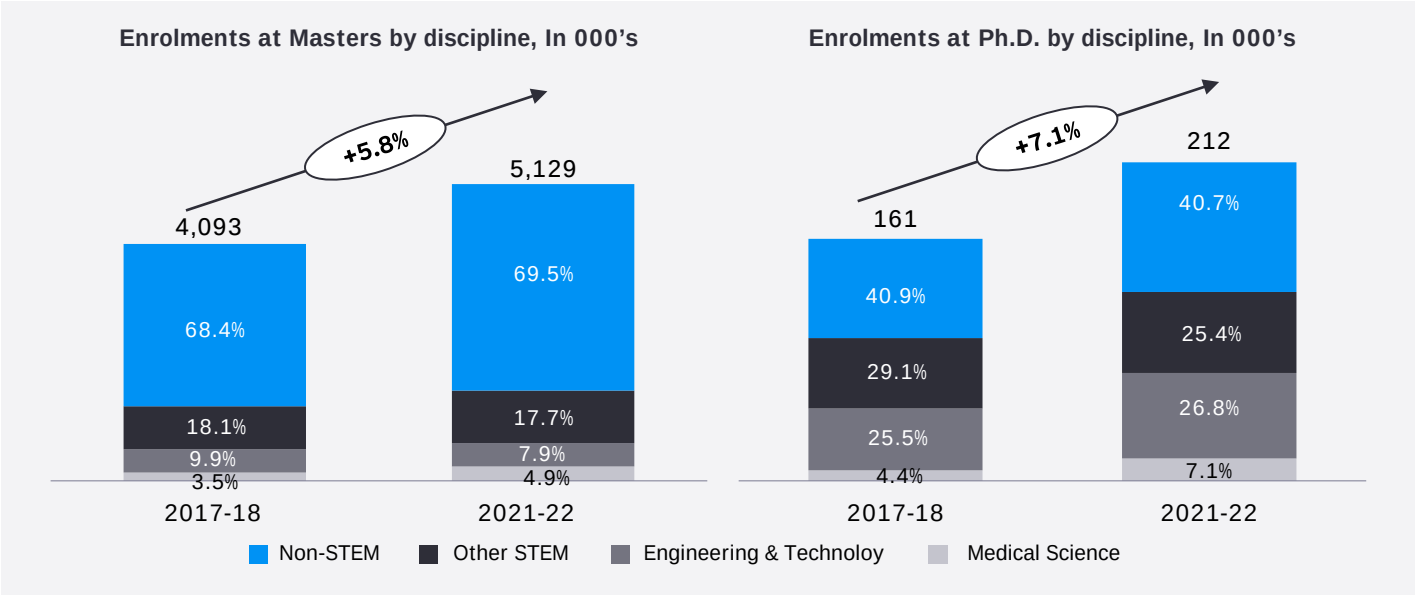
QS Reports TOI, 2 QS India Report 2023, 3 SERB 4. DST Report 2022-23, 5. MoE Industry Reports,

Science and engineering and leading the Indian HEI research landscape in scholarly contributions



Source: AISHE Report 2021-22

- India's research is currently largely focused on STEM, highlighted by strong enrolments at Ph.D. as well as PG level and the research output produced in these disciplines. Better job prospects, demand for STEM skills and India's strong focus on STEM are some of the main reasons for students opting for STEM courses.



Source: AISHE Report 2017-18, AISHE Report 2021-22

- As India evolves on the global stage, students are recognizing the potential of fields outside STEM, which has led to an increase in enrolments in non-STEM disciplines at the Masters level over recent years. Disciplines such as Criminology & Forensic Science, Law, Religious Studies, Design, Physical Education have seen a healthy growth in enrolments over the period 2017-18 to 2021-22.
- In India, the approach towards pursuing Ph.D. is generally quite specialized, where students focus on a particular field of study, leading to lack of multidisciplinary research. The trend is however gradually changing with many institutes in India now offering multidisciplinary courses, which can contribute to tackling real-world challenges. Prominent institutes such as IIT-B, IIT-K, IIT-H have started offering interdisciplinary academic programs.

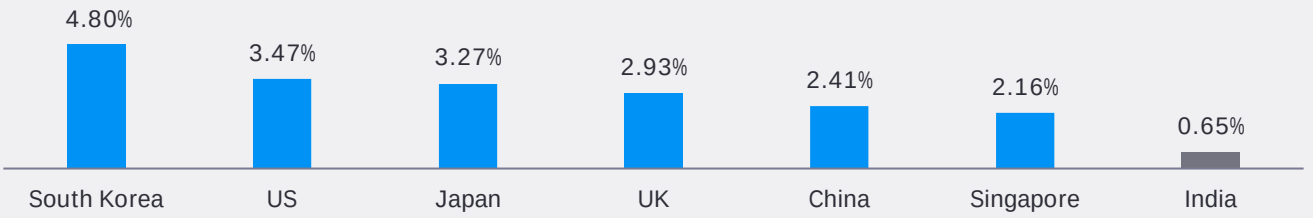
Despite growth, India's R&D investment trails behind global peers

- Current scenario of Indian HEIs relative to the global research landscape can be best understood by looking at where India stands compared to global peers on the below parameters.

R&D expenditure:

- India's R&D expenditure (as a % of GDP) has seen a downtrend from ~0.82% in 2010 to 0.65% in 2020.1
- India lags its peers in terms of R&D expenditure (as a % of GDP), directly impacting the research infrastructure. India lags behind peers in industries which are capital-intensive and require developed infrastructure such as healthcare and Industry 4.0.*

R&D expenditure (as a % of GDP) 2020

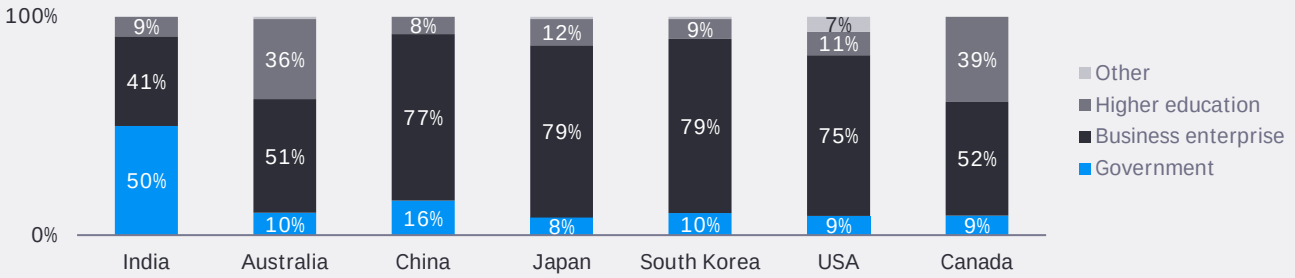


Sources: World Bank website

Funding from the business sector:

- 59% of participation in GERD in India including higher education is by the government, which is in contrast with developed and emerging countries.
- The contribution of higher education is also low in GERD in India as compared to other countries.
- In most of the developed and emerging economies, the participation of business sector in GERD is generally more than 50%. In some of the countries such as China, Japan, South Korea and US, it is more than 70%.

Participation of different contributors in GERD (2020)



Sources: Department of Science & Technology Report

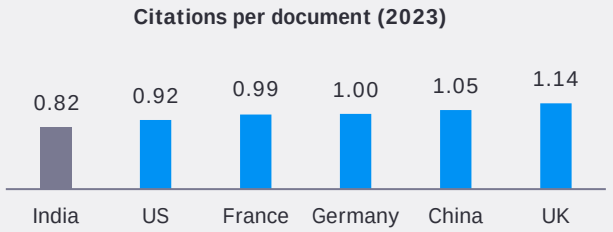
H index and citations per paper:

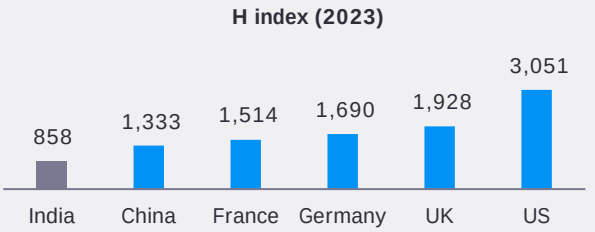
- India's H index saw an improvement from 795 in 2022 to 858 in 2023, however citations per document declined from 0.91 in 2022 to 0.82 in 2023.
- As compared to peers, India lags behind in citations per document and the H index.

* Dr. Sundar Manoharan, Director General, Pandit Deendayal Energy University

1 Department of Science & Technology Report , Primary Interviews

Lower citations per paper and H-index indicate underinvestment, signalling concerns about research quality





Sources: SCImago journal and country rank, FICCI-EY report on Transformation of Indian higher education, November 2023

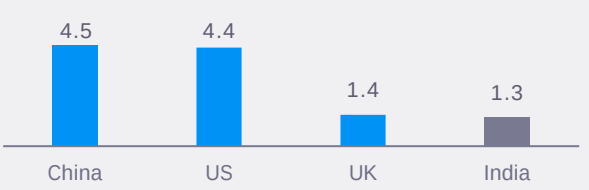
Rankings:

- As per QS World University rankings, 46 Indian universities featured in the list in 2025 as compared to 45 in 2024. [1] In terms of rankings by subject, 69 universities secured 454 entries in 2024, marking a ~19% increase as compared to the previous year.[2]
- India ranks fourth currently in terms of ranked entries (454), after China (1041), Japan (510) and South Korea (499) in the Asia region. [3]
- The Institutes of Eminence, an initiative launched by Ministry of Education in 2017 to empower HEIs in India to become world-class teaching and research institutes, leads the way accounting for 47 of the 69 institutes. [2]
- India has only a few institutes in the top rankings for certain subjects. It also lacks large multi-discipline institutes which rank among the top in multiple categories.
- IIM-A is among the top 25 institutions globally for business and management studies while IIM-Bangalore and IIM-Calcutta are among the top 50. Jawaharlal Nehru University ranked 20th in the development studies category, while Saveetha Institute of Medical and Technical Sciences ranked 24th in dentistry studies. [1]

Number of papers published:

- India continues to witness a steady increase in number of papers published.
- India ranks fourth globally in terms of number of papers published in the period 2017-22.

Sources: Department of Science & Technology Report



Sources: QS rankings, The Hindu

- Even though India's rankings and research output have shown positive signs in recent years, research quality still remains questionable highlighted by the fact that it has lower citations per paper and H index. Lower R&D expenditure and low contribution from businesses leads to inadequate funding, which significantly impacts the quality of research.

1 QS rankings, 2 QS rankings, 3 The Hindu,

When we compare Indian universities to global counterparts, several factors emerge that give the latter an advantage

- Global universities contribute more to strengthening institutional visibility, country's macroeconomic development and have stronger industry linkages than Indian institutes.

Key differentiators between global and Indian universities

Quality of faculty teaching and research	Global universities require their teachers to produce high quality teaching and research to ensure job tenure extension. However, in India teaching quality and research output are often measured by the number of hours spent and number of papers published, resulting in lack of quality control.
Diversity	Global universities place strong emphasis on cultural and discipline diversity, whereas in India it is generally low. Moreover, Indian universities have low number of foreign nationals studying, which is not the case in global universities.
Funding	Global universities can get large funding from the government, as well as private organizations. In India, funding is largely driven by the government, which is inadequate, resulting in low research budgets.
Alumni network	Global universities have strong alumni network and that enables them to get more visibility. Their alumni includes some prominent personalities taking top positions in corporations and government setup, which further enhances their image on the global stage. In comparison, some Indian universities have started to build robust alumni networks, but these efforts are seen primarily in the Tier 1 institutes of our country.
Academic excellence	Most global universities have academic excellence across multiple disciplines, unlike Indian universities which are generally focused on a few disciplines. Having multidisciplinary academic excellence helps global universities in tackling real world and complex challenges, which often require multidisciplinary expertise.
Research infrastructure	Most top-tier universities around the world boast of first-rate facilities, including advanced laboratories that support groundbreaking research and innovation. In comparison, universities in India often struggle with less developed research infrastructure, which poses a barrier to achieving high-quality research and innovation.

Sources: EYP analysis, Primary interviews

Funding and lack of incentives are the major bottlenecks faced by the Indian research ecosystem

Bottlenecks faced by the Indian research ecosystem

Research translation

- The research work undertaken is merely on paper and does not translate into meaningful action
- Lack of outcomes at the country level limits the impact of research
- Impact assessment is lacking in India, making it hard to demonstrate how specific research projects are producing real and tangible outputs and subsequently impacting the economy*

Funding

- Indian research ecosystem suffers from a lack of funding. In India, funding for research initiatives is generally driven by the government unlike other major countries
- Lack of funding results in shortage of resources, which in turn impacts the quality of research work

Research budgets

- India's spending on R&D is low as compared to major peers, which is a major factor in low quality of research output
- Innovation and new discoveries using cutting-edge technologies requires significant funding, which becomes difficult to achieve with limited funding

Lack of motivation

- Faculty's motivation to take up research work is largely driven by need to achieve the number of research papers published target set by the institute, while student's motivation to take up research work is to achieve the course work target
- Lack of interest from industry on research, inferior infrastructure, high patent cost etc. further impact motivation for pursuing research

Lack of incentives

- In India, generally there is no financial incentive related to publishing good quality research work
- In India, apart from taking lectures, faculty are required to do a lot of administrative work which takes time up their time, leaving little or no time for research work

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education
** Prof. Amit Sethi – IIT Bombay
Source: Primary interviews, EYP analysis

Policy

- Implementation of policies related to research are ineffective. Further, poor compliance acts as an impediment in attracting funding for R&D projects
- Intellectual Property Rights protects researchers and their innovations, but also acts as a barrier in knowledge sharing and collaboration
- Some processes in India are lagging and restrictive in nature – E.g.: purchasing equipment from foreign vendors are highly regulated, approvals for infra and other equipment take a lot of time**

Restriction in areas of research dissuades researchers from particular areas of research

Permissible Areas of Research

Engineering

- Research in various engineering disciplines, including civil, mechanical, electrical, and computer science, are widely accessible
- Regulated by the AICTE

Business and management

- Research in business administration, management, and related fields are permitted and widely offered by universities such as IIMs and institutes across India

Arts and humanities

- Research in subjects like literature, history, and philosophy are commonly available at many institutions
- There is minimal regulatory oversight in the arts and humanities compared to technical or scientific fields

Science

- Research in physical sciences and life sciences are widely accessible and prevalent
- Regulated by scientific bodies and councils, such as the Department of Science and Technology (DST) and the Indian Council of Medical Research (ICMR)

** Prof. Amit Sethi – IIT Bombay

Source: Primary interviews, EYP analysis

Restricted areas of research

Nuclear science

- Research in nuclear science are restricted due to its sensitive nature and potential risks
- The Department of Atomic Energy (DAE) and institutions like the Bhabha Atomic Research Center (BARC) oversee research
- Specialized institutions with the necessary approvals are permitted to conduct nuclear science research

Defense studies

- Research directly related to defense and military operations are restricted to ensure national security and protect sensitive information
- The defense Research and Development Organisation (DRDO) and military institutions manage research
- Access is restricted to individuals and institutions with specific clearances and security permissions

Medical fields

- Research in some advanced or experimental medical procedures, technologies, and treatments are restricted due to ethical, regulatory, and safety considerations
- The Indian Council of Medical Research (ICMR) oversees this research
- This research requires extensive ethical reviews, approvals, and regulatory compliances

Forestry

- Research in forestry, face restrictions due to conservation and environmental protection concerns
- The Forest Research Institute (FRI) and other environmental agencies regulate forestry research
- This research requires regulatory approvals and environmental assessments to minimize ecological impact

Source: EYP analysis

Strengthening the research ecosystem can help India in achieving SDG related goals

- SDGs are a collection of 17 interlinked global goals designed by the UN to achieve a better and more sustainable future for all. The SDGs were set up in 2015 by the UN General Assembly and intended to be achieved by 2030. Education is at the heart of the SDG as an entire goal SDG4 is dedicated to education.

Quality education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Underlying principles:

- Education is a fundamental human right and an enabling right
- Education is a public good
- Gender equality

The Vision India 2047 initiative and its alignment with the education sector

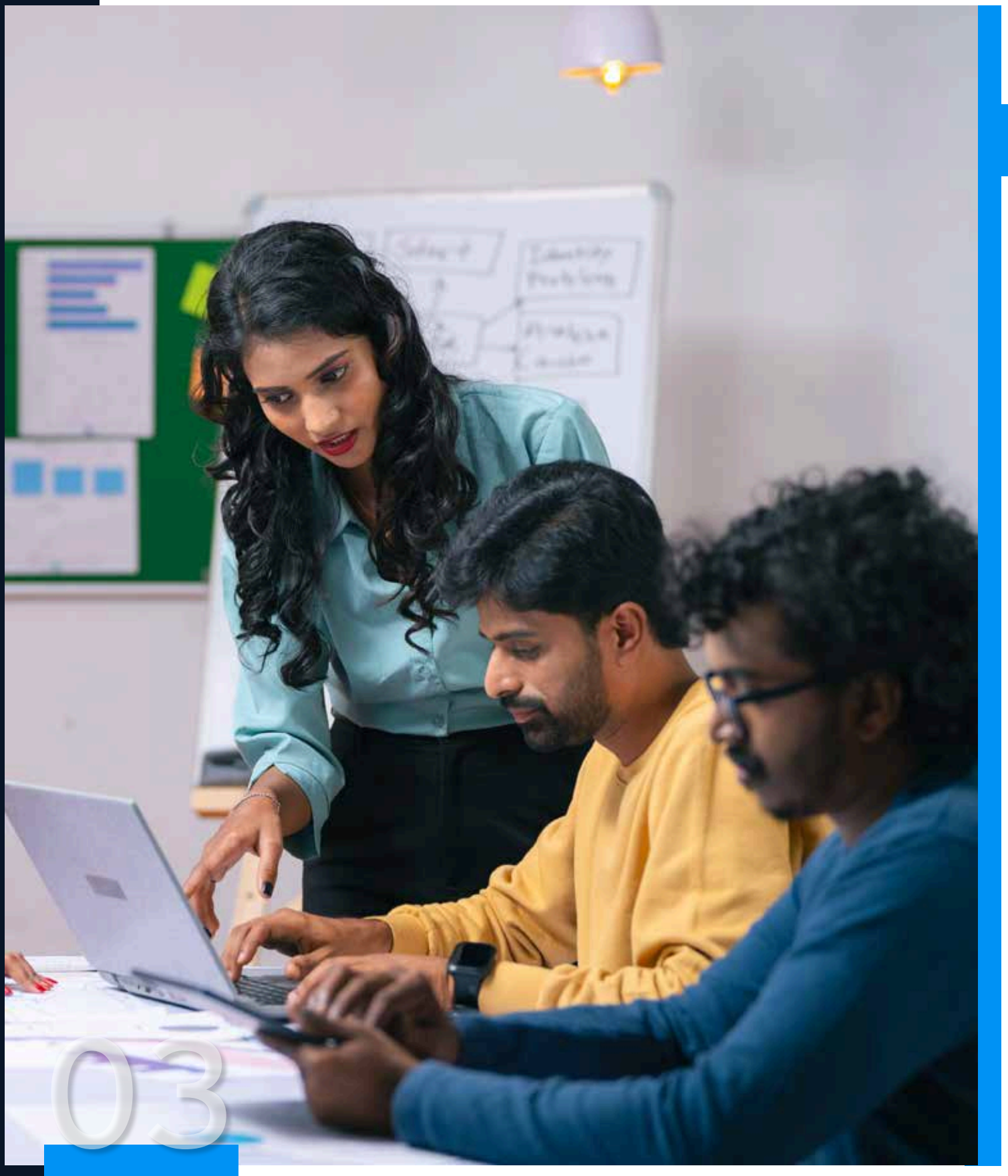
- Vision India 2047 envisages transformation of the country into a developed nation with a US$30 trillion economy by the time the country completes hundred years of independence. This plan aims to position India as a global leader in innovation and technology and enhance the country's economic stature, foster technological advancements and ensure environmental sustainability.
- Education sector will play a pivotal role in helping India achieve its Vision 2047 objectives by developing talent from within the country. Education will be fundamental to help citizens achieve their full potential, create an equitable and just society and promoting national development. Moreover, providing universal access to good quality education will lay the foundation for the country's economic development and enable India to take center stage at a global level.

Key measures for Indian research ecosystem to drive SDG achievement

- The Indian research ecosystem can help in raising awareness about SDG goals and India's objectives. Aligning research priorities with national goals can help the country move together towards the desired outcome.
- Encourage interdisciplinary research that combines insights from diverse fields such as technology, social sciences, environmental science, sustainability and economics to address complex SDG challenges.
- The Indian research ecosystem should produce innovative research on solutions to the challenges faced by the country related to SDG achievements.
- Researchers can research on best practices related to sustainability in foreign countries and suggest a potential roadmap for India to follow.
- The research ecosystem should bring in the HEIs, industry and the government together to collaborate to potentials ways to harness research capabilities of the country by pooling together resources, expertise and technologies.
- Promote open access to research findings and knowledge sharing among researchers, policymakers and students to strengthen collaboration between all stakeholders.
- Researchers should be encouraged to do research on NEP 2020 to understand its impact on the overall education system. Inputs from researchers can help the government make improvements to the policy, as the policy looks to transform the Indian education system.
- Researchers should be encouraged to link every research effort with SDGs. There is a 20-30% higher chance of receiving funding when research projects are linked to SDGs.*

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education

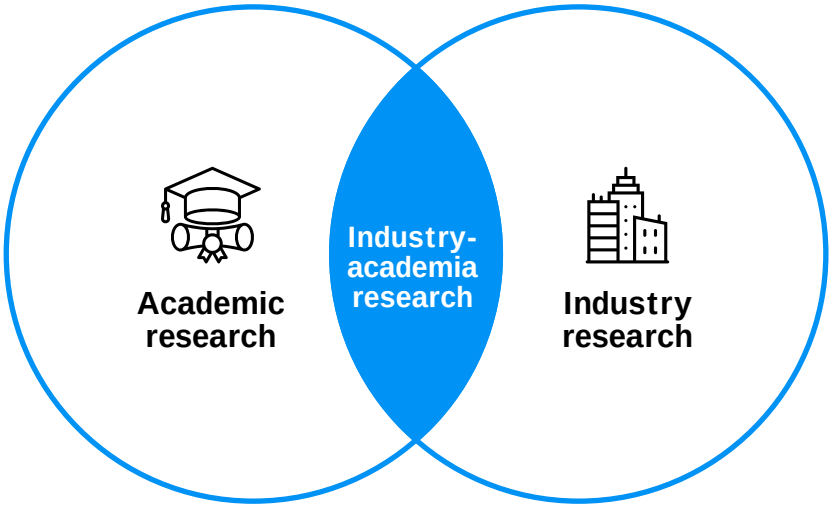
Source: EYP analysis, Primary Interviews



03

Models of research

Research can be categorized into three models



1 Academic research: led by higher education institutes

- Academic research is research that is conducted by faculty and students in higher education institutes
- This research is funded through universities, publically (through the government, NGO's, foundations) and/or privately through donations
- This research is conducted primarily for thought leadership and research building

2 Industry research: led by the private sector

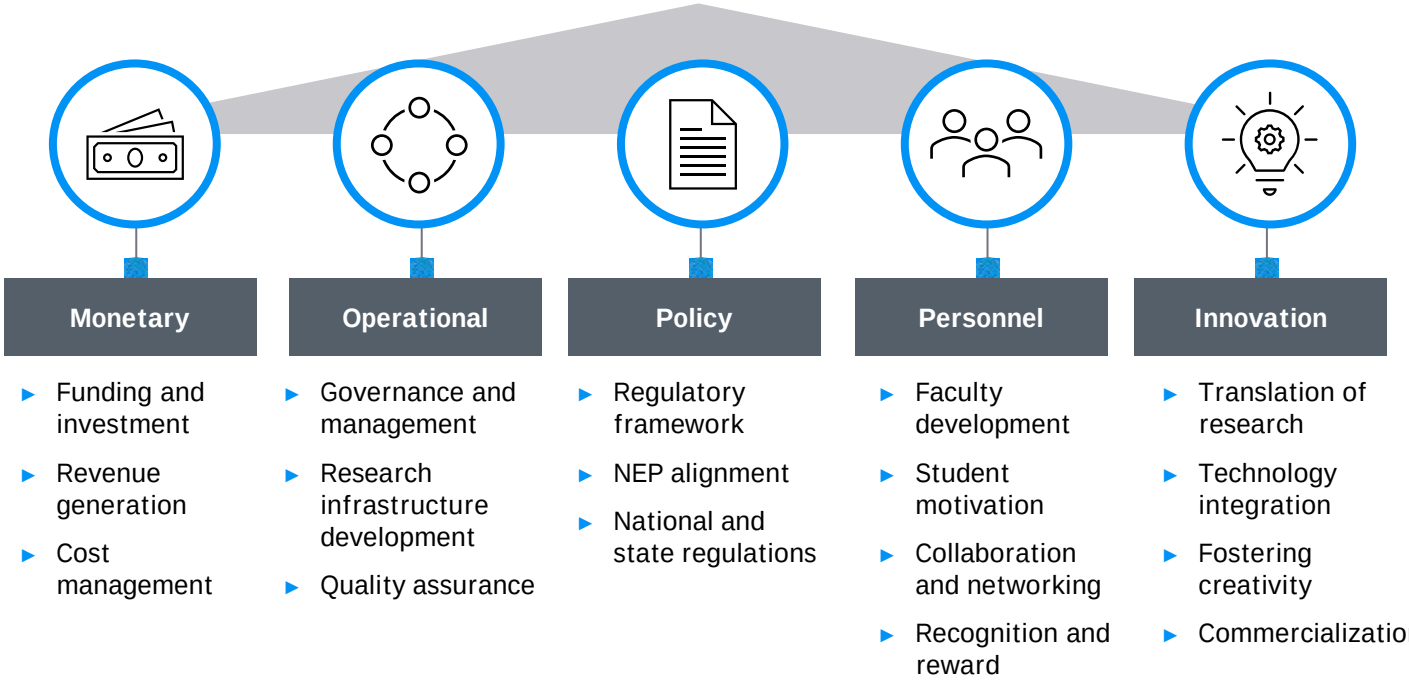
- Industry research is conducted and funded by the private sector
- Industry research can be further classified into demand led and supply led research
  - **Demand led research:** This is research based on already existing areas of commercial activity
  - **Supply led research:** This is research based on newly emerging areas of commercial activity
- Commercial research is focused on creating, expanding and/ or improving markets related to specific products and services

3 Industry - academia research: intersection of research between higher education institutes and private sector

- Academia research is typically research which is primarily funded by the private sector and conducted by higher education institutes
- Academic research could result in thought leadership or development of commercial activity

Source: EYP analysis

Strategic reforms across monetary, operational, policy, personnel and innovative pillars are imperative to internationlize research in Indian HEI's



- Strategic reforms across these five pillars will provide a comprehensive framework to elevate Indian HEIs to the global stage, fostering an environment conducive to impactful and internationally recognized research
- These recommendations are targeted at all three key stakeholders–Government, HEIs, and Industry–to ensure a collaborative approach in achieving internationalization

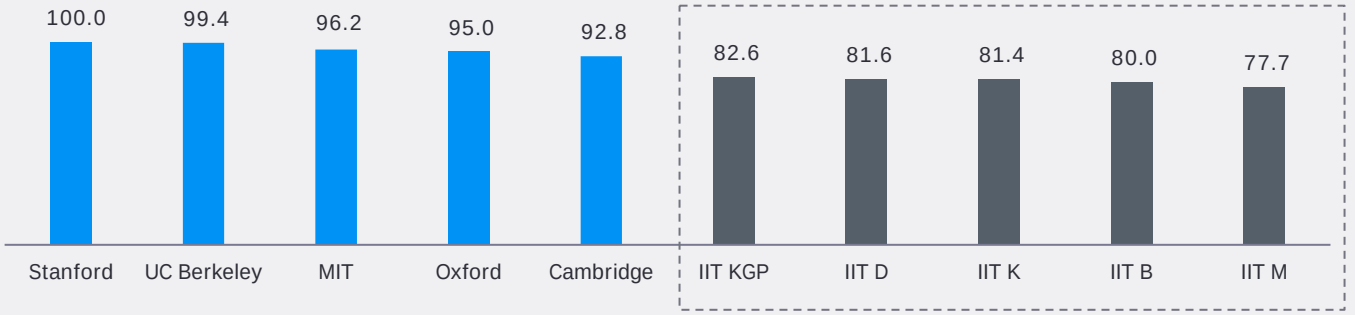
3.1 Academic research

Indian universities have low citation per paper and H index as compared to global universities

Research output

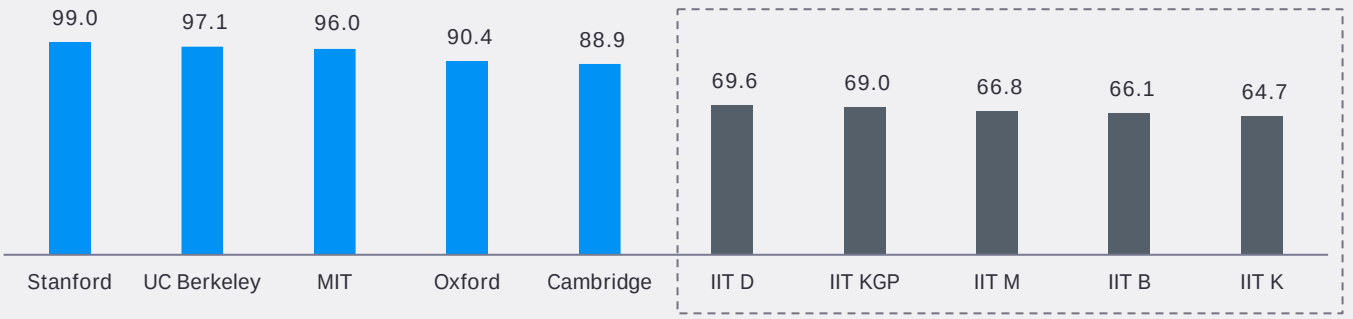
- Research output and impact are key metrics in global university rankings, influencing the institution's position and recognition on an international scale.
- In terms of academic research output, top Indian universities lag global universities. Top Indian Universities such as IITs lag global universities in citation per paper score and H index, clearly indicating low quality of research output. Global universities such as Stanford and MIT outperform because of best-in-class research infrastructure, coupled with the impact it has on real-world problems through its research.

Citation per paper score for Engineering and Technology subject



Source: QS rankings, 2024

H index score for Engineering and Technology subject



Source: QS rankings, 2024

- The low quality of research output in India is a result of institutional, faculty and student factors. Lower budgets and inferior quality of infrastructure are some of the major challenges faced by institutions.

Best Practice

World class infrastructure plays a significant role in R&D excellence and output, which can have a global impact

MIT

- Research and excellence is at the heart of MIT. It is **renowned for its research output** across various fields, including engineering, computer science, AI, robotics, biology and economics. **MIT's Computer Science and Artificial Intelligence Laboratory** has contributed to some ground-breaking innovations such as **development of World Wide Web, RSA encryption, and public-key cryptography.**[1]
- A major contributing factor to its research excellence is its **world-class research infrastructure**, with research being conducted in thirty departments across five schools and dozens of research centres, labs and programs. **MIT Lincoln Laboratory** has established itself as a pioneer in advanced electronics in air defense systems. It is a federally funded R&D center which addresses national security needs.
- An integral part of MIT's research ecosystem is **specialized centers**, which helps in interdisciplinary collaboration. A prominent example is **MIT Schwarzman College of Computing,** which emphasizes integration of computing with other disciplines to connect AI and computing to other disciplines.
- **MIT's research and innovation have a global impact** as they often address the real-world problems. A key focus area of MIT's research is **sustainability and climate change**. Through initiatives such as **Climate Grand Challenges**, MIT aims to develop solutions to challenging problems such as emissions reduction, climate adaption and risk forecasting, among others.

100/100
Score on citations per faculty as per QS rankings 2025

96/100
Score on International Research Network as per QS rankings 2025

Source: 1 DevX , QS rankings, MIT website, EYP analysis

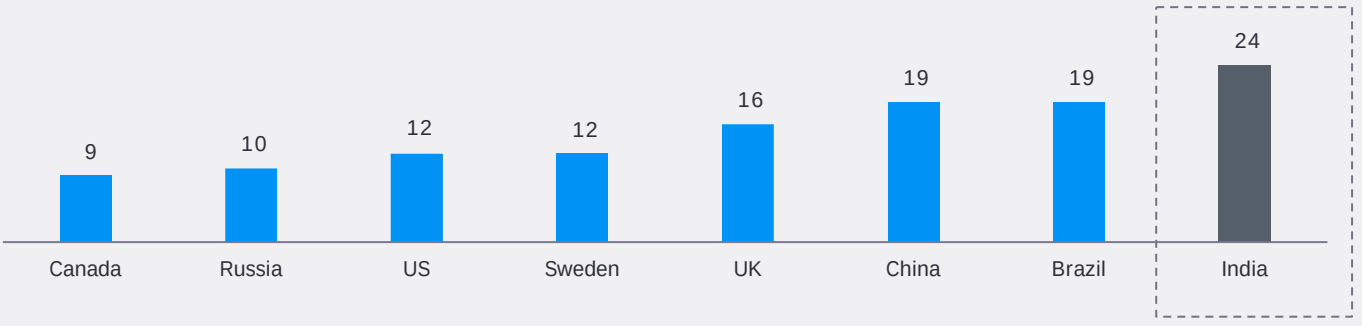
Research quality is shaped by faculty qualifications and capabilities with limited capacity hindering research efforts

Challenges faced by academic research

Faculty capacity

- Indian higher education system suffers from a high PTR unlike other developed countries, leading faculty to oversee many students. Apart from taking lectures, faculty are required to do a lot of administrative work which takes time up their time, leaving little or no time for research work.
  - Example - MAHE Manipal has tried to address this issue through goal setting theory. Faculties set their goals at the start of the year - percentage of time needed for academic purpose, percentage of time needed for research, and percentage of time needed for admin tasks. The year-end review is based on these goals set earlier in the year, and this creates accountability as well as allows the faculties to take charge and put enough hours on research*.
- Further, there is no financial incentive for faculties for taking up research work. Faculty's motivation to take up research work is largely driven by the need to achieve the number of research papers published target set by the institute. The focus on quality or relevance of the research is generally low.
- Faculty qualification and capability also play a significant role in guiding and mentoring students in their research. Many institutes in India lack well-qualified and knowledgeable faculties to guide the students. Global universities have well-qualified faculties with high capabilities to pursue research.

Pupil-Teacher ratio of select countries[1]



Source: QS rankings, IISc website, EYP analysis

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education

Source: 1. Education Quality Upgradation and Inclusion Program (EQUIP) Report, 2019-2024 , Primary Interviews

Best Practice

Encouraging faculty members through monetary benefits leads to excellence in R&D

IISc

- **IISc is one of the top Indian universities setting a benchmark for research quality and output**. It is one of the premier institutes for scientific and technological research and consistently scores high in rankings in the research field.
- **One of the major factors behind this success is the institute's faculty**. The faculty at IISc includes many distinguished researchers who have made significant contributions to their respective fields. Its faculties have been conferred several prestigious awards including Bharat Ratna and Padma awards among others, for their outstanding contribution to research.
- The PTR of the institute stands at 10, which is **lower than the country average**, giving faculty the time and freedom to focus on research work.
- It is one of the few institutes in India which **encourage faculty by providing monetary benefits**. A faculty member joining the institute gets a start-up grant for starting initial research work. Moreover, a faculty is also eligible for a share in consultancy fees for scientific and technical advice provided.

99.9/100
Score on citations per faculty as per QS rankings 2025

100%
Faculty with Ph.D.

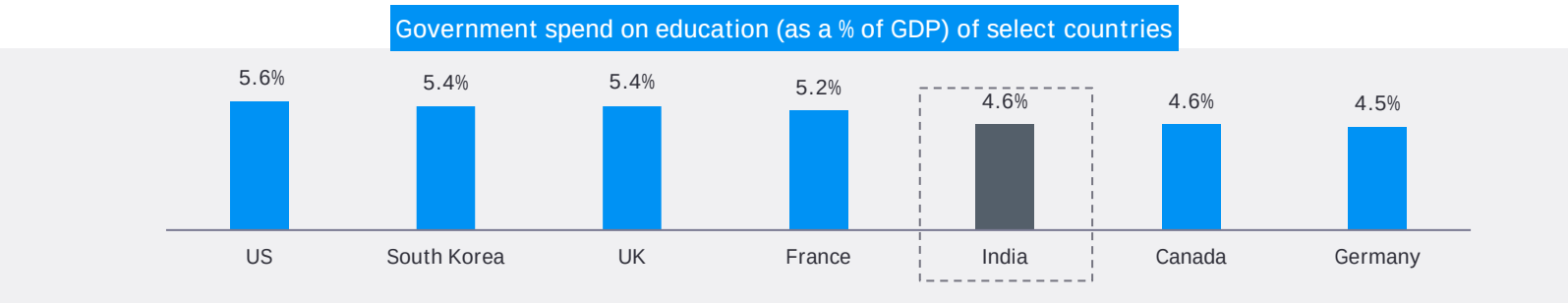
Source: QS rankings, IISc website, EYP analysis

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education

Institutional limitations and lack of motivation for students also play a role in research outcomes

Institutional limitations

- Most of the institutes in India suffer from budget limitations due to the country's lower spend on the education sector as compared to other major countries. Further, education spending in India is largely driven by the government and that being low puts significant strain on resources. Low budgets significantly impact the infrastructure quality of institutions resulting in low quality research work.
- Moreover, many institutes find it difficult to recover their research overhead costs, which further impacts the quality of research. Universities also find it difficult to generate revenue from academic research due to lack of its commercial appeal.
- Top institutes in India such as the IITs and IIMs have limited intake when compared to the number of applicants. Students not able to get into top institutes are not able to contribute much towards research.



Source: World Bank

Lack of student motivation for taking up research

- Student's motivation to take up research work is majorly driven to achieve the course work targets; hence they are not really concerned about the quality of research work. Many students also take up Ph.D. as a stop-gap arrangement to focus on other goals such as getting a government job, they are not passionate about the area of their research.
- Students generally get no or very little financial support for research, further dissuading them from taking up research work; while many global institutes offer students financial assistance to motivate them to pursue research.

Poor awareness of ethical standards

- Another hinderance that research in India faces is poor awareness of ethical standards for conducting research such as plagiarism and use of AI to write papers and essays. It degrades the credibility of research work.

Best Practice

Financial assistance to students serves as an incentive for them to pursue research opportunities

LSE

- London School of Economics (LSE) is a leading social science institute that **offers a variety of schemes to promote research among its students**.
- Some of the key funding schemes for research programs are listed below:
  - **LSE Ph.D. Studentships** are provided for four years which covers full fees and provides an annual stipend. These are available to UK, EU and international students undertaking research in any LSE discipline, subject to annual renewal.
  - **Economic and Social Research Council (ESRC) Doctoral Training Partnership has Studentships programs** for three or four years, depending on the program of study. They cover full fees and provide an annual stipend.
  - LSE is part of the London Arts and Humanities Partnerships (LAHP), which is funded by the Arts and Humanities Research Council (AHRC). **AHRC funding** is tenable for three years and helps in covering full fees and provides an annual stipend.
  - Additionally, there is **program related funding** for research in several departments intended for applicants studying at masters or doctorate level.

88	19
Ph.D. Studentships granted	ESRC studentships available across these number of departments

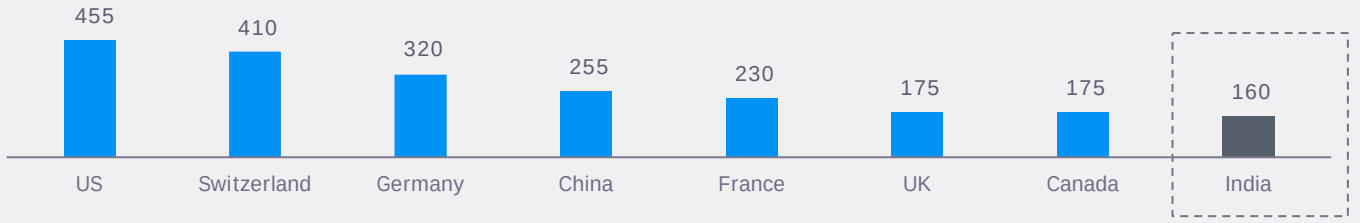
Source: London School of Economics website, EYP analysis

Low funding and sponsorships affect research quality in India

Funding and sponsorships in academic research

- India's GERD per researcher is lagging behind most developed economies.
- India's relatively low R&D spend leads to low GERD per researcher, directly impacting the quality of research output produced.

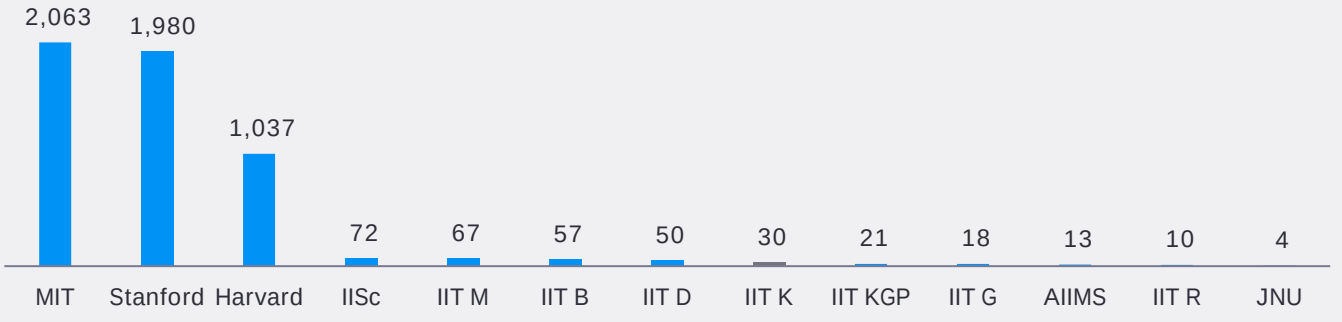
GERD per person for select countries (000 current US$ PPP), 2020



Sources: Department of Science & Technology Report

- Indian universities have considerably low sponsorships as compared to global universities such as Stanford, Harvard and MIT, as these universities have a strong track record of research excellence.
- For context, IISc sponsorship per project amounts to US$0.1 million as compared to Stanford's US$0.3 million.
- Low sponsorships affect the institute infrastructure limiting resources available to conduct research, directly having an impact on research quality.

Sponsorship amounts of select universities (US$ million)



Note: Indian universities amount are for year 2021-22; Stanford, Harvard and MIT amounts are for 2023; For Stanford, Harvard and MIT research sponsorship amounts have been considered; Indian universities amounts have been converted to US$ by taking an exchange rate of 75.92 as of March 31, 2022.

Sources: NIRF, Stanford website, Harvard website, MIT website

Best Practice

Strong reputation for innovative research, interdisciplinary collaborations and strategic location helps in attracting funding and sponsorships

Stanford University

- **The institute attracts funds from a variety of sources** including government agencies, private companies and non-profit organizations to support its research projects. This is made possible by **Stanford's exceptional academic standing, advanced research facilities, interdisciplinary approach, and its vast and influential alumni network**. Additionally, its **Silicon Valley location** strengthens its ability to forge partnerships with leading industries.
- Stanford has consistently pushed the boundaries of research across various domains such as **STEM, social sciences, and humanities.** A key milestone in this journey was the establishment of the **Stanford Research Park in 1951**, which created a unique platform for academia and industry to collaborate closely.
- **Stanford's research centers** brings together researchers form different fields in a collaborative environment to facilitate **interdisciplinary collaboration**. A prominent example is **Stanford Center for Automotive Research**, which is focused on developing sustainable and connected solutions.
- Stanford's robust research output and ability to secure high-profile sponsorships bolster its **global reputation**. This in turn draws further interest from both public and private sponsors, creating a **positive cycle of growth, innovation, and recognition** in the international research community.

US$2 billion

Total sponsored support for FY2023

99/100

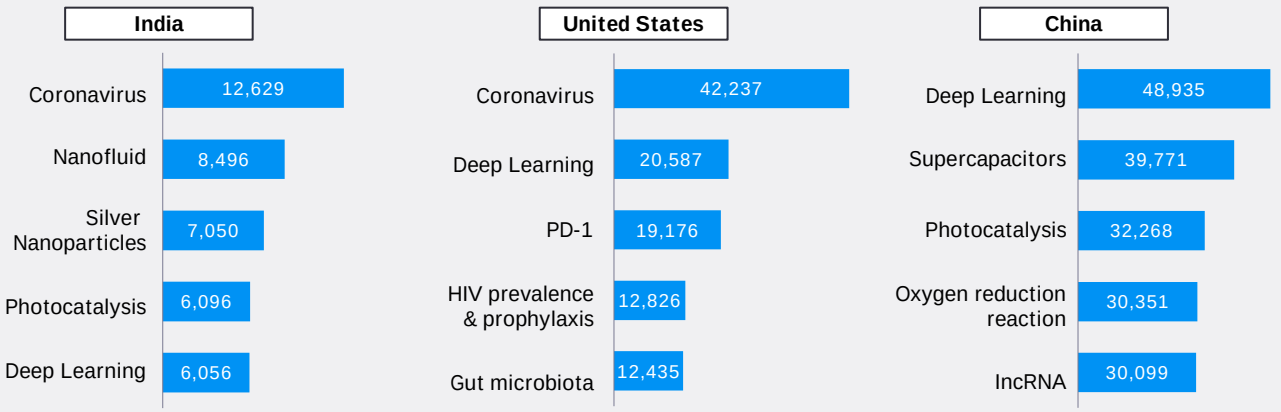
Score on citations per faculty as per QS rankings 2025

Source: QS rankings, Stanford website, Stanford Annual Report 2023, EYP analysis

India has focused on STEM and IT research as major areas of research in the last two decades but its output lags peers

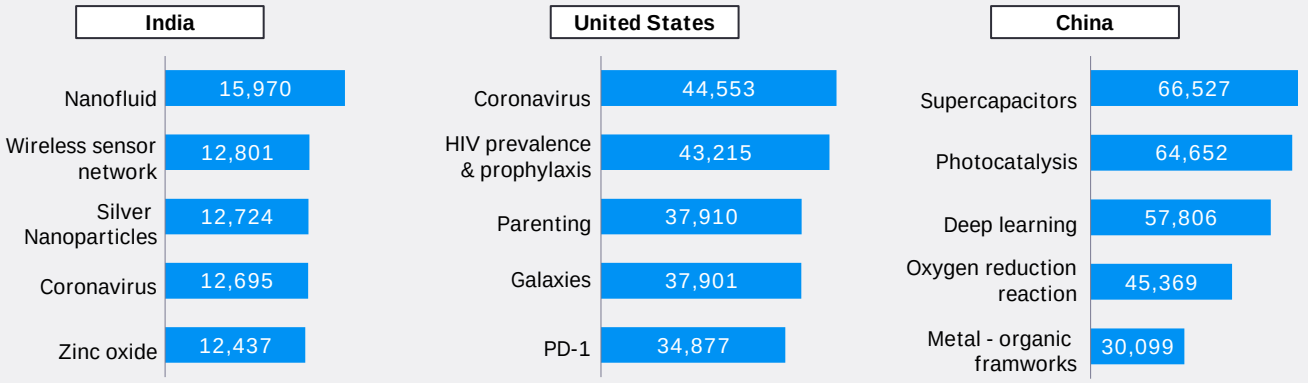
Areas of academic research in demand

Top Five Research Topics with the Highest Number of Published Papers (2019-2023)



Source: The Hindu

Top Five Research Topics with the Highest Number of Published Papers (2004-2023)



Source: The Hindu

- The largest fraction of India's research output is focused on nanotechnology. Nanofluids, in particular, have applications in heat transfer, while silver nanoparticles have applications in antimicrobial and anticancer therapy.
- In the US, attention is also paid to humanities subjects as reflected by the papers published on parenting in the last 2 decades. This could possibly indicate their position as a developed economy, where quality of life forms basis of research which can be later monetised through parent advice books and classes etc.

Collaborative and interdisciplinary research can benefit the research ecosystem

Trends in academic research in India

Focus on interdisciplinary academic research

- Focus on interdisciplinary research in India reflects a broad global trend towards recognizing the importance of interdisciplinary research to tackle complex problems.
- Interdisciplinary research brings together theories, concept and methods from different disciplines to create new frameworks which can lead to innovative solutions.
- Further, the NEP 2020 emphasizes the importance of multidisciplinary research education and research in higher education institutions.
- Data shows that interdisciplinary research often leads to higher citation rates, increased innovation, and more successful grant applications, which further incentivizes the faculty and students to engage in such work*
- Prominent institutes in India such as IIT H, IIT K and IIT B have started offering interdisciplinary academic programs.

Increase in enrolments at Ph.D. level

- India is seeing positive trends at enrolment at Ph.D. level. The number of enrolments grew at CAGR of 7.1% over the period 2017-18 to 2021-22.[1]
- The increase in enrolments reflect India's focus on promoting research and positioning itself on the global stage as a leader in research and innovation.
- The government has created a financial corpus of INR 1 lakh crore to strengthen the research and innovation in private sector at commercial scale, apart from the INR 50,000 crores allocated to NRF for basic research and prototype development[2]

Strong focus on STEM subjects at Ph.D. level

- There is a strong focus on STEM subjects as it is considered an integral part of fostering innovation which is a key driver for competitiveness on the global stage.
- Further, India aims to be a global leader in technology and innovation, hence there is a national push for STEM education at all levels.

* Prof. Rajita Kulkarni, President, Sri Sri University

Source: 1. AISHE Report 2021-22 2. PIB, 3. Leverage Edu, EYP analysis

Increase in collaboration with foreign universities

- Many institutes in India are looking to collaborate with International universities for research and academics.
- These collaborations can be very beneficial for Indian universities in terms of visibility. A few examples of collaborations are:
  - IISc has signed MoUs and agreements with over 120 international universities.[3]
  - IIT K has signed an MoU with University of California, Santa Cruz. [3]
  - Shiv Nadar University has collaborations with foreign university such as Babson College, USA; Mondragon University, Spain; National Yunlin University of Science and Technology, Taiwan etc.[3]
  - Ashoka University has collaborations with the University of Aizu, the University of British Columbia, the University of Cambridge, Yale University etc. [3]

Best Practice

Creating research-intensive environment through translation of interdisciplinary research and global collaborations into patents, products, impact and revenue

SIMATS

- Saveetha Institute of Medical and Technical Sciences (SIMATS). has made a name for itself through its **prolific research output**, particularly in the medical and dental fields. The university has published over **19,000 papers indexed in Scopus**, making it one of the most research-intensive private institutions in India[1]
- SIMATS has established a robust research infrastructure that includes **200+ departmental lab facilities, 20 Centers of Excellence, and 17 research parks**. They have **invested over 200 crores in numerous research facilities** that have created one of Asia's leading research environments[1]
- They have an extensive network of **collaborations with global institutions**. Faculty members have strong research ties with prestigious universities such as the University of Pennsylvania, University of Buffalo, and various institutions in Australia and Europe. Additionally, SIMATS integrates **industry partnerships into its curriculum, providing students with over 5,000 field visits, internships, and research projects[2]**
- SIMATS has had great success in translating research into output having **15 products developed, patents and licensed that have generated a revenue of over 53 lakhs[1]**
- Saveetha Dental College had the thi**rd highest number of patents filed by a single institute in 2018**. They have published over 150 Patents over the past 5 years and are **ranked as the No. 1 dental college[1]**

> 400	> INR 6 crore	> INR 100 crore
Patents published[1]	Valued consultancy projects undertaken[1]	Funding received for research[1]

Source: 1. SIMATS website, 2. SIMATS Website, EYP analysis

Improving research infrastructure is imperative for India to reach International research standards

Need for internationalization

- Internationalization of education has become a critical agenda in both India and globally, driven by the need to align educational outputs with global market demands and social relevance. This involves attracting international students, fostering cross-border academic collaborations and enhancing the quality and impact of research.
- The key is to integrate international perspectives into education to produce graduates and research outcomes that are competitive and socially relevant worldwide.

Internationalization has long existed in developed countries

- Globally, countries like the US, the UK and Australia have long leveraged internationalization to enhance their higher education system. These nations attract a significant number of international students, contributing to their research output and economic growth.
- International students bring diverse perspectives, enhancing the research landscape by addressing global and local issues through collaborative efforts. Incentivizing students with scholarships and work-study opportunities ensures that their education is aligned with the market needs.

India is taking gradual steps towards internationalization

- India's NEP 2020 has prioritized internationalization, aiming to position India as a global hub for education. The policy promotes the entry of top international institutions into India, enhances the international mobility of students and faculty, and encourages Indian institutions to establish campuses abroad.
- A crucial aspect is incentivizing international students to study in India through scholarships, streamlined visa processes and establishing India as a center for affordable and high-quality education. This also includes developing curriculum and research agendas that are globally relevant while addressing local challenges.
- Top universities in India are now beginning to hire faculties (even international faculties) with a specific focus on research. Earlier the universities were focused on teaching mostly, but now there is a push in IITs and IISC for getting grants and getting more funding for research*

Scope for improvement In India

- One significant barrier that still poses a challenge is the current state of research infrastructure in India, which is often not competitive with the advanced facilities available in European and other developed countries.
- This disparity creates a one-sided approach to internationalization, as there is little incentive for international students and researchers to come to India when the research facilities are not on par with those in more developed regions.
- To address this issue and enhance India's appeal to international students and researchers, it is essential to focus on building and upgrading research infrastructure not only improve research capabilities but also make Indian institutions more attractive to a global audience, thus advancing internalization efforts beyond mere accreditation and fostering meaningful global academic collaboration.

* Prof. Amit Sethi – IIT Bombay

Source: EYP analysis, Primary Interviews

Best Practice

Fostering a global approach to education by opening campuses abroad, promoting student mobility and collaborating for international research

New York University

- New York University has placed **a strong emphasis on internationalization of education through its strategy**. The university **promotes student mobility** where students can study abroad in any of the campuses in other cities, while remaining within the New York University system.
- To **attract students and faculties** to take up research, the university provides **fellowships**, where they can conduct research in residence at the campus. Benefits as part of fellowships include travel cost cover, office space and a stipend.
- The **curriculum at the university is designed to incorporate global perspectives** to ensure graduates produced feel competitive and socially relevant worldwide. It has a strong focus on developing an appreciation and respect for cultural differences and imparting learning on what is takes to lead and innovate in an international environment.
- To **promote international research**, the university has **collaborated with other international universities**. An example in this case is New York University partnering with LMU Munich for research collaboration. Moreover, New York University has created a **Global Research Seed Grants competition** along with its two-degree granting campuses at Abu Dhabi and Shanghai to support research that strengthen collaboration between campuses.
- The university encourages faculties to **host researchers from abroad**. Through this initiative, the university has **hosted over 600 visiting faculty at the Washington Square campus.**

14
Global academic centers

2
Degree granting campuses outside the US

Source: QS rankings, New York University website, EYP analysis

Establishing international branches of educational institutions has yielded numerous advantages, including a significant enhancement in research output

New York University (NYU) in Abu Dhabi

Overview

- NYU opened its global campus in Abu Dhabi in 2010, aiming to create a liberal arts education model that integrates global perspectives.

Impact

- NYU Abu Dhabi has boosted the UAE's education sector by attracting international talent and fostering a research-driven environment. It has contributed to the local economy through job creation and partnerships with local businesses. The university's research initiatives have addressed regional challenges, such as water scarcity and renewable energy, thereby supporting the UAE's economic diversification efforts.[1]

Weill Cornell Medical College in Qatar

Overview

- Weill Cornell Medical College established its Qatar campus in 2001, offering medical education and research opportunities. It is a partnership between Cornell University and the Qatar Foundation and is the first US medical school established outside the country

Impact

- The campus has significantly contributed to Qatar's healthcare sector by training medical professionals and conducting research. It has fostered collaborations with local healthcare institutions, enhancing the quality of medical services and research output. The college's research initiatives have focused on addressing regional health issues, such as diabetes and cardiovascular diseases, thereby improving public health outcomes[2]

University of Liverpool in China

Overview

- Xi'an Jiao Tong-Liverpool University (XJTLU) was established in 2006 as a joint venture between the University of Liverpool and Xi'an Jiao Tong University. XJTLU offers a range of undergraduate and postgraduate programs.

Impact

- XJTLU has enhanced the quality of higher education in China by providing an international curriculum and fostering research collaborations. The university's research collaboration focus on areas such as chemistry, electronics, health, law and heritage, addressing regional and global challenges. XJTLU has also contributed to the local economy by creating jobs and promoting innovation.[3]

Source: 1. NYU Website, 2. WCM-Q Website, 3. University of Liverpool, EYP analysis

NEP 2020 seeks to overhaul the Indian higher education system by setting ambitious aspirations, including promotion of research and innovation

Government regulations, policies and initiatives

- Institutional restructuring and consolidation
- Holistic and multidisciplinary education
- Optimal learning environments and support for students
- Financial support for students
- Internationalization
- Student activity and participation
- Vocational education
- Motivated, energized and capable faculty
- Equity and inclusion in higher education
- Curbing commercialization of education
- Quality academic research through the National Research Foundation
- Promotion of Indian languages, arts and culture
- Effective governance and leadership for HEIs
- Transforming regulatory system of higher education
- Professional education

Source: National Education Policy

The NRF is a key initiative to promote a strong research culture and capacity, though its funding remains significantly less compared to the NSF

National Research Foundation (NRF)

Goals	u Promote interdisciplinary research that will address India's most pressing development challenges u Promote the translation of research into policy and practice
Governance structure	u The NRF is presided by the Prime Minister and consist of 10 major directorates, focusing on different domains of science, arts, humanities etc. u It will have an 18-member board with eminent Indian and international scientists, senior government functionaries and industry leaders
Responsibilities	u NRF will provide the unifying platform for multi-disciplinary and multi-institutional collaborative research u The NRF will support both commissioned task force research and investigator-initiated research
Funding Sources	u Funding for the Foundation comes from government appropriations, contributions from different sectors, and designated funds. INR2,000 crores were allocated to NRF in the budget 2024-25.[1] Private funding to play a vital part as NRF aims to attract INR36,000 crore out of INR50,000 crore proposed for next 5 years[2]

National Science Foundation (NSF)

Goals	u Supports fundamental research and education in the fields of science and engineering u Its objective is to promote progress of science; advance national health and prosperity and secure national defense
Governance structure	u NSF is governed by the National Science Board (NSB) and directed by the NSF Director. The NSB consists of 25 members appointed by the President u Members serve six-year terms, apart from the NSF Director, and one-third of the board is appointed every two years
Responsibilities	u Funds research projects and education across all fields of science and engineering with a particular focus on technology related fields. u About 25% of support to America's colleges and universities is granted by the NSF. Its focus is on solution-oriented research which has the potential to improve people's lives
Funding Sources	u Funded primarily by the federal government. NSF's budget is requested by the President and approved by the Congress. For FY25, the President has requested a budget of US$10.2 billion for NSF

Source: National Research Foundation, National Science Foundation, 1 The Hindu, 2. Nature, EYP analysis

UGC in collaboration with various discipline specific bodies plays an important role in regulating higher education and research

University Grant Commission (UGC)

- The primary regulator of higher education in India, responsible for coordination, determination, and maintenance of standards of university education
- It provides recognition to universities in India and disburses funds to such recognized universities
- UGC also frames regulations on minimum standards of education, monitors developments, advises the government.

All India Council of Technical Education (AICTE)

- A statutory body established for the proper planning and coordinated development of the technical education system in India
- It accredits postgraduate and undergraduate programs under specific categories at Indian institutions as per its charter
- AICTE also ensures the quality of technical education through its various policies on academic standards

Council of Architecture (COA)

- A statutory authority constituted by the Government of India to regulate the education and practice of the profession of architecture in India
- It prescribes the standards of education, recognized qualifications, and standards of practice to be complied with by practicing architects
- The COA is responsible for maintaining the register of architects in India and ensures that only qualified individuals practice architecture

Indian Council of Historical Research (ICHR)

- An autonomous body dedicated to the systematic and objective pursuit of historical research and to the promotion of the study of history
- It provides fellowships and financial support for research projects and conducts seminars, workshops, and conferences for scholars
- ICHR publishes books, monographs, and journals related to historical studies

Indian Council of Philosophical Research (ICPR)

- Established to promote research in philosophy and allied disciplines and to bring out publications in these areas
- It sponsors and supports projects and programs of research in philosophy
- ICPR organizes seminars, lectures, and workshops to foster philosophical inquiry and dialogue

Indian Council of Social Science Research (ICSSR)

- A national organization for promoting research in the social sciences in India
- It provides grants for projects, fellowships, international collaboration, and capacity building
- ICSSR also supports surveys, databases, and other infrastructure necessary for social science research

Source: EYP analysis

Primary Apex Body | **Discipline Specific Apex Body**

The UGC ethics policy forms the core for all research regulations in India, promoting originality, ethical conduct and respect for intellectual property

- The UGC has promulgated the "Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions" Regulations, 2018
- These regulations are enforceable for all constituents of HEIs, encompassing students, faculty, researchers, and staff

Definition and Objectives

- Academic integrity is defined as the principled generation of intellectual property, which encompasses the formulation, execution, and dissemination of research
- Plagiarism is characterized as the illegitimate representation of another individual's intellectual work or ideas without appropriate accreditation

Preventative Strategies

- The UGC mandates the formation of Departmental and Institutional Academic Integrity Panels for the examination and resolution of plagiarism incidents
- HEIs are required to establish educational frameworks to instruct and mentor individuals on the principles of academic integrity and methods for plagiarism prevention

Penalties for Plagiarism

The punitive measures escalate in severity corresponding to the detected percentage of similarity:

- Up to 10% similarity may necessitate manuscript revision
- Between 40% to 60% similarity could lead to more grave consequences, such as enrolment cancellation
- More than 60% similarity might result in expulsion or withholding of faculty increments

Due Process and Panel Structure

- Investigations into plagiarism allegations are conducted in accordance with the principles of natural justice
- The composition of the Academic Integrity Panels includes external scholars and specialists in plagiarism prevention tools

Exemptions and Provisions

- Bibliographic references and commonly accepted content are not subject to plagiarism scrutiny
- The sequential use of up to 14 words is generally not regarded as plagiarism unless there is a significant degree of similarity

Support and Implementation

- The UGC provides for the rectification of any difficulties that may arise during the implementation of these regulations, in collaboration with the Ministry of Human Resource Development

Source: UGC Ethics Guidelines, EYP analysis

Research councils give support to the UGC by promoting research and innovation at their level

Indian Space Research Organization (ISRO)

- The organization is involved in science, engineering and technology to harvest the benefits of outer space for India and the mankind
- The organization is a major constituent of the Department of Space, Government of India and executes the Indian Space Program primarily through various centres or units. One of its objectives is to develop infrastructure for space research
- It provides research grants to support fellowship, materials, consumables, internal travel and testing charges etc. to promote research

Department of Atomic Energy (DAE)

- The Department aims to empower India through technology, creation of more wealth and providing better quality of life to its citizen
- Its mission is to support basic research in nuclear energy, support research and development projects and international cooperation in areas of advanced research
- Homi Bhabha Chair is one of the most important schemes run by the Department, where it gives recognition to outstanding Scientists and Engineers who were involved in the development of critical technology to carry out research and development work

Indian Council of Social Science Research (ICSSR)

- The Council was established to promote research in social sciences in the country. The council's aim is to review the progress of social science research and give advice to its users
- One of the important objectives of the Council is support high quality independent program of research and provide opportunities for training of future researchers
- The Council provides research grants as a direct support to research projects taken up by social scientists

Indian Council of Medical Research (ICMR)

- The Council aims to translate research into action for improving the health of the population
- Its mission is to generate, manage and disseminate new knowledge and increase focus on research on the health problems of vulnerable, the disadvantaged and marginalized sections of the society
- The Council gives grants for project proposals, fellowships, intramural research, post-doctoral research among other things

Indian National Academy of Engineering (INAE)

- The Academy comprises India's most distinguished engineers, engineer-scientists and technologists covering the entire spectrum of disciplines of engineering
- It functions as the apex body and promotes the practice of engineering, technology and related sciences for their application to solving problems of national importance. The Academy promotes research projects, pilot studies, fellowships, scholarships and awards in its field
- The Academy has three main schemes namely DST Abdul Kalam Technology Innovation National Fellowship, Chair Professorship and Distinguished Professors/ Technologists for promoting research and innovation

Council of Scientific and Industrial Research (CSIR)

- The Council is known for its cutting-edge R&D knowledge base in diverse science and technology areas. The Council has a large network of laboratories and centres
- It encourages technology innovation and translation research and commercialization to align with national goals
- The Council provides grants such as in-aid general grants, grants for capital creation and grants for in-aid salaries for promotion of research and development

Some of the other important councils are Defense Research and Development Organisation (DRDO), Indian Academy of Sciences (IASc), Indian Council for Agricultural Research (ICAR), Indian Council of Historical Research (ICHR), Indian Council for Philosophical Research (ICPR), Indian National Science Academy (INSA) and National Academy of Sciences (NASI)

Source: AICTE, Council websites, EYP analysis

The Government of India is also actively promoting research at the central level through substantial grants

- These grants support projects across various disciplines, including science, technology, social sciences and interdisciplinary fields, with the aim of fostering innovation and translating academic research into societal benefits.

Impacting Research in Technology (IMPRINT)

- Launched in November 2015, it is a government initiative for engineering research and technology development in 10 domains, jointly by IITs and IISc
- 142 proposals were funded from a preliminary 2612 proposals received[1]
- IMPRINT II brought on board the stakeholders ministries right from conceptualization stage to create a participative ecosystem

Prime Minister's Research Fellowship (PMRF)

- Selects top students annually for Ph.D. programs in IITs, IISc, IISERs and NITs to advance research in science and technology
- Fellows receive a graduated fellowship starting at INR70,000 per month, increasing to INR80,000 by the fourth and fifth years[2]
- Each fellow is also granted INR2 lakh per year for five years to cover research paper presentation costs[2]

Impactful Policy Research in Social Science (IMPRESS)

- Sanctioned by the Government of India on August 13, 2018, with a budget of INR414 crores until March 31, 2021[3]
- The scheme aims to support social science research in higher education institutions and inform policy-making[4]
- A total of 1500 research projects are to be awarded over two years, starting from 2018-19, through four application cycles[4]

Scheme for Transformational and Advanced Research in Sciences (STARS)

- Six key areas identified: Physics, Chemistry, Biological Sciences, Nanoscience, Data Sciences & Mathematics, and Earth Sciences
- The scheme has a budget allocation of INR 250 crores for three years, with an additional two years dedicated to monitoring[5]
- An Apex committee led by the Secretary of Higher Education has approved a total of 500 projects under this initiative[6]

Sources: 1. SERB 2. Drishti IAS, 3. India Today, 4. PIB, 5. India Today, 6. Indian Wire, EYP analysis

Recommendations

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Focus on volume-based research rather than quality focused research	Operational	HEIs (Research dept.) Government (UGC)	Quality focused research grants	„ *Action:* Introduce internal grants that specifically reward high-quality research proposals rather than those that promise many publications „ *Implementation:* Research grant authorizing committees evaluates grant applications based on potential impact, innovation and alignment with national or global priorities. While giving grants, focus should be to give grants to research focused institutes* „ *Expected outcome*: Encourages researchers to pursue meaningful, high-impact projects
Lack of student and faculty motivation to do research	Personnel	HEIs	Restructure course and credit systems to incentivize research	„ *For faculty- action:* Provide faculty opportunities to create semester long classes to teach students exclusively about research they have conducted „ *Expected outcome:* Enhance faculty motivation by recognizing and valuing their research work within the academic curriculum, which will potentially lead to higher satisfaction and productivity. This will also foster a more engaged and research-oriented learning environment. „ *For students- action:* Provide students an opportunity to earn course credits through self-paced, faculty reviewed research „ *Expected outcome*: By earning credits through research, students will see tangible academic rewards for their efforts, encouraging deeper involvement. This will also encourage students to connect and learn about research from experienced faculty members
Low funding for research	Monetary	HEIs (Research dept, faculty)	Establish a dedicated office for funding	„ *Action:* Encourage faculty to seek external funding from government bodies, international organizations, and private industry. „ *Implementation:* Establish a dedicated office within the HEI that helps researchers identify funding opportunities, prepare grant applications, and manage funded projects „ *Expected outcome:* Increased funding for research, allowing for more ambitious and high-quality projects

Priority Recommendation Short-Term Medium-Term Long-Term

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education

Source: EYP Analysis, Primary Interviews

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Internationalization of education is currently at nascent stage	Operational	HEIs (HODs) Government Industry	Develop National Research Infrastructure Clusters (NRIC's) where multiple institutes share research facilities	„ *Action*: Develop NRIC's where HEI's, research institutes and industries collaborate and share advanced research facilities. These clusters will serve as a hub for high quality research „ *Implementation:* Partner with the private sector and govt. to co-finance these centres. Create an online portal through which HEI's can book slot for equipment use, data access or collaborative opportunities „ *Expected outcome:* Researchers from multiple institutions can access world-class facilities without duplicating investments, fostering collaborations and reducing the gap between Indian and Global research infrastructure. Indian institutes ranking will also improve and higher funding opportunities arise through these collaborations*
Low regulation and awareness of ethical standards of research	Policy	Government (MoE, UGC)	Develop and mandate a framework for research ethics	„ *Action:* Mandate a national research ethics framework for all universities, covering plagiarism, data integrity, informed consent and ethical treatment of human and animal research subjects „ *Implementation:* The MoE, in collaboration with bodies like the UGC and ICMR, can draft these guidelines. Universities would be required to align their internal ethics committees and research practices with this framework „ *Expected outcome*: Reduce research misconduct and ensure consistent ethics nationwide, enhancing the global credibility and reliability of Indian research
Low focus on interdisciplinary research	Innovation	HEI's (Head of Dept.)	Integrate interdisciplinary research into the curriculum	„ *Action:* Develop courses and research opportunities that require students to work across disciplines, encouraging a broader perspective on problem solving „ *Implementation:* Create joint-degree programs or minors that span multiple disciplines and require interdisciplinary research projects as part of graduation requirements „ *Expected outcome*: Increase inter-disciplinary research which helps bridge gaps between different fields, leading to more robust and actionable insights

Priority Recommendation Short-Term Medium-Term Long-Term

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education

Source: EYP Analysis, Primary Interviews

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Faculty reservation in taking research roles in tier 2 and tier 3 colleges	Personnel	HEIs (Management, R&D Heads, Faculty) Corporate (Employees) Government (Ministry of Education)	Create cross institutional faculty collaborations and encourage corporate professionals to take up research*	„ *Action*: Foster cross-institutional collaborations between Tier 2/3 and Tier 1 institutions, while incentivizing corporate professionals to engage in part-time research and teaching roles. Establish a three-year fellowship program for corporate employees interested in research, allowing them to return to industry post-research. „ *Implementation:* Offer monetary compensation and fellowships to corporate researchers, while facilitating their integration into academic roles. Launch Quality Improvement Programs for Tier 2/3 faculty and PhD scholars and allow them to collaborate and utilize the resources like research infrastructure, funding, library etc. of Tier 1 colleges. „ *Expected outcome:* Increased faculty participation in research, improved research quality at Tier 2/3 institutions, and greater industry-academia synergy through corporate involvement. This will bridge the skill gap across institutional tiers

Short-Term Medium-Term Long-Term

* Prof. Amit Sethi – IIT Bombay
Source: EYP Analysis, Primary Interviews

3.2 Industry research

India's R&D conversion into economic development and policy making is hindered by funding and lack of innovation

Translation of research to economic development

01	**Research to Practice**	**Triple Helix Model -** Interactions between academia, industry, and government to foster economic and social development **RPP –** Research Practice Partnerships produce more relevant research, improving the use of research evidence in decision making, and engaging both researchers and practitioners to tackle problems of practice
02	**Practice to Product Development**	This stage is driven by innovation–whether in the form of new drugs, technological devices, or software A key aspect of this phase is the protection and commercialization of intellectual property through patents, which incentivizes further innovation by securing exclusive rights to profit from this innovation
03	**Product Development to Economic Development**	Direct impact on GDP by fostering industries that produce high-value goods and services Stronger economic growth due to the creation of more competitive industries, increased exports of high-tech products, and the attraction of foreign investment

Factors that stop India from achieving this transition?

- India's investment in R&D is notably low, placing it below the global average. Empirical evidence highlights the critical role of robust R&D infrastructure in fostering sustained economic growth and enhancing employment. For instance, R&D activities accounted for about 15% of productivity gains and 67% of economic growth in Europe between 1995 and 2007.[1] These figures illustrate the significant impact increased R&D spending can have on a nation's long-term economic development and competitiveness.
- Industry-academia partnerships is significantly lacking. This is due to industries being unaware of ongoing research and its potential usefulness, stifling collaboration possibilities due to lack of communication and transparency between academic institutions and industry*
- Corporate research is crucial for India's economic growth and job creation. To achieve global competitiveness, a stronger focus on technological innovation is needed. At present, India's corporate GERD falls short when compared to that of developed economies, indicating a need for enhanced investment and strategic emphasis in this area. Due to low funding and low budget especially for smaller private colleges, researchers are required to shell money out of their own pocket, which acts as a barrier to uptake any further research**
- 90% of research conducted in India is predominantly empirical, relying heavily on direct observations or experiences. This stifles innovation and hinders translation of research into scalable products and solutions
- India's translational readiness level (TRL) is low, with most researches in Indian institutes at stages 4 or 5. TRLs measure the maturity of technology from research to deployment, with 9 being the most mature. This indicates a gap in advancing to practical application**

Best Practice

Converting research insights into market ready solutions to transform education sector and propel ed-tech solutions

Coursera

- **R&D to Practice** - Coursera originated from research at Stanford University that was focused on machine learning and artificial intelligence. Researchers **launched an online discussion to demonstrate their research** which attracted over **160,000 students** revealing the potential of digital platforms to **scale and globalize education**.
- **Practice to Product Development** - The foundation of Coursera was built on **research into MOOCs (Massive Open Online Courses).** The researchers found that **video lectures combined with interactive exercises could effectively substitute traditional classroom settings**, offering a scalable solution to education.
- **Product to Economic Development** - In **2012, this research was transformed into Coursera.** The company utilized insights from learning sciences to create an interface that includes quizzes, peer-graded assignments, and community discussion forums, all derived from evidence-based educational practices. **Coursera's business model initially focused on providing courses for free, monetizing through certification fees, which was another research-backed decision indicating that learners valued the certification of skills more than the content itself.**

100,000+
Student enrolments to learn from Coursera Co-Founders[1]

2012
Year of establishment of Coursera

* Dr. Sandeep Sancheti, Vice President (Research Relations & Academic Advisory), Elsevier (India)

** Dr. Sundar Manoharan, Director General, Pandit Deendayal Energy University

Source: 1 Research Gate, 2 India Today, EYP analysis, Primary Interviews

Source: 1. Cleverism, Success Story, EYP analysis

Despite the surge in contributions, procedural delays and conservative approach affects momentum

Contribution by the industry

Corporate backed research institutions

Some large conglomerates have set up research institutions and innovation labs, such as the Tata Institute of Fundamental Research (TIFR) and the Infosys Foundation, which support research across various domains. These institutions contribute to scientific research and innovation.

Public Private Partnerships

The Indian government has encouraged PPPs in research through various initiatives. For example, the Biotechnology Industry Research Assistance Council (BIRAC) is a government initiative that collaborates with private companies to support innovation in the biotech sector.

Under-par support to research

Weak industry academia linkage

37% of investment in research and development comes from industry – much lower than the 80–90% in countries with technology-heavy economies, including Israel, South Korea and Japan[1]

Imbalanced R&D funding responsibility

In most of the developed capitalist countries, R&D is undertaken by the private sector. In India, this expenditure is mostly borne by public funding.

IPR gaps and commercialization difficulty

The lack of a conducive environment for innovation, including weak intellectual property rights (IPR) enforcement and a slow patenting process, has also been a deterrent. Innovation is a key aspect in shift from practice to product development and hindrances here does not help India realise the economic potential of its research

Source: 1 Nature, EYP analysis

New product development and innovation serves as the key motivator for industry to engage in research activities

Incentives for Industry to undertake research work

- Companies often conduct internal research and disclose information about their research through publications as this brings some benefits to them. Below we list some of the incentives for companies to undertake research work.

New product development and innovation

- The most important incentive for a corporate to do research work is new product development through ground-breaking innovation which does not exist in the market.
- Once a company is able to develop a new product it can have a direct impact on the company's performance and visibility in the market.

Attracting talent

- Companies known for new product development and innovative products are known to attract the best talent.
- Job-seekers view these companies as an opportunity in contributing to building something innovative.
- Big tech firms such Google, Microsoft, and Tesla are some of the prominent examples.
- In India, top three of the most sought-after employers are from the technology sector namely Accenture and Cognizant.[1]

Improve profits and attract investors

- Research and innovation when converted into a commercial product can result in tremendous gains for the companies.
- It can give a direct boost to sales and profits of the company attracting more visibility which can lead to heightened investor interest.
- An automotive company's strategic focus on research and development has led to significant product improvements and the introduction of advanced technologies. This, combined with competitive pricing strategies and capturing nearly 80% of the EV market, has greatly enhanced its market share, company prospects and investor interest.

Grants and awards

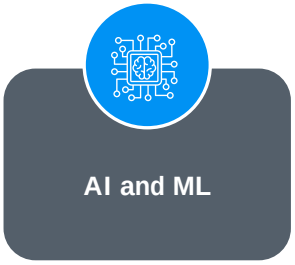
- In the Indian context, startup firms may undertake research work to obtain grants and awards which can help it from a monetary angle as well as in terms of visibility.
- Several grants and schemes in India such as NIDHI, Startup India seed fund scheme provides startup with required support.
- National startup awards have twenty awards each year to be given to startups which includes a cash prize of INR10 lakhs.[2]

Source: 1 TICE, 3. Startup India, EYP analysis

Fields such as technology, healthcare and renewables are experiencing heightened research interest

Areas of research in demand

- With digital threats increasing, there is a strong demand for research in advanced cybersecurity measures, including the development of new techniques for threat detection, response to it, and its prevention.
- Companies are also focusing on improving cybersecurity governance and integrating cybersecurity with physical security systems.
- The National CoE, a joint initiative of the Data Security Council of India (DSCI) and the Ministry of Electronics & IT, organized the Cybersecurity R&D & Innovation Roadshow in 2023. This event, held at IISc Bangalore, brought together industry leaders, researchers, and start-ups to showcase and collaborate on the latest developments in cybersecurity R&D. The roadshow aimed to bridge the gap between academic research and industry needs, encouraging companies to invest in the commercialization of cybersecurity innovations[1]



- Research in AI and ML continues to be a high priority, particularly in areas such as natural language processing, computer vision and AI ethics.
- The integration of AI in business processes, predictive analytics, and AI-driven automation is critical for many industries.
- An IT Company has invested heavily in R&D towards AI and ML with a project pipeline of more than US$1.5 billion. They have also invested heavily towards AI that can help them with talent development front.

- As enterprises move towards multi-cloud environments, research in cloud architecture, data management, and cloud security is a priority.
- Most of the tech companies consider cloud systems as a necessity in their digital journey, making it a hot topic of research.
- A global company's investments in India continue to rise as they have committed to investing nearly US$13 billion in cloud infrastructure in India by 2030, on top of the US$3.7 billion already invested between 2016 and 2022. This investment aims to enhance cloud service capabilities across various sectors, including government and private enterprises, contributing significantly to India's economy

- For advancing healthcare with changing times, research in personalized medicine, genomics, and biotechnology is crucial.
- Industries are investing in the development of new treatments, vaccines, and diagnostic tools, especially in response to global health challenges such as the COVID-19 pandemic.
- Bharat Biotech, a leading Indian biotechnology company, has committed to a research and development investment with the University of Sydney's Infectious Diseases Institute. This collaboration is centered on advancing vaccine research, aiming to drive innovations in vaccine development through focused R&D initiatives.[2]

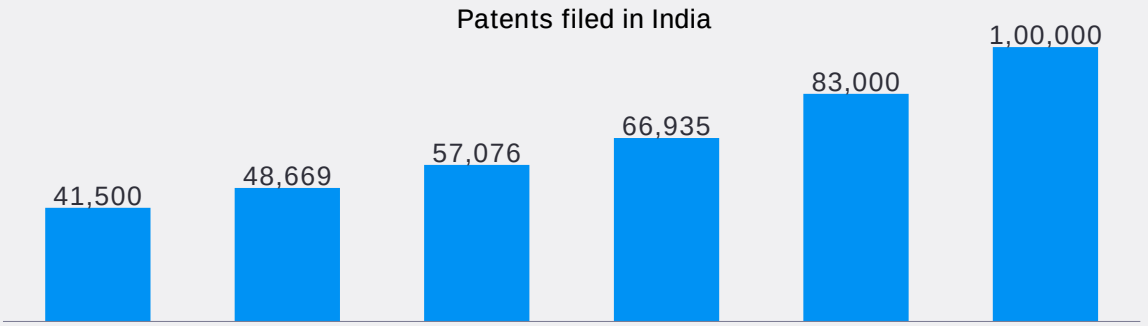
Source: 1 NCOE, 2 Economic Times, 3 Business Standard, EYP analysis

Sustainability

- Given the global push towards sustainability, there is heightened interest in research related to renewable energy technologies such as solar, wind and green hydrogen.
- Research in energy storage, grid resilience and decarbonization strategies are also critical as industries rush to meet climate related goals.
- Reliance Industries has committed to investing US$10 billion over three years in its new energy business, focusing on renewable energy sources such as solar power and green hydrogen. The company has already started working on a solar manufacturing plant in Gujarat.[3]

The number of patents filed in India has witnessed a healthy growth

Research output



Source: Nasscom

- The steady increase in the number of patents filed in India serves as a strong indicator of the growing strength of industrial research within the country. This trend reflects progress in innovation and can be considered a valuable metric for assessing the state of industrial research and development in India. However, this should be taken with a pinch of salt, as almost 50% of these patents are not very useful in most cases, often filed just for the sake of it and merely sitting on paper without being actionable or implementable.*
- According to NASSCOM, 83,000 patents were filed in FY23, reflecting a positive and encouraging annual growth rate of 24.6% – the highest recorded in the past two decades. This upward trend is anticipated to continue, with projections indicating that over 100,000 patents will be granted by mid-March 2024.[1]
- AI, the Internet of Things (IoT), and Neurotechnology were among the leading technologies for which Deep-Tech start-ups in India filed patents. In terms of application areas, healthcare saw the highest number of patent filings, particularly in medical imaging, diagnostics, report generation, and testing, highlighting the growing focus on technology-driven solutions within the sector.
- The proportion of patents filed by Indian residents has increased significantly, rising from 33.6% in FY19 to over 50% in FY23. This growth can be largely attributed to heightened awareness of IPR across the country. Although the patent filing process in India has seen substantial improvements over the past two years, India's share of global patent filings remains at just 2%, indicating a need for further emphasis in this area.[1]

* Dr. Sandeep Sancheti, Vice President (Research Relations & Academic Advisory), Elsevier (India)

Source: 1. Nasscom, Primary Interviews

Emerging tech and cross border researches are rising, but private sector funding and output translation remain concerns

Trends in industrial research

Field of Study

India's leading field of research is Engineering & Technology, accounting for 52.6% of total research. The country's next predominant research fields are split between Natural Sciences and Life Sciences & Medicine[1]. While emerging tech R&D has sprung up in recent years, these three fields continue to occupy the top three spots. India is also witnessing increased contributions towards SDGs.*

Cross Border Research

India produces 19% of its research output alongside cross-border collaborators, in keeping with the global average of 21% and aligned with that of its closest competitors.[1]

Emerging Technologies

Most patent filings in India are now driven by emerging technologies such as AI, IoT, cybersecurity and quantum computing. This trend highlights the country's shift from traditional industries like manufacturing, textiles, automobiles etc. towards cutting-edge research and development in high-growth sectors.[2] Research on AI is now being applied to environmental science to develop predictive models for climate change. Similarly, quantum computing is being explored for its potential to revolutionize cryptography and cybersecurity**

Innovation's new capital

Bangalore has overtaken Delhi as the leading city for patent filings in India, particularly in technology sectors. This underscores the city's growing role as a central hub for research and development.[3]

Challenges in industrial research

Research not translating into actionable outputs

- In India quality of research work is low which results in research not translating into actionable outputs, leading to lower contribution of research to economy and industry.
- Sub-standard quality of research work from students does not help them with employment opportunities.

Private sector capacity to fund R&D

- In India, R&D funding is driven by the government, unlike other developed countries. Private sector currently has limited capacity to fund R&D projects, which becomes a challenge for undertaking capital-intensive and large innovation projects.

* Dr. Sandeep Sancheti, Vice President (Research Relations & Academic Advisory), Elsevier (India)

** Prof. Rajita Kulkarni, President, Sri Sri University

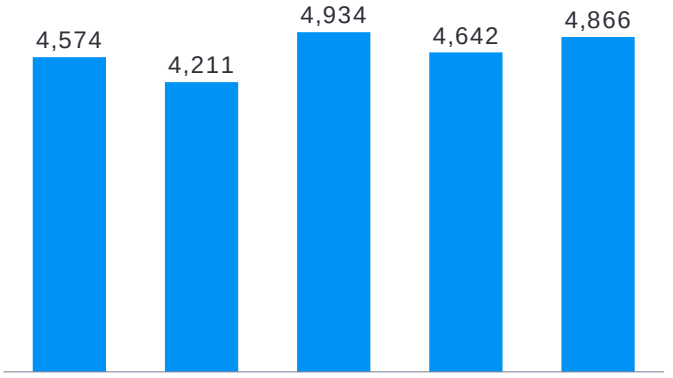
Source: 1 Free Press Journal, 2 Depenning, 3 Bananaip, 4 Springer, Primary interviews, EYP analysis

R&D expenditure is yet to sync with India's long-term economic aspiration

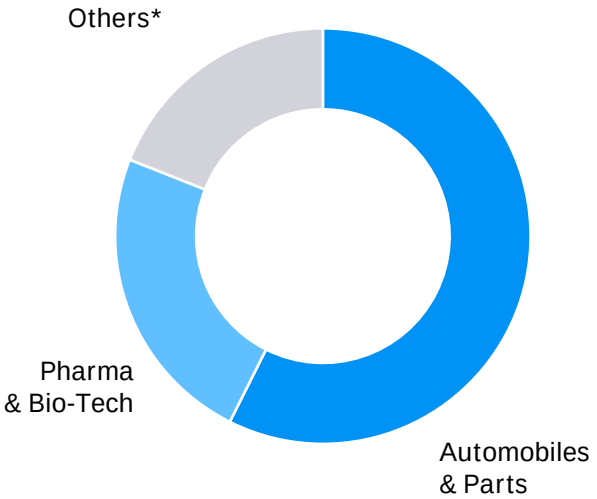
R&D spending

- Compared to global benchmarks, the R&D performance of Indian corporations remains subpar, reflecting a misalignment with India's long-term economic goals, particularly the realization of 'Vision 2047.'
- In 2019, U.S. businesses invested 71 times more in R&D than Indian listed companies. Similarly, European Union businesses spent 38 times more, while Chinese and Japanese firms allocated 24 times more than their Indian counterparts.
- Indian listed companies contributed just 0.5% to global corporate R&D spending in 2019, with only one Indian entity among the top 100 global R&D spenders.[2]

R&D Expenditure of Indian Corporates in EUR million (FY2015-19)[1]



R&D Expenditure of Indian Corporates by Sector (FY2015-19)[1]



- In India, patent activity is predominantly concentrated in pharmaceuticals and mechanical engineering, whereas countries like the US and China demonstrate a broader distribution across emerging fields such as AI, biotechnology, and green technologies.
- India's patents are more focused on incremental innovations rather than breakthrough technologies, a key difference from the top patent-filing countries. This limits the commercial value and global competitiveness of Indian patents, as they offer less differentiation and market impact. Consequently, establishing leadership in cutting-edge industries becomes more challenging. India's aim should be now to build hardware innovations and machinery rather than focussing on its already existing software innovations and competency.*

*Others include software & computer services, chemicals, industrial metals & mining, Oil equipment, industrial engineering, construction & materials and oil & gas producers

* Prof. Amit Sethi – IIT Bombay

Source: 1. EU R&D Scoreboard 2015-2019, 2. Vidhi Center for Legal Policy, Primary Interviews

Best Practice

Investments from corporates and integration between all stakeholders creates an excellent research ecosystem

South Korea

- **South Korea is recognized globally for its R&D excellence**, particularly in fields such as electronics, automobile manufacturing, chemicals and shipbuilding.
- **South Korean government has played an instrumental role in this journey**. The government has **promoted a strong R&D culture and incentivized large industrial groups** such as Samsung, LG and Hyundai **by providing tax credits** to contribute to nation building. These companies invest significant resources in R&D and are often at the forefront of the technological innovations in the country.
- Moreover, there is **seamless integration between industry, academia and research institutes**. This synergy helps in commercialization of research findings and development of cutting-edge technologies.
- The country has **included research and innovation in its education curriculum**. The STEAM (Science, Technology, Engineering, Arts and Mathematics) education was introduced in 2011 to prepare a quality workforce for creating a technology-based society.

4.8%

South Korea's R&D expenditure as a % of GDP

79%

Contribution of Business Enterprises in GERD in South Korea

Source: Department of Science & Technology Report, World Bank, EYP analysis

Best Practice

R&D excellence accelerates breakthroughs, leveraging digital tools and drives rapid medical innovations

Pfizer

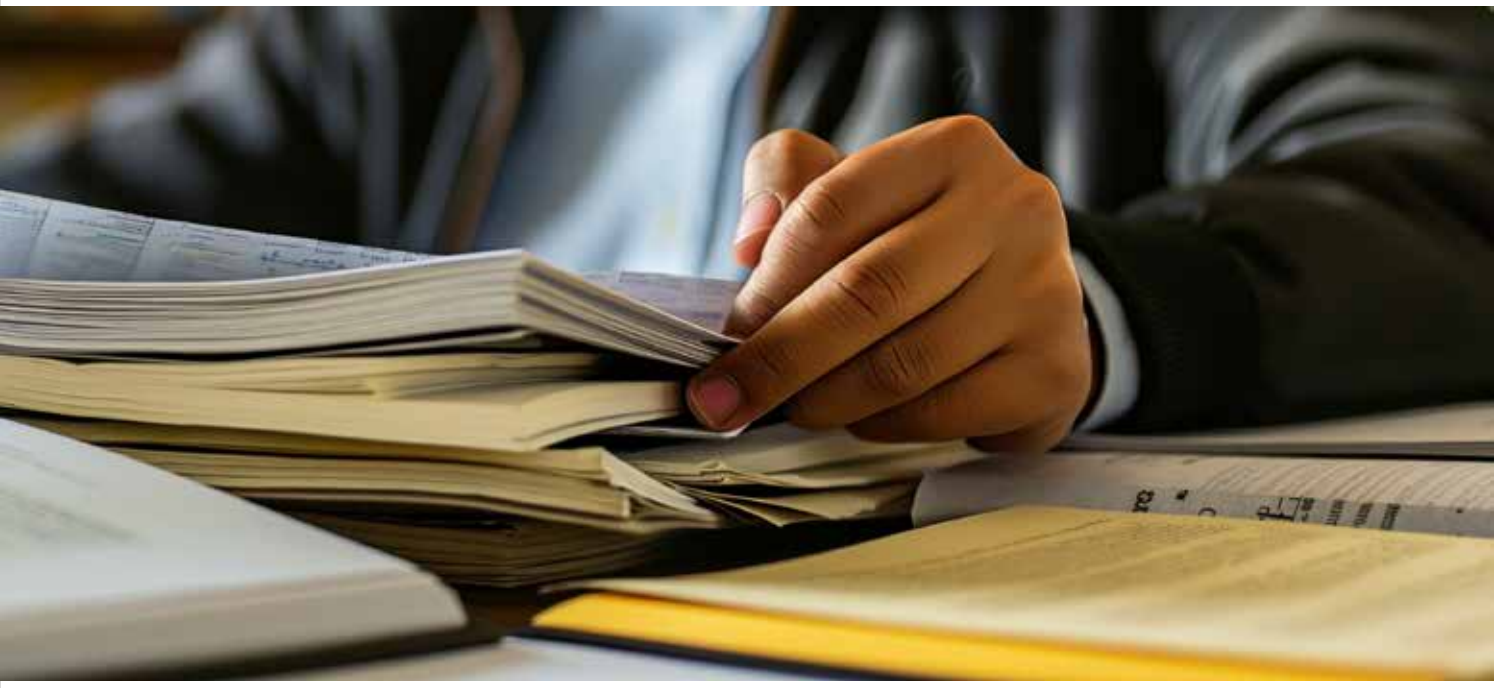
- Pfizer has continued to prioritize R&D as a core component of its strategy, with an **8.7% increase in its R&D budget for 2023**. The company has focused on prioritizing projects with the potential to yield significant breakthroughs, such as GLP-1 candidates for diabetes and obesity, combo vaccines for flu, COVID-19, and RSV, and gene therapies for haemophilia.
- Since 2019, Pfizer has **reduced its median time from first-in-human trials to approval from nine years to approximately five years** by 2022. This acceleration was driven by the "lightspeed principles" developed during the creation of their COVID-19 vaccine. This approach is now being applied across all therapeutic areas, enabling Pfizer to bring critical treatments to patients more quickly.[4]
- Pfizer has **embraced digital tools, AI, and machine learning (ML) to enhance various stages of drug development.** For example, AI and ML were instrumental in the rapid development and production of PAXLOVID, Pfizer's oral COVID-19 treatment. These technologies also played a **key role in optimizing clinical trials, reducing trial timelines by 50%, and improving manufacturing efficiency by shortening supply chain cycles by 67%.**[4]
- Pfizer has leveraged strategic partnerships to enhance its R&D capabilities. By **collaborating with academia, biotech companies, and technology firms, Pfizer has been able to expand its reach and speed in bringing new treatments to market**. These partnerships have been particularly crucial in areas like antimicrobial resistance and vaccine development, where global cooperation is necessary to address widespread health challenges.[4]

4
Awards at 2023 Clinical Trials Arena Excellence Award with 3 in the R&D Category[1]

8
months to develop COVID-19 Vaccine[2]

US$ 12-13 billion
Pfizer's R&D spending, marking a 7.7% increase from last year[3]

Source: 1. Clinical Trials Arena, 2. HBR, 3. Fierce Biotech, 4. Pfizer Annual Report, EYP analysis



Lower R&D spend reflects on Indian firms' research quality and impact when compared to global firms

R&D spending and its impact on research quality and relevance

- Indian corporate sector has played a pivotal role in the country's economic development. Industrial research drives innovation, leads to development of new products, services and industries. Moreover, research also has the potential to create employment. However, attention needs to be paid towards technology and innovation in the sector to help India transform itself into a global leader. GERD by corporates in India is lower than developed countries.
- The gap between global and Indian firms is also seen in R&D outputs. A study was conducted by the Foundation for Advancing Science and Technology India in collaboration with IIFL Securities to understand how Indian firms compare with leading global firms on selected parameters for R&D inputs and outputs.[1]

Methodology of the study:

- Data from about 120 firms was collected and analyzed in this study. Six sectors were chosen for comparison between firms from similar industries. Data was collected between FY 2016 to FY 2023.
- R&D intensity (the ratio of a firm's R&D expenditure to its revenue) and proportion of employees with Ph.D. were chosen as primary inputs, along with R&D by profits and R&D growth.
- Patents and publication by revenue were chosen as output indicators supplemented by disclosure information.

The below table provides the sectoral comparison and overall comparison between global and Indian firms.

Global vs India comparison medians

Sectors	R&D intensity*	Ph.D. by total employees*	R&D by profit*	R&D growth	Patents by revenue	Publications by revenue
Automobiles	3.1x	3.4x	5.9x	0.7x	29.8x	1.6x
Chemicals	1.7x	1.0x	2.0x	0.8x	14.1x	3.4x
Defense	2.8x	2.5x	3.0x	0.8x	33.0x	0.4x
Energy	2.5x	4.0x	2.8x	0.6x	9.9x	0.9x
Pharmaceuticals	3.0x	7.1x	2.0x	1.2x	5.6x	8.4x
Software	32.0x	6.1x	46.3x	1.1x	12.1x	0.4x
Overall	2.9x	3.7x	2.9x	0.8x	13.1x	1.3x

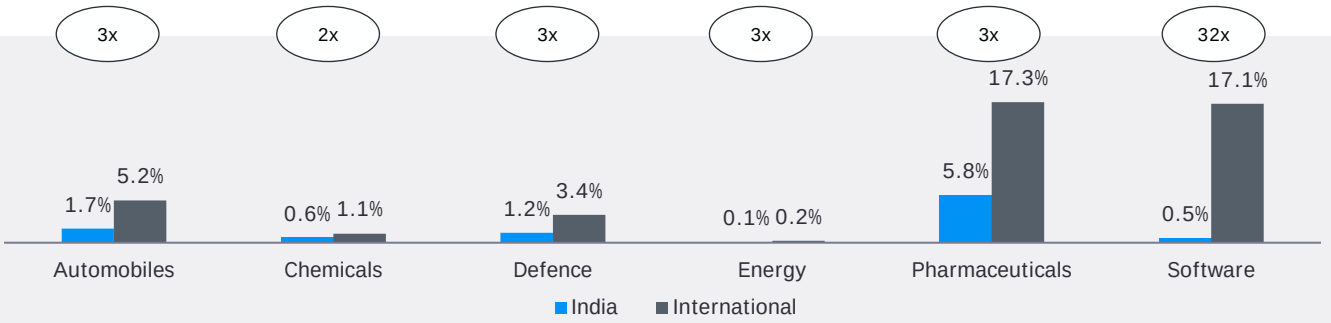
* is shown for the latest year FY2023, while for other parameters information is shown for the study period FY2016 to FY 2023.

Source: FAST India Report 2024

Indian firms lag global firms in R&D intensity and the proportion of high skilled employees

R&D inputs

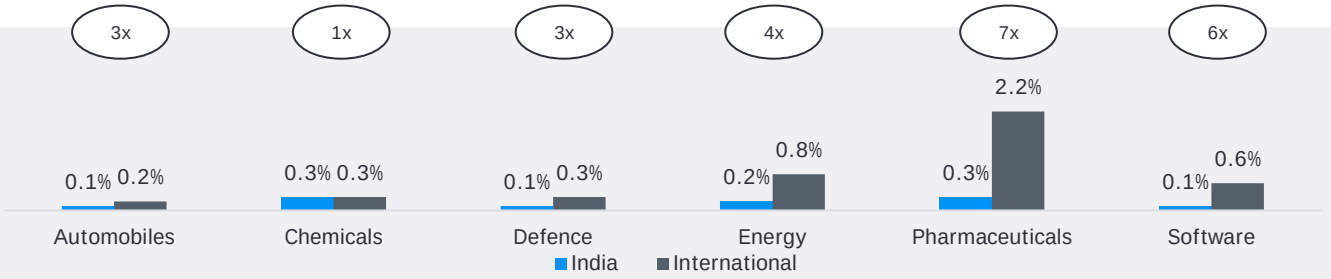
R&D Intensity for FY2023



Source: FAST India Report 2024

- Global firms outperformed Indian firms in R&D intensity in all sectors. The R&D intensity of global firms was 2.9x Indian firms.
- The largest difference in R&D intensity was seen in the software sector, likely due to the Indian software firms being service-led. The smallest difference was seen in the chemicals and energy sectors where global firms outperformed Indian firms by a factor of 1.7x and 2.5x, respectively.

Ph.D. employees as a proportion of total employees*



*Information about Ph.D. employees was collected in December 2023

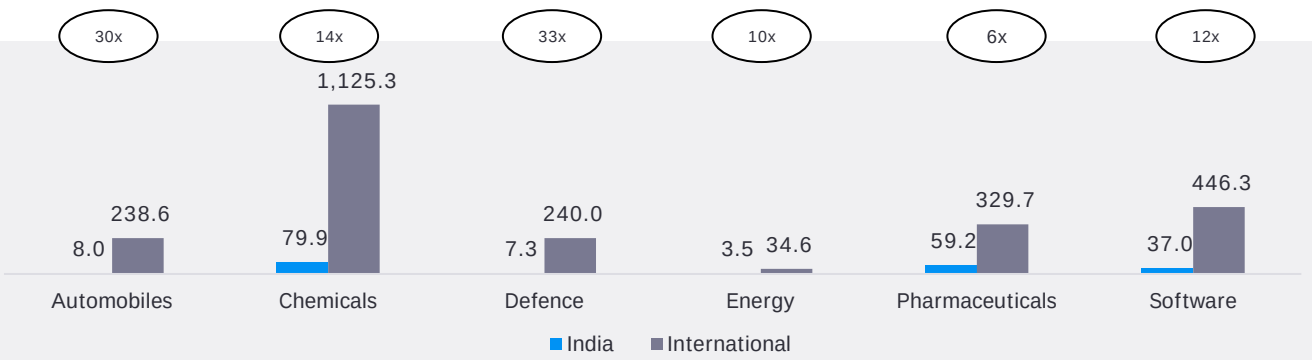
Source: FAST India Report 2024

- On average, global firms had 3.7x employees with Ph.D. as a proportion of total employees compared to Indian firms.
- Global pharmaceutical and software firms had the highest outperformance in this parameter, reflecting that these sectors have higher Ph.D. holders as compared to Indian firms. The lowest outperformance was in chemicals, which indicates that Indian firms have a good number of Ph.D. holders as compared to global firms.
- Global firms outperformed Indian firms by 2.9x in R&D by profit parameter. The highest outperformance was seen in the software sector due to Indian firms being largely service driven. The lowest outperformance was seen in the pharmaceuticals and chemicals sectors, standing at 2.0x for both.
- Indian firms outperformed global firms in the R&D growth parameter standing at 0.8x. The exceptions to the overall number were pharmaceuticals and software sectors, were global firms performed better than Indian firms.

Global firms outperformed Indian firms in patents by revenue and publications by revenue

R&D inputs

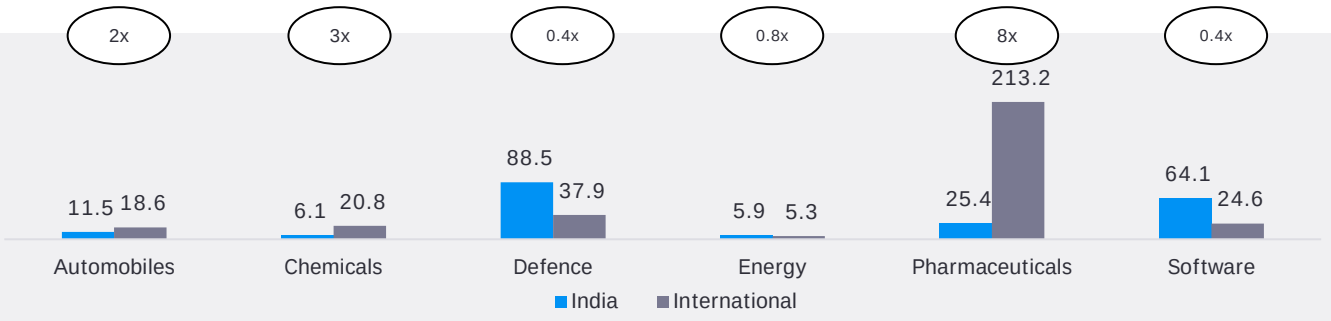
Patents by US$ billion revenue



Source: FAST India Report 2024

- On average, global firms published 354.8x more patents than Indian firms as indexed on the Google patent database for the period of study. However, when normalized by per billion US$ revenue, the global firms had 13.1x more patents than Indian firms.
- The variation between global and Indian patent data was stark in defense and automobile sectors, where outperformance was 33.0x and 30.0x, respectively. The gap in the pharmaceutical sector was the lowest where global firms had 5.6x patents by revenue compared with Indian firms.

Publications by US$ billion revenue



Source: FAST India Report 2024

- Global firms had 34.4x articles compared to Indian firms on the Scopus database for the period of the study. However, when normalized by per billion US$ revenue, the difference is much smaller with global firms publishing 1.3x more than Indian firms.
- Indian software and defense sector firms outperformed their global counterparts in publications by revenue. Indian software firms had published 2.6x, while Indian defense firms had published 2.3x more articles by revenue as compared to their global counterparts.
- The largest difference between the publication by revenue was seen in the pharmaceuticals sector, where the global firms published 8x more articles by revenue compared to Indian firms.
- An additional output metric which was used in the industry was R&D disclosure. Indian firms consistently score higher on R&D disclosures as compared to global firms. Out of 10, average Indian firms R&D disclosure score was 6.2, while global firms average score was 3.7 indicating that Indian firms and investors valued R&D related disclosures and information.

Among various sectors, pharmaceutical firms stand out for their performance, both in India as well as globally

Ranking of India sectors					
Sectors	Overall rank	R&D intensity	Ph.D. by total employees	Patents by revenue	Publications by revenue
Pharmaceuticals	1	1	1	2	3
Chemicals	2	4	2	1	5
Defense	3	3	4	5	1
Software	4	5	5	3	2
Automobiles	5	2	6	4	4
Energy	6	6	4	6	6

Source: FAST India Report 2024

Ranking of Global sectors					
Sectors	Overall rank	R&D intensity	Ph.D. by total employees	Patents by revenue	Publications by revenue
Pharmaceuticals	1	1	1	3	1
Software	2	2	3	2	3
Defense	3	4	4	4	2
Chemicals	4	5	5	1	4
Automobiles	5	3	6	5	5
Energy	6	6	2	6	6

Source: FAST India Report 2024

- Pharmaceutical firms performed best within the Indian cohort overall, ranking first in both the main input parameters. Similarly, pharmaceutical firms performed best within the global cohort, ranking first in both input parameters and publications by revenue.
- On the other hand, energy sector ranked last in all parameters except Ph.D. employees as a proportion of total employees globally as well as in Indian firms.
- To conclude, the study states that Indian firms are moving in the right direction by recording high R&D growth in most of the sectors studied and disclosing their R&D activities in their annual reports. However, Indian firms lag global firms in R&D intensity, number of skilled individuals, patents and publications.

Funding from the government and private sources continue to inject vitality into R&D efforts of established industries

Funding and support to R&D for demand side

Funding in Automobile Industry

- The automobile sector received a cumulative equity FDI inflow of about US$35.40 billion between April 2000 - September 2023. India is on track to become the largest EV market by 2030, with a total investment opportunity of more than US$200 billion over the next 8-10 years[1]
- Center sanctions INR800 crore under FAME scheme phase II for 7432 public fast charging electric vehicle stations[2]
- PLI scheme (outlay of US$3.5 billion) for the automobile sector proposes financial incentives of up to 18% to boost domestic manufacturing of advanced automotive technology products and attract investments in the automotive manufacturing value chain. The scheme has proven successful, attracting proposed investments of US$8.1 billion (INR67,690 crore) against the target estimate of US$5.1 billion (INR42,500 crore) over five years, with US$1.6 billion (INR13,037 crore) already invested by December 31, 2023[1]

Funding in Pharma and Biotech Industry

- The government has allowed up to 100% FDI through the automatic route for greenfield investments and up to 74% for brownfield investments. As a result of these policies, the sector has attracted 3% of the total FDI equity inflow, worth over US$21.5 billion since April 2000[3]
- Scheme for Promotion of Bulk Drug Parks (2020): The scheme boosts domestic manufacturing of identified KSMs, Drug Intermediates and APIs by attracting large investments in the sector. Financial assistance, up to INR1000 crore, will be provided for the creation of common infrastructure facilities in three Bulk Drug Parks selected in Gujarat, Himachal Pradesh, and Andhra Pradesh[3]
- The Department of Biotechnology in collaboration with the Natural Environment Research Council (NERC), UK, jointly launched research called "Tackling AMR in the environment from antimicrobial manufacturing waste". A total of 39 joint proposals were received spanning various geographies and research areas, including meta-genomics, sensors, microbial ecology, remediation, geo-spatial, mappings, and mathematical modelling[4]

Funding in Chemicals Industry

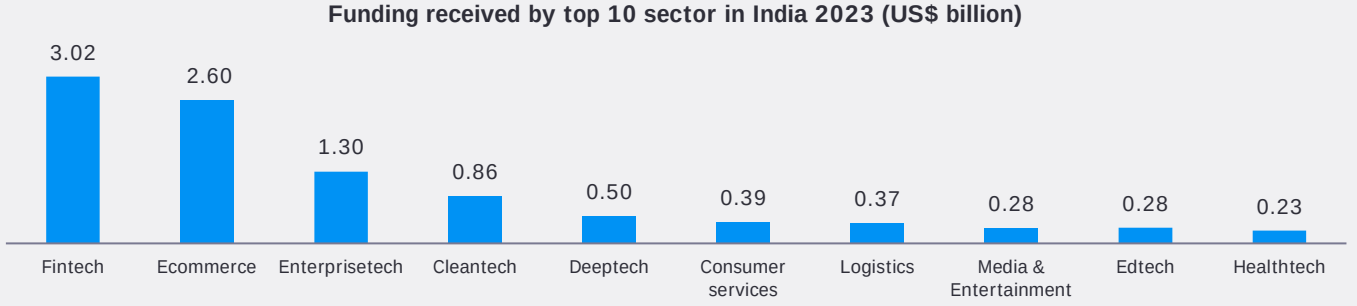
- Chemicals is in sixth position in terms of total FDI in India amounts to around 3% of total FDI equity inflows in India, with highest recorded growth i.e., 91% over the FY 2021-22 among all the sectors. It received foreign direct investment of INR14,662 crore in FY 2022-23 in comparison to INR7,202 crore in FY 2021-22 and INR6,300 crore in FY 2020-21[5]
- Research and development grant provided to one of the IITs for five years to encourage indigenous production of lab grown diamonds
- Union Budget 2022-23 announced the issuance of sovereign green bonds aimed at mobilizing resources for green infrastructure projects. This initiative is particularly relevant for the chemical industry as it seeks to reduce carbon intensity and promote sustainable practices

Source: 1 IBEF Report, 2 Invest India, 3 Invest India, 4 India Briefing, 5 Indian Chemical, EYP analysis

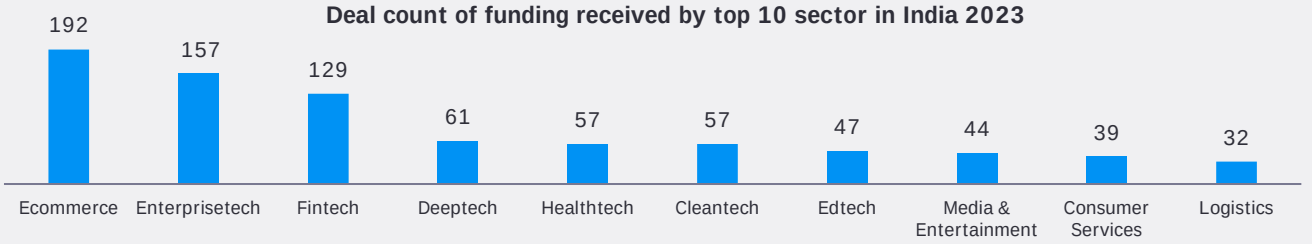
In the vibrant startup ecosystem of India, Fintech sector has emerged as the beneficiary of investment inflows

Funding and support to R&D for supply side

- Technology is at the forefront of start-up funding in India, highlighted by the fact that majority of the emerging sectors that received highest funding are technology driven.
- Fintech sector received the highest funding in 2023 for the second year running, though the amount of funding declined from ~US$4.5 billion in 2022 to ~US$3 billion in 2023. The decline is reflective of the overall slowdown in funding ecosystem in India.
- Ecommerce sector secured the second-largest funding in 2023. The funding in the sector has reduced from the highs of ~US$11 billion in 2021 to ~US$2.6 billion in 2023, highlighting weak trends in the seed and growth stage funding.



Source: Inc42 Indian Tech Startup funding Report 2023

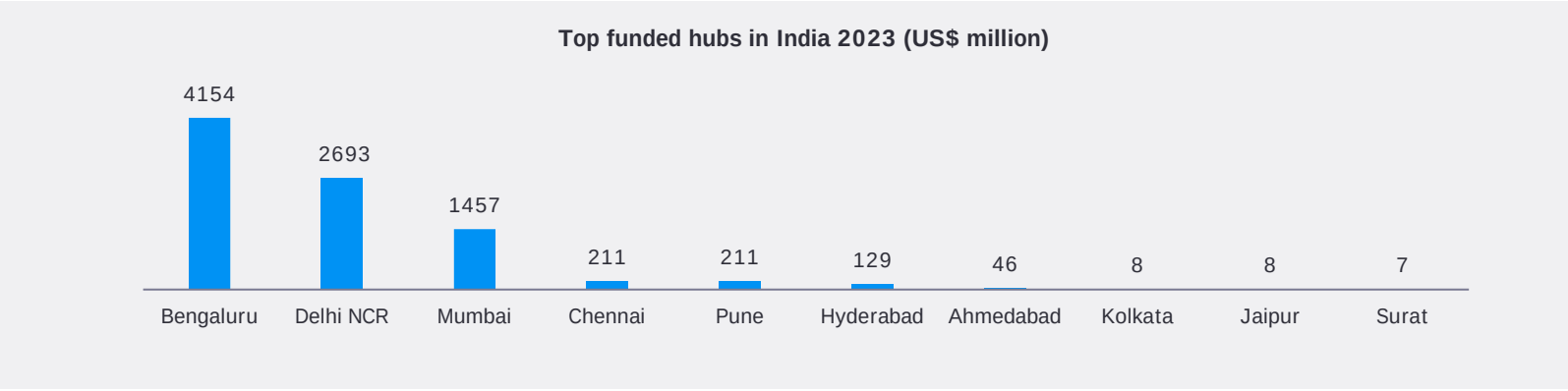


Source: Inc42 Indian Tech Startup funding Report 2023

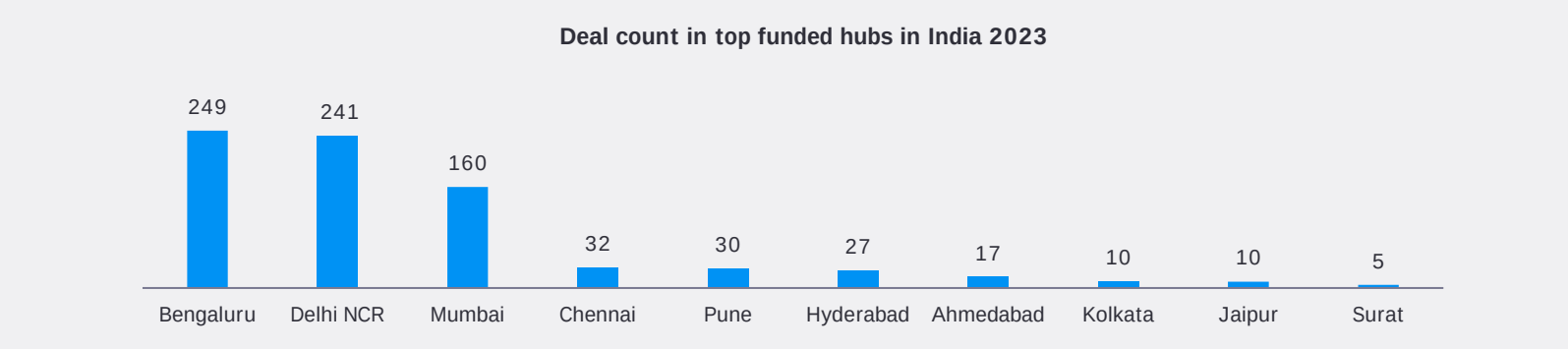
- In terms of deal count, Indian funding ecosystem has seen the number of deals decline to 897 in 2023 from 1517 in 2022, reflecting overall slowdown in funding.
- Ecommerce sector saw the highest number of deals for the second year running, followed by Enterprisetech.

Bengaluru has established itself as the leading hub for funding in India, bolstered by the Startup India initiative

- Bengaluru is known as the Silicon Valley of India as the city hosts a large number of startups and is the nation's leading software exporting state. Further, support from the Karnataka government with the startup policy has also contributed to creating a supportive environment. It has garnered the maximum funding as compared to other hubs in India since many years. However, it witnessed a 61% YoY decline in funding in 2023 to ~US$4.2 billion.
- Delhi NCR comes in at second, with its funding also declining 51% YoY to ~US$2.7 billion.



Source: Inc42 Indian Tech Startup funding Report 2023



Source: Inc42 Indian Tech Startup funding Report 2023

- Bengaluru witnessed the highest number of deals in 2023, though the number of deals declined 48% YoY.
- Delhi NCR saw the second highest number of deals. The number of deals declined 39% YoY in 2023.

Startup India initiative offers plethora of funding assistance and incentive schemes (1/2)

Government funding and support initiatives for R&D

What is Startup India initiative?

- Startup India is a flagship initiative of the Government of India. This initiative is intended to build a strong eco-system for nurturing innovation and startups in the country, which will drive sustainable economic growth and generate employment opportunities.
- To meet the objectives of the initiative, Government of India action plan that addresses all the aspects of the startup ecosystem was announced.
- The action plan is divided in the following areas:
  - Simplification and handholding
  - Funding support and incentives
  - Industry-academia partnership and incubation

Funding support and incentives initiatives

Tax exemption

Tax exemption on capital gains

- Exemption shall be given to persons who have capital gains during the year, if they have invested such capital gains in the fund of funds.
- Existing capital gains tax exemption for investment in newly formed manufacturing MSMEs by individuals shall be extended to all startups.

Tax exemption for three years

- The profits of startup initiatives are exempted from income-tax for a period of three years.
- The exemption shall be available subject to non-distribution of dividend by the startup.

Tax exemption on investments above fair market value

- Under the Income Tax Act, 1961, consideration received by a startup for issue of shares more than the fair market value of such shares is taxable as income from other sources.
- Investment by venture capital funds in startups is exempted from operations of this provision. The same shall be extended to investment made by incubators in the startups.

Source: PIB, Vikaspedia

Startup India initiative offers plethora of funding assistance and incentive schemes (2/2)

Monetary benefits

Providing funding support through Funds of Fund

- Government has set up a Fund of Funds to provide funding support with an initial corpus of INR2,500 crores and a total corpus of INR10,000 crores over a period of four years.
- The fund will not invest directly in startups but shall participate in the capital of SEBI registered venture funds.

Credit guarantee Fund for Startups

- Credit guarantee mechanism through National Credit Guarantee Trust Company/SIDBI is being envisaged with a corpus of INR500 crores per year for the next four years.

Legal support and patent examination at lower cost

- The central government will bear the entire fees of the facilitators for any number of patents and trademarks that a startup may file, and the startup will only bear the cost of statutory fees payable.
- Startups will be provided an 80% rebate in filing of patents and a facility for expedited examination of patent applications.

Awards and recognition

National Startup Awards

- National startup awards are given to recognize and reward outstanding startups and ecosystem enablers that are building innovative products, solutions and scalable enterprises, with the potential of employment or wealth creation. The awards were initiated in 2020.
- The awards are conferred across twenty categories.
- Cash prize of INR10 lakhs is awarded to one startup in each category. Moreover, startups get pitching opportunities to present to relevant public authorities and corporates for potential pilot projects and work orders.

The central government has introduced a variety of fiscal incentives to stimulate R&D (1/2)

Key central government incentives to boost R&D growth

- Central government has various fiscal incentives for R&D to boost the research ecosystem in India. Below we list out the key incentives by type and their legal provision.

1 Tax deduction

Section 35(1)(i), Income Tax Act, 1961	Allows eligible assesses to deduct sums equal to the revenue expenditure incurred on R&D from their taxable income
Section 35(1)(iv), Income Tax Act, 1961	Allows eligible assesses to deduct sums equal to the capital expenditure incurred on R&D from their taxable income
Section 35(1)(ii) and Section 35(1)(iii), Income Tax Act, 1961	Allows eligible assesses to deduct sums equal to the amount paid for scientific/social science/statistical research to research associations, universities, colleges, or other institutions from their taxable income
Section 35(1)(iia), Income Tax Act, 1961	Allows an eligible assessee to deduct sums equal to amount paid to an Indian company for conducting scientific research from their taxable income
Section 35(2AA), Income Tax Act, 1961	Allows eligible assesses to deduct sums equal to amount paid to National Laboratory/a University/an Indian Institute of Technology from their taxable income
Section 35(2AB), Income Tax Act, 1961	Allows a company engaged in biotechnology/any business of manufacture or production of any article to deduct sums equal to expenditure incurred by approved in-house R&D units from their taxable income
Section 80(IB)8A, Income Tax Act, 1961	Allows companies carrying on scientific R&D to deduct sums equal to 100% of profits for a period of 10 years. This incentive can only be availed by companies which were approved in this regard before 1st April 2007
Section 35(2AB), Income Tax Act, 1961	Allows accelerated depreciation allowance up to 40% on the investments made by an assessee in new plant and machinery based on indigenous technology

Source: The Vidhi center for Legal Policy

The central government has introduced a variety of fiscal incentives to stimulate R&D (2/2)

2 Customs Duty Exemption

Section 25, Customs Act, 1962 read with notification no. 50/96-Cus., dated 23 July 1996 (General Exemption No. 135)	Exempts payment of full customs duty in respect of import of equipment, instruments, raw materials, components, pilot plant and computer software for R&D projects undertaken by a company having an in-house R&D unit for a government funded project

3 Patent Box

Section 115BBF, Income Tax Act, 1961	If the total income of an assessee includes any income by way of royalty for a patent developed and registered in India, then such royalty shall be taxable at the reduced rate of 10%

The government has been curtailing the ambit of tax incentives provided to businesses for investing in R&D and is signalling a shift towards rewarding R&D output over inputs. Moreover, several new incentives, particularly the reduced tax rates on patent royalties have been introduced by the government. The net effect of these reforms on improving Indian Corporate's R&D performance will be tested going ahead.

Source: The Vidhi center for Legal Policy

Central government has introduced several schemes to boost funding (1/2)

Key central government funding schemes to boost R&D growth

- Central government has various funding schemes for R&D to boost the research ecosystem in India. Below we list out the some of the key schemes and their details.

Scheme	Entity	Beneficiaries	Funding details
Epidemic preparedness through rapid vaccine development	Department of Biotechnology and Biotechnology Industry Research Assistance Council	Indian companies and Not for Profit Limited Liability Partnerships	Grants without royalty payment obligations
Fund for technology development and application	Technology Development Board	Companies, cooperatives, and other agencies such as startups and techno-entrepreneurs	Loans at 5% simple annual interest up to 50% of the project cost, equity up to 25% of the project cost and grants especially for projects of national importance
National Initiative for Developing and Harnessing Innovations (NIDHI)	National Science and Technology Entrepreneurship Development Board and Department of Science and Technology	Startups and incubators	Soft loans, equity or equity linked instruments
National BioPharma Mission	Department of Biotechnology and Biotechnology Industry Research Assistance Council	Academic researchers, Bio entrepreneurs, Small and Medium Enterprises	Direct funding
New Millennium Indian Technology Leadership Initiative	Council of Industrial and Scientific Research	Public funded R&D institutions and private industry	Grants and soft loans to private sector partners
Patent Acquisition and Collaborative Research and Technology Development (PACE)	Council of Industrial and Scientific Research	Industries registered in India having a healthy financial track record and have Department of Scientific and Industrial Research recognized R&D units, R&D organisations, academic institutions, and universities	Secured loan or grants

Source: The Vidhi center for Legal Policy, EYP analysis

Central government has introduced several schemes to boost funding (2/2)

Scheme	Entity	Beneficiaries	Funding details
Promoting Innovations in Individuals, Startups and MSMEs (PRISM)	Council of Industrial and Scientific Research	Citizens of India having an innovative idea, publicly funded organizations, autonomous organizations, societies or trusts engaged in promotion of innovation	Sanction amount between the range of INR9 lakhs to INR50 lakhs
Renewable Energy Research and Technology Development Program	Ministry of New and Renewable Energy	Industry, academic and R&D institutions, registered societies and startups	Grants
Revised Scheme on R&D for Conservation and Development	Ministry of Environment and Forests	Institutions with experience in the identified thematic areas	Grants
SRIJAN Scheme	Technology Information, Forecasting and Assessment	Indian MSME units	Secured loan at flexible terms and softer interest rate of not more than 5% per annum with financing up to 80% of the project cost and mostly not more INR100 lakh
Technology Mission Programme on Water and Clean Energy	Department of Science and Technology	Individual researchers, academic and R&D institutions, industries having recognized R&D and industry associations	Fellowships and innovation grants

- Central level funding schemes target improving the overall research and infrastructure and developing the professional skills of the country's R&D manpower, instead of focusing on just providing funding, which is the right approach considering the current situation of the overall R&D ecosystem in India.

Source: The Vidhi center for Legal Policy, EYP analysis

Several states have crafted their own policies to nurture startups

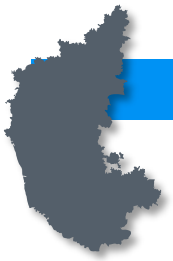
Key state-level initiatives to boost R&D growth

- A state's startup policy is crucial in providing the essential funding, mentorship, and market access support required by startups to grow as important contributors to a state's economy in terms of revenue and job creation.
- 31 of 36 states in India and Union Territories have dedicated startup policy. 27 of these startup policies were developed after the launch of the Startup India initiative. There is at least one DPIIT- recognized startup present in each of the 36 states and Union Territories. 653 districts host at least one recognized startup.
- Below we list out some examples of state-level startup policies and initiatives.

Maharashtra

Maharashtra has implemented the Maharashtra Startup Policy 2018-23. 24,389 startups have been recognized so far. Some of the key policy initiatives are:

- Startups to be allowed self-certification for government compliances.
- Local laws shall be looked into with the view of relaxing some norms for easy compliance.
- Easier procurement norms without any relaxation in quality standards and technical parameters.
- Startups may be reimbursed SGST paid by them, whenever system credit for the same is not available to the customers of these startups.
- For recognized incubators or startups that wish to rent a space, 100% of stamp duty and registration fee may be compensated for first three years and 50% for the second tranche of three years.
- The government may take up 80% of quality testing costs incurred by startups at accredited facilities.
- Assistance and financial support in filing of patents, trademarks and designs to ensure startups sustain.



Karnataka

Karnataka has implemented the Karnataka Startup Policy 2015-20. 14,412 startups have been recognized so far. Of these, 6,797 startups are women-led, highlighting the focus on promoting women entrepreneurship in the state. Some of the key policy initiatives are:

- For domestic patents the cost of filing and prosecution of the application will be reimbursed to incubated startups up to a limit of INR2 lakh per patent awarded. For foreign patents on a single subject matter, up to INR10 lakh will be reimbursed to incubated startups. The reimbursement will be done in 2 stages - 75% after the patent is filed and the balance 25% after the patent is granted.
- Marketing assistance of 30% of the actual marketing costs, including travel incurred in international marketing through trade show participation, will be reimbursed on submission of valid claims. This incentive will be subject to a maximum of INR5 lakh per year per company.
- Tax paid by startups incubated in Karnataka supported incubators whose annual turnover does not exceed INR50 lakh for the first three years will be reimbursed.

Source: Startup India

Recommendations

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Lack of focus on developing new innovative technologies in emerging areas such as AI, biotechnology and green technologies	Innovation	Corporates (Head of research) Government (Ministry of Corporate Affairs)	Corporates should focus on developing ground-breaking technologies to increase India's global competitiveness	„ *Action:* Encourage corporates to pursue research in upcoming technological areas rather than incremental innovation on work already done by developed countries to enhance India's competitiveness on the global stage. „ *Implementation:* Government should encourage corporates by funding research projects which have the potential to become ground-breaking or can solve real-world complex problems through PPPs. Moreover, the government should ensure there is seamless integration between all the stakeholders in the research ecosystem to ensure the turnaround time between a research idea to developing a commercial product is minimized. „ *Expected outcome*: India to witness an increase in contribution to innovative technologies in lower turnaround times.
Lack of conducive regulatory environment	Policy	Government (Ministry of Commerce and Industry/ Department of Industrial Policy and Promotion)	Streamline the Intellectual Property Rights (IPR) and patenting processes to make it more transparent and faster	„ *Action:* Government needs to undertake steps to simplify the IPR laws interpretation and patenting application process. „ *Implementation:* Government should focus on increasing awareness on IPR through channels including online platforms and awareness campaigns. The government needs to streamline the IPR and patenting process to make it user-friendly and efficient. For patenting, a single window clearance system should be introduced*. Moreover, the government should also look at bringing the cost of patent filing down as it becomes too costly for researchers*. To enforce the laws, coordination between different government agencies and courts should be strengthened to resolve legal issues. To provide protection to new forms of intellectual property such as digital content, continuous evaluation and updating of legal framework would be required. „ *Expected outcome*: Increased awareness on IPR laws and simplification of the patenting process will help Indian corporates and startups protect their inventions.

Priority Recommendation Short-Term Medium-Term Long-Term

* Dr. Sundar Manoharan, Director General, Pandit Deendayal Energy University
Source: EYP analysis, Primary Interviews

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Lack of skilled employees results in low quality of research output	Personnel	Corporates (Head of research, Talent team)	Increase the number of doctorates and specialized skills employees to improve the quality of research output	„ *Action:* Encourage corporates to recruit personnel with specialized skills and know-how to build the internal knowledge base to conduct research. „ *Implementation:* Encourage corporates to recruit faculties and doctorates from universities specializing in research to boost the quality of research output produced. Moreover, corporates should also focus on upskilling current employees, so they are up to date with the latest technologies and tools which can help in improving research quality. „ *Expected outcome*: Increase in the number of specialized skills employees will lead to better research outcomes.
Low R&D spending by corporates	Monetary	Corporates (Head of research, Finance department)	Increase spending on GERD by corporates from current 41% to 60% - 70% to match developed countries	„ *Action:* Corporates should aim to increase R&D investments to foster a culture of research and innovation. „ *Implementation:* Corporates should try to spend at least 1%-2% of their annual budget on R&D activities, which will help in technological innovation and excellence that is competitive globally.* Additionally, corporates should try to spend 1% of their CSR budget on domestic or international partners to strengthen R&D related partnerships.* „ *Expected outcome*: Corporates willingness to invest in R&D can help India match the R&D spending of developed countries.

Priority Recommendation Short-Term Medium-Term Long-Term

* Dr. Sandeep Sancheti, Vice President (Research Relations & Academic Advisory), Elsevier (India)
Source: EYP analysis, Primary interviews

3.3 Industry-academia research

Industry-academia collaboration is key to innovation and product development with multiple successful partnerships in the past

Collaboration leads to quality research and research translation into output

- In a rapidly evolving global world, collaboration between industry and academia is increasingly gaining importance as it creates a win-win situation for both the parties.
- Industry gains access to intellectual resources and cutting-edge research from universities, while universities benefit from the practical insights and financial support provided by industry. This collaboration also offers students opportunities like consultancy and live projects, contributing to job creation and employment.
- The quality and relevance of research are key factors in forming ecosystem partnerships. High-quality research signals expertise, attracting companies to partner with universities. Similarly, research with real-world applicability is more likely to draw ecosystem partners.
- Partnerships between industry and academia has led to the development of new products and innovation in India. Below we highlight a few prominent examples.

IIT Madras and TVS Group	The collaboration led to the development of Sundaram Ventago, a low-cost respiratory device. It offers doctors a simple, cost-effective solution when ventilator capacity is exceeded and is particularly useful in remote areas lacking ventilators.[1]
IIT Delhi and ITC	They have signed an MoU to support research in STEM areas for helping India's journey towards achieving SDGs. Energy storage, low carbon cold transportation and plastic bio degradation are among the few areas identified for research.[2]
IIT Kanpur and AVPL International	They have collaborated for co-developing cutting-edge drones with advanced technologies. These will be designed to address agricultural issues such as seed broadcasting and agrochemical spraying in India, Australia and other European countries[3]

Source: 1 Autocar, 2 IIT-D website 3 IIT-K website, EY-P Analysis

Best Practice

Empowering future technologies through synergistic and aligned research partnerships

IIT Bombay

- IIT Bombay collaborates **through the Tata Center for Technology and Design**. This partnership focuses on creating solutions for societal challenges in areas like **healthcare, energy and waste management**. The company **funds research projects and contributes to the curriculum, ensuring alignment** with industry innovations.[5]
- IIT Bombay has also collaborated with **Larsen & Toubro for development of green hydrogen technology**. The collaboration aims to address the challenges associated with **hydrogen production, particularly focusing on improving the efficiency and cost-effectiveness** of green hydrogen generation through innovative technology.[6]
- An Indian automobile company and IIT Bombay signed a five-year Memorandum of Understanding (MoU) to collaborate on **joint R&D projects** aimed at developing future automotive technologies. This partnership focuses on **bridging academic research with industry needs, particularly in engineering domains critical to the company's future products**. The collaboration also involves **curriculum development, live projects, and advanced training** for students stepping out of campus, aligning with the 'Make in India' initiative and preparing Indian industry to compete globally.

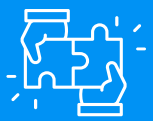
130	24	2000+
Cutting edge collaborations[4]	# of COEs/hubs/labs commissioned[4]	Faculty and students impacted[4]

Sources: 4. IIT Bombay website, 5. IIT Bombay Website, 6. L&T, EY-P Analysis

Universities are increasingly looking to collaborate with industry for funding and employment benefits

Trends in industry-academia partnerships (1/3)

Fostering Collaboration



- Academia is increasingly looking to foster collaborations with the industry. Undertaking consultancy projects and R&D projects are some forms used to collaborate with the industry.
- A prominent example in this case in IIT-Madras, which through its incubation cell has successfully fostered collaborations with the industry.
- All the top institutes in India are actively engaging with the industry, with tier 2 and tier 3 institutes increasingly looking for opportunities to do so.

Best Practice

Leveraging industry collaborations for transformative impact in advanced technologies and professional education

Purdue

- ICON (Institute for Control, Optimization, and Networks) at Purdue University has focussed on complex systems in areas such as manufacturing, transportation, healthcare, and supply chains. The center **collaborates with several major industry players, including Saab, Rolls-Royce, Northrop Grumman, and John Deere.**
- ICON has **attracted significant funding, including US$13 million for the TSUNOMI project**, which focuses on threat and situational understanding using networked machine intelligence.[1]
- ICON has also had a significant **impact on education, offering professional master's programs that prepare students for careers in emerging fields** such as the Internet of Things (IoT), robotics and autonomy. These programs are designed to meet the growing demand for skilled professionals in these advanced technological domains.[2]
- The **impact of ICON extends across several industries including autonomous vehicles, robotics, precision agriculture and advanced manufacturing**. By integrating AI, machine learning and data science with classical control and optimization theories, ICON has driven innovations that enhance both the safety and efficiency of complex dynamical systems. One specific area of impact has been in the **development of autonomous systems for both civilian and defense applications, where ICON's work has contributed to significant advancements in autonomous vehicle control and autonomous drone operations.[2]**

2020	94	10
Establishment year as a multidisciplinary research center[1]	Faculties contributing actively to the research[1]	Labs and research facility for greater output generation[1]

Sources: 1. Purdue Icon, 2. Purdue Edu, EY-P Analysis

Trends in industry-academia partnerships (2/3)

Donations and Fund Raising

- Institutes are increasingly turning to their alumni for donations. These donations can be used for providing scholarships, undertaking research initiatives and infrastructure development.
- Prominent examples are IIT-Delhi, where INR500 crore have been pledged by over 400 alumni. Co-founder and Chairman of the Board, Infosys, has donated INR315 crore to IIT-Bombay[3]
- Institutes are also undertaking fund raising events to diversify their revenue pool. They can leverage campaigns to get financial support from philanthropic organizations, corporates and individual donors.
- A prominent example is IIT-B, who through its heritage foundation has undertaken several fundraising initiatives.

3. Hindustan Times, EY-P Analysis

Trends in industry-academia partnerships (3/3)

Skill Development and Employment Opportunities

- Universities are partnering with industry for skill development of their students.
- An example here is IIT-M, which has signed twenty-four MoUs with industry partners across multiple sectors to offer online skills courses.[1]
- Institutes are also partnering with industry for working on live projects, consultancy projects and internships for students. These initiatives are aimed at diversifying the revenue base and helping in placement of students.

Best Practice

Enhancing industrial efficiency and creating employment opportunities through university driven advancements in production technology

University of Michigan

- The goal of the program was to **develop innovative manufacturing systems that could be easily adapted to changes in product design, production volume and other variables.** The program received partial funding from the NSF and garnered **strong support from over 30 industrial partners**, including companies such as **General Motors, Ford and Chrysler (Stellantis).**
- The collaboration between academia and industry in the RMS program led to significant technological advancements in manufacturing. The program played a crucial role in the **development of manufacturing systems that were more flexible, cost-effective and responsive to market demands.** The program not only advanced the field of manufacturing but also **strengthened the U.S. manufacturing sector by providing a pipeline of highly skilled engineers and by developing new technologies that improved industrial efficiency**. The long-term legacy of the program continues to influence manufacturing education and practices.[2]
- In 2006, **General Motors implemented Professor Yoram Koren's in-line surface porosity inspection system** at its engine manufacturing facility in Flint, Michigan. This advanced inspection technology was seamlessly integrated into the production process, enabling the real-time evaluation of every engine block within a 20-second cycle. The system's precise measurements effectively **ensure that only high-quality engine components proceed through the production line, thereby significantly reducing the risk of defective parts** reaching the end customers.[3]

1996	1400	350
Launch year as part of the NSF's Engineering Research Centers initiative[2]	Scientific Citations received by RMS[3]	Graduates who are now working in US Industry and National Labs and as Professors[2]

Sources: 2. Michigan Website, 3. Michigan Website, EY-P Analysis

1. The Hindu, EY-P Analysis, Primary Interviews

Heavy reliance on government funding persists, with limited industrial contributions and restricted funding access

Challenges in industry-academia partnerships

Government Funding over Private Funding

- Funding currently in India is primarily driven by the government, with industry only contributing 41%, lower than its developed peers.[2]
- Low private funding results in resource crunch as government funding alone is not sufficient to take up large capital-intensive projects, leading to low research quality out.

Top Institutes have access to funding

- Currently in India only top tier institutes such as IIMs, IITs and a handful of others can get private funding due to their strong relationships with the industry.
- Tier 2 and Tier 3 institutes are not able to get access to private funding, leaving them largely reliant on government funding. Access to private funding for these institutes needs to be addressed if India is to see overall development of the research ecosystem. Currently, there are many protocols and approval systems that could make accessibility of funds from corporates challenging.

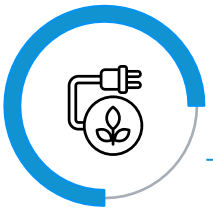
2. DST Report 2022-23, EY-P Analysis, Primary Interviews

While healthcare and automotive continue to dominate Indian research, emerging areas like tech have seen rise in research

Areas of research in demand

AI, ML and IoT

- AI and ML are at the forefront of collaborative research between industry and academia. Given the rise of digitization, IoT and blockchain are gaining traction. Industry-academia partnerships are looking to leverage these technologies for creating secure digital transactions and interconnected devices.
- An Indian IT giant has partnerships with various academic institutions worldwide. Through its network, it has been engaging in numerous projects that apply AI and ML in fields such as healthcare, smart and sustainable cities. These collaborations will help the company to create real-world solutions that are impactful.



Sustainable technologies

- Given the concerns around climate change, there is a global push towards sustainability. There is a growing emphasis on R&D in sustainable technologies.
- An Indian company's collaborations with IIT-D and IIT-M focus on research in future related technology and innovation for sustainable changes. These projects include EV infrastructure, hydrogen technologies, battery energy storage systems and microgrids.
- Sri Sri University has collaborated with L&T to established a center of excellence for electric vehicle which imparts hands-on education in electric vehicle technology and advancing sustainable transportation solutions*

Big Data and Analytics

- The importance of data in the global digital world has increased significantly, leading to a lot of R&D on big data and analytics.
- These areas are critical for processing volumes of data, leading to better decision-making.
- Wipro has collaborated with the Center for Brain Research, a non-profit organization situated at the IISc campus. The collaboration will work towards harnessing AI, ML and big data analytics to develop new technologies that will help in prevention and management of health disorders[1]

Healthcare

- Research in developing scalable telehealth solutions, particularly for rural and underserved regions. Developing AI-driven diagnostic tools, personalized treatment plans, and predictive analytics for patient outcomes.
- Personalized medicine is transforming healthcare by developing tailored treatments based on individual genetic profiles. This field is attracting substantial investment from both the public and private sectors due to its potential to improve patient outcomes and reduce healthcare costs*
- IIT Madras recently received an INR16.5 crore CSR grant from Power Finance Corporation for set-up of a facility at the Department of Medical science and Technology. The aim of this partnership is to develop products that can cater to specific customer needs and work through with the medical history of the client[2]

Automotive

- Research aims to improve battery efficiency, reduce costs, and develop new materials for better EV batteries, while also advancing self-driving car technologies like sensor fusion, machine learning, and V2X (Vehicle to Everything) communication
- Mercedes-Benz Research and Development India (MBRDI) has partnered with the IISc to drive innovation in sustainable mobility. This collaboration is aligned with Mercedes-Benz's "Ambition 2039" initiative, which aims to make all new vehicles in their fleet carbon-neutral by 2039[3]

* Prof. Rajita Kulkarni, President, Sri Sri University

Source: 1. Hindu Business Line, 2. FreePressJournal, 3. Mercedes Benz, EYP analysis

Startup India has placed special emphasis on industry-academia partnership to boost the startup ecosystem

Industry-academia partnership and incubation initiatives	
Organizing startup fests	u To bolster the startup ecosystem in India, the government has proposed introducing startup fests at national and international stages with the aim of showcasing innovation and providing a collaboration platform.
Atal Innovation Mission and Self-employment and Talent Utilization Program	u The Atal Innovation Mission will establish sector specific incubators and five hundred 'Tinkering Labs' to promote entrepreneurship and provide pre-incubation training. u Three innovation awards would be given per state and union territory, along with three national awards. A grand innovation challenge award would be given for finding ultra low-cost solutions.
Tapping private sector expertise for incubator setup	u Government will create a policy framework for setting-up incubators across the country in public-private partnership to ensure professional management of government sponsored incubators.
Building innovation centres	u To increase the incubation and R&D efforts, the government will set up 31 centres to provide facilities for over 1,200 new startups of innovation and entrepreneurship at the national institutes.
Setting up of new research parks	u The Government is setting up seven new research parks in institutes with an initial investment of INR100 crore each. u The new research parks will be modelled based on the research park setup at IIT-M.
Innovation focused programs for students	u An innovation core program will be created to target school kids aimed to source ten lakh innovations from five lakh schools, from which the best hundred would be shortlisted and showcased at an Annual Festival of Innovations. u A grand challenge program called National Initiative for Developing and Harnessing Innovations has been created through Innovation and Entrepreneurship Development Centres to award INR10 lakh to 20 student innovations. u Uchhattar Avishkar Yojana has been earmarked INR250 crore annually to foster high quality research among IIT students.
Annual incubator grand challenge	u The government will select ten incubators evaluated on a pre-defined criteria as having the potential to become world class and give them INR10 crore each as financial assistance to improve their infrastructure.

Source: PIB, Vikaspedia, Startup India, Startup India, Meity

Industry-academia partnership and accelerator initiatives

213

Number of accelerators available under the Startup India initiative

- Accelerators under Startup India initiative support early and mid-stage startups to scale up and fine tune their product for the desired market.
- Startup India has supported corporate accelerator models in partnership with major corporations like Microsoft and Jio Gennext. These programs focus on bringing startups into established corporate structures, providing mentorship, funding and access to the corporate ecosystem to scale their solutions.
- The Ministry of Electronics and Information Technology (MeitY) has launched an Extended Reality (XR) accelerator program in collaboration with Meta. This program aims to support startups working in emerging XR technologies by offering resources like mentoring, access to infrastructure and guidance on scaling.

Best Practice

Fostering market ready ideas and startup success through university led incubations and entrepreneurship initiatives

BITS Pilani

- BITS Pilani, in collaboration with the Government of India, has strategically established a Technology Business Incubator (TBI) specializing in Embedded Systems and VLSI Design, alongside a center for Entrepreneurial Leadership (CEL). These initiatives are **designed to create a focused and structured approach to nurturing entrepreneurship** across various disciplines within the university.
- By leveraging the TBI's facilities, entrepreneurs can **accelerate the development of innovative products and solutions, with a clear pathway toward commercialization**. These units provide an integrated platform that combines cutting-edge technology incubation with robust entrepreneurial guidance, ensuring that the **innovations emerging from this ecosystem are both market-ready and scalable**.
- TBI has significantly contributed to the technology sector in India by nurturing startups that have gone on to become major players in various domains like automation, software solutions and online services. The incubator also **emphasizes biotech and IoT, reflecting global trends** and needs in industries that require continuous innovation and cutting-edge technology.
- The incubator provides **state-of-the-art infrastructure, including lab facilities, office space, and access to BITS Pilani's extensive research resources**.
- TBI offers a **robust mentorship program, connecting startups with industry veterans, successful entrepreneurs and academics**. This mentorship helps in refining business strategies, technological innovation, and market access. Startups under TBI are also **exposed to networking events, pitching sessions and investor meets**, which are critical for raising funds and scaling operations.
- Some **notable startups[3]** that began at BITS Pilani's TBI include:
  - **RedBus**: Now one of India's leading online bus ticketing platforms
  - **Mobile Medics**: Focused on delivering healthcare to remote villages through mobile clinics, winning the Global Social Venture Competition in 2007
  - **Innovese**: Known for Yo!Captcha, a solution to monetize websites through human verification tasks

2004	75	50	INR 8 crore+
Set up year and inducted into not-for-profit society - Pilani Innovation and Entrepreneurship Development[1]	Startups supported since inception[1]	Mentors from various industrial fields[2]	Total funding raised for multiple startups[2]

Sources: 1. BITS Pilani Website, 2. BITS Pilani Website, 3. Your Story, EY-P Analysis

Best Practice

Empowering startups and driving innovation through collaborations, incubation support and dedicated research development programs

MAHE

- MAHE houses the Manipal-GoK Bio incubator, a joint initiative with the Government of Karnataka, was recognized as the "Best Incubator" at Global Bio India 2024. The bio incubator focuses on biopharma, biotechnology, and biomedical devices, offering seed funding and mentorship to startups.[3]
- MAHE boasts an extensive network of over 250 international collaborations. These collaborations facilitate high-impact research and innovation, aligning with global standards. They have a strong track record of translating research into tangible outputs. The university has filed over 70 intellectual property rights (IPRs) in the last two years.[4]
- The university's research output is supported by a dedicated research cell that organizes workshops, grant clinics, and research certificate programs to improve faculty and student research contributions.

36

Researchers were ranked among the top 2% globally, based on citation metrics[1]

INR 111.21 crore

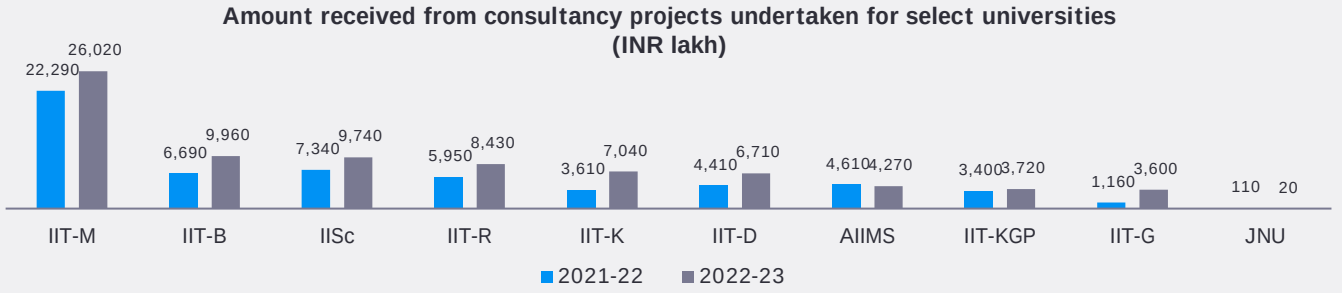
Total sanctioned for 382 ongoing research projects

Sources: 1. MAHE Website, 2. MAHE Bulletin, 3. Business News, 4. MAHE Website, EY-P Analysis

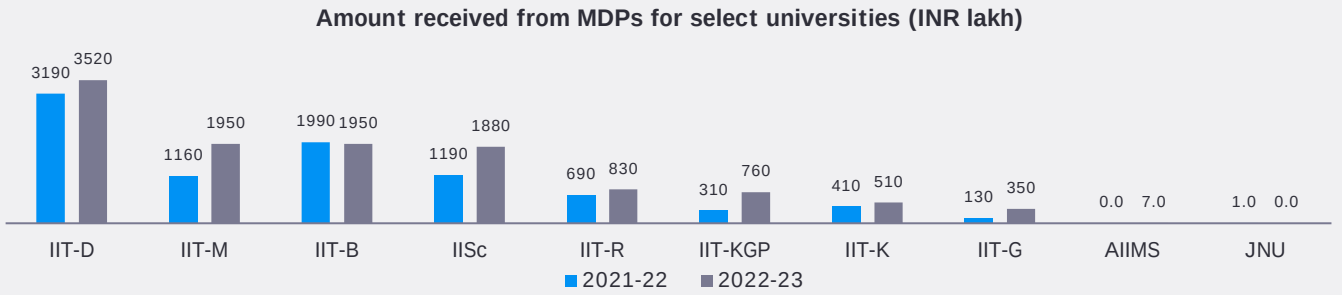
Though government is taking steps in the right direction, Indian universities funding lags compared to their global counterparts

Sponsorships received by top Indian institutes through corporates compared with those of US

- Rise of dedicated research centres and increase in the number of incubation centres point to a strengthening relationship between industry and academia. As of 2023, India had 650 start-up incubators[1] and was ranked third in the world in terms of number of incubators, behind US and China[2]. In 2017, there were 13 Atal Incubation Centres (AICs) in India, established under the Atal Innovation Mission (AIM) however by 2022, this number had risen to 69 AICs, demonstrating a significant increase[3].
- IIT-M leads the way in amounts generated from consulting projects undertaking 1168 projects in 2022-23.
- Most of the top institutes witnessed an increase in amount received from MDPs, with IIT-G and IIT-KGP witnessing the highest growth due to increase in the number of programs undertaken.



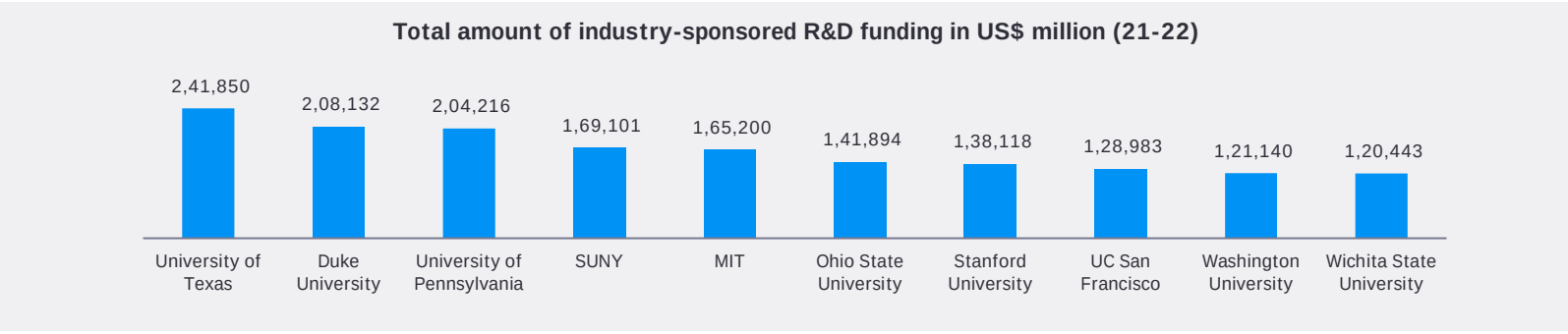
Source: NIRF



Source: NIRF

- Substantial investment directly correlates with the superior research output of US institutions, enabling them to lead globally in innovation, particularly in fields like life sciences and engineering. Indian institutions have limited research capabilities and global competitiveness due to this funding gap. The charts underscore the need for increased investment in India's higher education sector to foster a more robust research ecosystem to match and outpace the world in innovation.
- This financial advantage not only enhances the research capabilities but also attracts top-tier talent and fosters cutting-edge infrastructure.

Source: 1 Tice, 2 Tice, 3 PIB , EYP analysis



Source: HERD Survey 2022

IDP for HEIs can help institutes to diversify their revenue base by strengthening relations with industry

Regulations and guidelines related to industry-academia partnerships

What is Institutional Development Plan (IDP)?

- IDP is a strategic plan created to improve the overall growth and performance of HEIs in some areas, including academic excellence, research, infrastructure, governance and student assistance.
- The UGC has provided guidelines for individual HEIs to develop their own development plan to achieve the targets set by the NEP 2020. According to the IDP, HEIs must undertake academic and professional excellence journeys as the core of these guidelines.
- The guidelines for HEIs are founded on key principles that emphasize the following:
  - Supporting HEIs in academics, research and teaching excellence.
  - Promoting learner-centric teaching, innovation, knowledge creation and its application.
  - Advocating multi-disciplinary integration by including science, arts, humanities, vocational and sports.
  - Enable HEIs to manage academic, administrative and financial autonomy with accountability and responsibility.
  - Emphasizing participation, inclusivity and adaptability fostered by encouraging openness, collaboration, research and innovation and community.
  - Enabling a framework for HEI-led research, innovation and startup ecosystem

Framework related to financial enablers and funding models

- Financial enablers are key for HEIs to ensure they function in an efficient manner and have the necessary financial resources to invest in research work.
- To ensure institutions have adequate funding, they must strategically diversify their revenue sources by tapping into government grants, optimizing project overheads, and expanding research consultancies. Additionally, institutions should focus on patent commercialization, strengthen alumni donation efforts and actively cultivate private sector partnerships and targeted fundraising campaigns.
- It is essential that each revenue source contributes a balanced share to the overall financial portfolio, aligned with the institution's strategic objectives and scale. Therefore, HEIs should focus on diversifying and expanding revenue streams within a “strategy aligned" framework, ensuring fulfilment of the institution's long-term goals and operational needs.

Regulations in research funding and sponsorships

- CSR mandate: Under the Companies Act, 2013, 2% of the average net profits should be spend on CSR activities, which can include R&D in areas like technology and healthcare.[1]
- Weighted tax deduction on R&D expenditure: Companies investing in R&D can avail of a weighted tax deduction on expenditure under Section 35(2AB) of the Income Tax Act[2]. Although recent budgets have reduced the benefits, this remains a significant incentive for corporate R&D investment.
- Accreditation and grants: HEIs in India are required to maintain accreditation by bodies like the National Board of Accreditation (NBA) and the National Assessment and Accreditation Council (NAAC). Accreditation levels often influence the ability to secure government and corporate research grants, as higher ratings can attract more funding.

Source: IDP, 1. Cleartax, 2. DSIR Website, EY-P Analysis

Recommendations

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Inadequate university funding compared to global standards	Monetary	Corporates (R&D team, Strategy team) HEIs (R&D Director, Research Head)	Develop industry-sponsored research chairs	„ *Action:* Establish industry-funded research chairs in key disciplines of mutual interest to drive initiatives and foster deeper industry-academia collaboration through aligned research and funding. „ *Implementation:* Collaborate with industry associations (e.g., NASSCOM, SIAM) to identify priority areas and develop agreements outlining roles, responsibilities and expected outcomes (patents, publications, products). „ *Expected outcome*: Increased academic research funding, cutting-edge research outputs and strengthened industry-academia relations, fostering innovation and collaboration.
Need for stronger startup ecosystem through industry-academia partnerships	Operational	HEIs (R&D team, Incubation center) Government (Ministry of Commerce and Industry)	Strengthen incubation programs within HEIs (Launch new or expand scope and power of current)	„ *Action:* Enhance the capacity of HEI-based incubators by integrating industry mentors and providing seed funding through public-private partnerships. „ *Implementation:* Launch initiatives to create or expand incubation centers with corporates and international partners. Start with region or sector-based incubators, leveraging support from industry bodies like FICCI & CII.* „ *Expected outcome*: A robust startup ecosystem, leading to the commercialization of research and innovation at a faster pace.
Lack of research translation into output and economic development	Policy	HEIs (R&D team, Faculty and PhDs, Management) Corporate (R&D team, HR)	Establish an exchange program for faculty, PhDs, and corporate employees to spend part of their tenure with the other stakeholder**	„ *Action:* Introduce an exchange program where faculty/PhDs spend 3-6 months in industry, corporate employees spend one semester in HEIs, and faculties work on industry-driven research problems. „ *Implementation:* Establish partnerships through MoUs and implement a selection and matching process to ensure suitable participants. Faculty to get a research problem from industry while corporate employees work with R&D team during their tenure. „ *Expected outcome*: Enhanced research output aligned with industry needs, economic growth through market-ready innovations, and stronger academia-industry linkages.

Priority Recommendation Short-Term Medium-Term Long-Term

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education
** Dr Rajan Saxena , Hon. Advisor, FICCI Higher-Ed Committee
Source: EYP analysis, Primary Interviews

Gap	Strategic Pillar	Stakeholder	Recommendation	Detailed description
Limited industrial contributions	Monetary	Corporates (R&D team, Liaison dept.) HEIs (Industry Liaison office, R&D Head) Govt. Bodies (FICCI, CII etc.)	Establish dedicated industry liaison offices within universities	„ *Action:* HEIs establish dedicated offices to manage and foster industry partnerships, focusing on co-developing research projects. „ *Implementation:* Train staff to bridge industry needs and university research capabilities. Organize regular meetings, workshops, and networking events to identify collaboration opportunities. Industry bodies like FICCI and CII can help expand industry involvement in research.* „ *Expected outcome*: Increased funding, stronger partnerships and better alignment of academic research with industry needs, leading to higher research output.
Heavy reliance on government funding and restricted funding access	Policy	Corporate (R&D team, Finance team) Government (Ministry of Corporate Affairs)	Implement diversified funding schemes	„ *Action:* Create a co-financed fund where corporates contribute to research aligned with industry needs, supported by tax incentives. Offer higher incentives for supporting tier-2 or tier-3 colleges. The government should also diversify funding to include these institutions. „ *Implementation: S*et up a National Industry-Academia Research Fund with a regulatory framework that simplifies compliance and enables private, government, and international funding. „ *Expected outcome:* A diversified, sustainable research funding ecosystem that boosts innovation and enhances global competitiveness for Indian HEIs.
Impact assessment that can quantify research impact on economy	Innovation	Corporate (R&D Team) HEIs (Research Head) Government (Assessment Body)	Government should help develop tools to correctly assesses the impact of a research undertaken*	„ *Action:* Assessment body to collaborate with other stakeholders to ensure comprehensive and accurate assessments. „ *Implementation*: This assessment must be integrated at the research design stage by the researchers to evaluate both social and economic impacts, with a focus on conducting a longitudinal study to track outcomes. „ *Expected outcome:* Increased innovation as quantifiable economic impact would drive further investments. Better informed policy making would be possible and research sector will have more transparency.

Priority Recommendation Short-Term Medium-Term Long-Term

* Lt. Gen (Dr.) M.D. Venkatesh , Vice Chancellor, Manipal Academy of Higher Education

Source: EYP analysis, Primary Interviews

04

Concluding remarks

Conclusion

India stands at a pivotal moment in its journey to becoming a global leader in research and innovation. The rapid changes in technology, geopolitics and environmental challenges underscore the need for India to harness the power of research for social, economic and technological development. However, the current fragmentation within the ecosystem–where various constituents (academic, industry, government) operate in isolation–undermines progress.

Academic research	Academic research in India is constrained by limited faculty capacity, low funding and a lack of motivation among students. Our analysis emphasized the need for reforms that would improve faculty development, promote interdisciplinary research and incentivize quality-focused grants.
Industry research	Industry research, while showing promise in sectors like technology, healthcare and pharmaceuticals, is similarly hampered by low R&D expenditure and a conservative approach to innovation. For India to align its R&D ambitions with its economic goals, it must streamline IPR processes, increase corporate investment in research and foster a culture of innovation that is driven by high-skilled talent.
Industry-academia partnership	Industry-academia research offers immense potential for bridging the gaps in India's research ecosystem. However, heavy reliance on government funding and limited industrial contributions continue to stifle growth. To remedy this, we recommend strengthening incubation programs within HEIs, establishing industry-sponsored research chairs, and creating dedicated industry liaison offices within universities.

The accompanying table provides domains we have examined within the Indian research landscape, encapsulates our expert-validated recommendations, and project the anticipated trajectory of the Indian research ecosystem that the growth pathways will lead to.

Key Thematic Area	Growth Pathways	Potential Outlook
Research ecosystem fragmentation	Building integrated research networks among HEIs, industries and research bodies can foster innovation and interdisciplinary research	A unified ecosystem will accelerate India's innovation pipeline and improve global research standing
Academic research impact	Expanding faculty development programs and embracing international research collaboration	India's HEIs will become globally recognized, attracting international researches and funding, leading to improved rankings
Industry-academia synergy	Strategic public-private partnerships and industry driven research can bridge this gap, particularly in emerging tech field	Enhanced collaboration will fuel innovation, increase R&D commercialization, and align research with market demands
R&D spending and innovation	Increasing R&D investments from both public and private sectors, with focus on high potential industries like technology	Higher R&D spending will drive innovation, new patents, and research turning into output
Global competitiveness	Strengthening global partnerships and expanding cross border research will elevate India's research profile and output	Higher partnerships will help India become leaders in specialized fields like renewable energy, AI, Biotech etc. and contribute high impact innovations
Policy framework and government support	Streamlined and focussed policy implementation, with clear monitoring mechanism, can provide boost to research activities	Robust policy framework will create an enabling environment for disruptive innovation, ensuring India's research revolution

The government has already prioritized the research sector and has rolled out multiple policy and schemes to encourage research. The NEP 2020 and initiatives like the NRF and Start-up India are steps in the right direction, but their success hinges on adequate funding and widespread adoption of research ethics frameworks. Maximizing research in India requires a multi-faceted approach that addresses the systemic challenges while leveraging the country's inherent strengths. The pathway forward requires a clear, sustained commitment to policy reform, strategic investment, and institutional collaboration. India's research ecosystem must evolve from its current fragmented state into a unified, well-resourced and globally connected entity.

This report has laid out the challenges and opportunities that India's research ecosystem faces. The task now is to translate these findings into actionable strategies. By focusing on these actionable pathways, India can not only close the gap with global research leaders but also contribute significantly to the global innovation landscape, addressing pressing challenges in fields such as renewable energy, artificial intelligence, and biotechnology.

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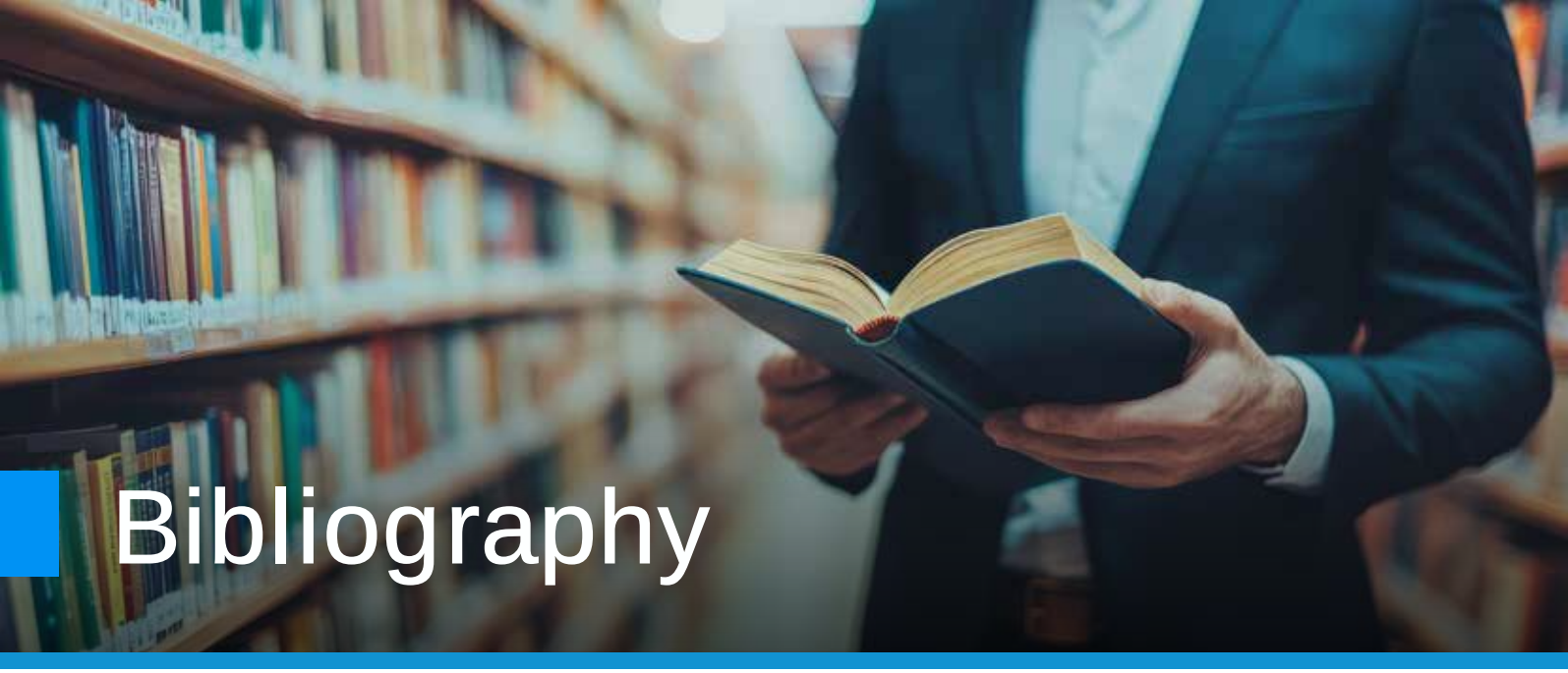
Appendix



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Glossary

AI	Artificial Intelligence
AICTE	All India Council for Technical Education
AIIMS	All India Institute of Medical Sciences
CSR	Corporate social responsibility
EU	European Union
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on Research and Development
HEI	Higher Education Institute
ICT	Information and communication technology
IIM	Indian Institute of Management
IIM-A	Indian Institute of Management Ahmedabad
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IIT-B	Indian Institute of Technology Bombay
IIT-D	Indian Institute of Technology Delhi
IIT-G	Indian Institute of Technology Guwahati
IIT-K	Indian Institute of Technology Kanpur
IIT-KGP	Indian Institute of Technology Kharagpur
IIT-M	Indian Institute of Technology Madras
IIT-R	Indian Institute of Technology Roorkee
JNU	Jawaharlal Nehru University
MDP	Management Development Program
NEP	National Education Policy
PG	Post-Graduate
Ph.D.	Doctor of Philosophy
PTR	Pupil-Teacher Ratio
R&D	Research and Development
SDG	Sustainable Development Goals
SIDBI	Small Industries Development Bank of India
STEM	Science, technology, engineering, and mathematics
UK	United Kingdom
UN	United Nations

About EY- Parthenon's Education Sector Practice

EY-Parthenon, EY's strategy arm consists of a team of 50+ partners and 1000+ consultants in India and ranks fourth in the Vault Consulting 50 list of top consulting firms. EY-Parthenon is the leading strategic advisor to the education sector globally, with our education team completing 300+ projects annually.

The EY-Parthenon education consulting strategists help clients negotiate the changing currents in the sector so that they not only adapt but also adopt strategies in terms of globalization-driven skill sets and new collaborations.

With broad experience and deep sector knowledge, the education strategy consulting professionals at EY-Parthenon are helping leaders overcome challenges with bespoke, all-encompassing growth strategy plans, due diligence services and implementation support.

We have dedicated consultants in the following five segments of the sector:

Governments & Foundations	Pre-K & K-12 School Chains	Higher Education Institutions & TVETs	Indian & Global Ed-Tech Companies	Global Investors
Our clients include Central and State Ministries of Education, supporting organizations and foundations. We have supported in developing short term and long-term growth strategy plans to reform systems.	Our teams provide services such as market needs assessment, strategic planning, performance analytics, operational improvement, financial advisory and organizational redesign.	Our teams help HEIs identify opportunities for differentiation through various modes, using our insights from global best practices. We also help TVETs formulate end-to-end strategies and help with executing the same.	We provide competitive landscaping, market analzes, go-to-market strategies, support on organic and inorganic growth like fundraising, acquisitions, partnerships, joint ventures or divestments.	We provide due diligence services to investors. From the pre-contract stage through the eventual integration or separation, we help guide decision-making and provide execution assistance.

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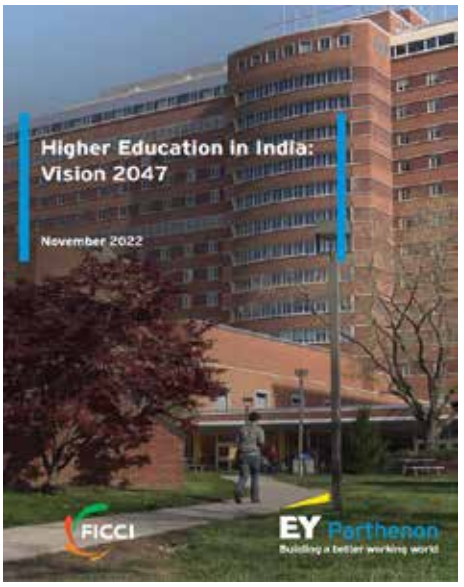
FICCI-EYP Higher Education 2022 Report

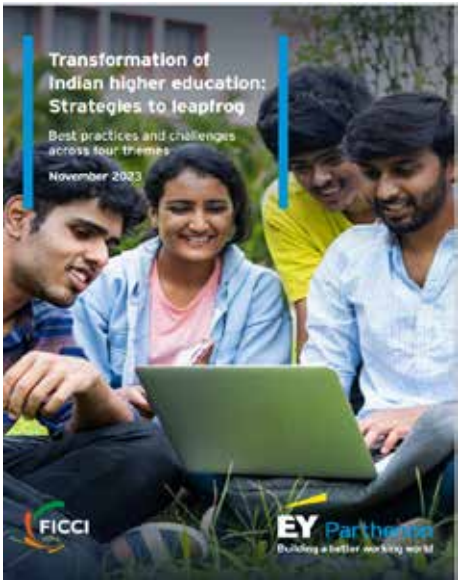


The FICCI-EYP report 2022, "Higher Education in India: Vision 2047," addresses key structural and implementation challenges within higher education while exploring opportunities and offering recommendations for developing an equitable, inclusive, and globally competitive system. The report explains five strategic pillars– (i) student centricity, (ii) research, (iii) faculty development, (iv) international mobility, and (v) digital learning–which hold significant potential to profoundly reshape the future of India's higher education landscape.

The report marked an initial effort to pinpoint current challenges and outline the necessary steps to advance toward the envisioned education landscape of 2047. It evaluates both immediate changes and long-term transformations, taking into account the NEP 2020 as a crucial factor in shaping the evolving educational environment.

The report provided recommendations, to build a futuristic and inclusive higher education landscape, by focusing on its strengths and highlighting areas of improvement.

FICCI-EYP Higher Education 2023 Report



The FICCI-EYP Report 2023, titled "Transformation of Indian Higher Education: Strategies to Leapfrog," built upon the insights from the 2022 report, offering a detailed evaluation of the progress made under India's first five-year plan for higher education. Building on the objectives of the 5-year plan, 2023 report highlighted four key short-term areas of focus for Indian higher education. These areas were: (i) quality education, (ii) alignment with industry needs, (iii) research and innovation, and (iv) inclusivity.

The report analyzes best practices in India and abroad, built on the five strategic pillars: (i) creating a student-centric and equitable ecosystem, (ii) enhancing research and innovation, (iii) developing faculty, (iv) improving international mobility, and (v) investing in digital learning.

It set forth key action points for stakeholders to focus on over the next 12 to 36 months, aimed to enhance the sector's overall performance and alignment with global benchmarks.

About FICCI

FICCI Higher Education

For the past two decades, FICCI has been a leading force in shaping India's higher education landscape. Through its strategic partnerships, research-driven initiatives, and advocacy efforts, FICCI has emerged as a potent catalyst for transformative policy changes. The FICCI Higher Education Committee, with its strong representation from industry, academia, and thought leaders, has cultivated dynamic forums for critical discourse and facilitated progressive dialogue, vibrant knowledge exchange, and robust policy advocacy. Over the years, FICCI has been promoting industry-academia collaboration, to compliment the government's growth agenda for the sector.

Key areas of work

Research and Knowledge Creation: The Committee publishes several industry reports, policy briefs, and papers that intricately capture the evolution and progress of the higher education sector. Some of these reports are 'Vision 2030 for Higher Education,' 'Transformation of Indian higher education: Strategies to leapfrog,' 'Higher Education in India: Vision 2047,' and 'Leapfrogging to Education 4.0.' Notably, the 'Higher Education Vision 2030' report significantly influenced the design of the National Education Policy (NEP) 2020.

Policy Advocacy: The HE committee collaborates with key stakeholders including government and industry, in actively identifying opportunities and addressing gaps. Through intensive consultations with a diverse array of stakeholders, this collaborative effort unfolds across various conferences, discussions, events, and forums. Brimming with shared wisdom and expertise, these engagements have proven pivotal in propelling the education sector forward in India.

International Delegation of Higher Education Leaders: The Delegation of senior Higher Education Leaders to focused countries has led to exposure to global best practices, facilitated effective teaching and research partnerships, and helped develop a comprehensive global education policy landscape.

Higher Education Summit (HES): Established in 2004, FICCI HES is a global Education Summit and a sought-after forum for deliberations on the transformation of global higher education, promoting engagement, collaboration, and innovation. The Summit is organized with the support of the Ministry of Education, Govt of India and over the years, has drawn thousands of participants, including education luminaries, policymakers, scholars, and global though leaders.

Higher Education Excellence (HEE) Awards: Launched in 2014, the FICCI Higher Education Excellence Awards recognizes institutions and individuals contributing significantly to promoting quality of higher education in India. The Awards play a crucial role in motivating institutions and promoting a culture of ongoing improvement, serving as a catalyst for excellence and innovation in India's higher education sector.

FICCI Industry Academia Conference (FIAC): The FIAC is a platform for dialogue, deliberation, and policy advocacy to promote collaboration between industry and academia. Through FIAC, FICCI facilitates discussions aimed at encouraging institutions and industry to engage in collaborative research, internships, and initiatives that enhance student employability to propel industrial growth.

FICCI Leadership Development Program (LDP): The FICCI LDP is focused on developing the leadership capabilities of higher education administrators. The program brings together vice chancellors, deans, and other academic leaders to enhance their knowledge and understanding on the effective functioning of institutions.

FICCI EdTech Conclave: The FICCI EdTech Conclave is a platform for discussions on the evolving landscape of educational technology. This conclave is designed to unite senior EdTech leaders, academics, policymakers, government officials, and thought leaders to deliberate on the rapidly evolving EdTech landscape and its effects on education ecosystem.

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Notes

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About FICCI

Federation of Indian Chambers of Commerce and Industry (FICCI) Established in 1927, FICCI is the largest and oldest apex business organization in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organization, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies. FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community

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