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India's R&D Ecosystem Faces Funding Concentration and Governance Barriers Despite Rapid Growth in Science, Technology and Innovation

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Recent Developments:

The **NITI Aayog report, "Ease of Doing Research & Development in India"**, released in April 2026, identifies persistent institutional, financial, administrative and human-resource barriers that constrain India's research ecosystem. The exercise drew inputs from **400+ institutional leaders and 850+ scientists and researchers**.

The report highlights a significant concentration of research funding, noting that the **IIT system receives more than 80% of ANRF's R&D funding**, which may restrict funding opportunities for other higher-education and research institutions.

India's **Gross Expenditure on Research and Development (GERD)** remains around **0.64% of GDP**, substantially below major research economies. The Economic Survey 2025–26 places the corresponding figures at **3.48% for the United States, 2.43% for China and 4.91% for South Korea**.

The report also identifies fragmented funding systems, cumbersome grant procedures, weak industry participation, shortage of research personnel and limited conversion of research into commercial technologies as major constraints.

The **₹1 lakh crore Research, Development and Innovation (RDI) Scheme**, approved in 2025, represents a major policy shift towards strengthening **private-sector-led R&D and deep-tech innovation**.

Status of Research and Development in India:

Low R&D Intensity:

India has substantially increased its absolute R&D expenditure, but **R&D intensity has remained low at around 0.64% of GDP** for several years.

India therefore faces a gap between its economic ambitions and the scale of investment required to become a leading **knowledge and technology economy**.

Leading economies devote considerably larger shares of national income to R&D, enabling sustained investment in advanced laboratories, frontier technologies, skilled researchers and high-risk innovation.

Limited Private-Sector Participation:

India's R&D ecosystem remains substantially dependent on **government funding**, whereas business enterprises contribute a much larger share of R&D expenditure in major innovation economies.

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The Economic Survey 2025–26 reports that the **business sector contributes about 41% of India's GERD**, compared with **77% in China, 75% in the United States and 79% in South Korea**.

Increasing private participation is essential because commercial R&D can accelerate **technology development, patenting, productisation, deep-tech entrepreneurship and industrial competitiveness**.

Concentration of Research Funding:

The NITI Aayog report notes that **more than 80% of ANRF R&D funding goes to the IIT system**, indicating a concentration of competitive research funding in a relatively small group of institutions.

Concentration is not inherently undesirable because premier institutions may possess advanced infrastructure and research capacity, but excessive concentration can weaken the development of **State universities, emerging institutions and regional research ecosystems**.

A broader funding base can help build research capacity beyond established centres of excellence and improve geographical and institutional diversity.

Major Challenges in India's R&D Ecosystem:

Administrative and Compliance Burden:

Researchers often spend significant time navigating **multiple portals, approvals, financial procedures and compliance requirements**, reducing the time available for actual research.

The NITI Aayog consultation found that researchers seeking grants may have to interact with independent systems operated by different ministries and funding agencies.

A fragmented application architecture also makes it difficult to obtain a national picture of **who is receiving funding, from which agency and for what research objective**.

Rigid Procurement and Financial Rules:

Researchers face difficulties in procuring specialised equipment, reallocating funds, hiring project personnel and making timely research-related expenditures.

Scientific research often involves uncertainty and rapidly changing technological requirements, making excessive rigidity particularly unsuitable for frontier research.

Greater financial flexibility should therefore be combined with **outcome-based accountability and transparent auditing**.

Fragmented Research Governance:

India's R&D ecosystem involves multiple ministries, departments, laboratories, universities and funding agencies with overlapping mandates.

Limited coordination can result in **duplication of research, delayed approvals, fragmented databases and inefficient utilisation of public resources**.

The NITI Aayog report therefore advocates integrated governance mechanisms and better visibility across publicly funded research programmes.

Human-Resource Constraints and Brain Drain:

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India produces a large pool of **science, technology, engineering and mathematics graduates**, but the availability of researchers, laboratory technicians and interdisciplinary specialists remains inadequate.

Researchers also face concerns regarding **career progression, fellowship availability, remuneration, research infrastructure and long-term funding security**.

Limited domestic opportunities can encourage highly skilled researchers to move to countries offering stronger research ecosystems and more predictable career pathways.

Weak Translation and Commercialisation:

India has expanded its scientific publications and patent activity, but laboratory-level discoveries do not consistently become **commercial technologies, startups, industrial products or scalable solutions**.

The major policy challenge is therefore to strengthen the complete **research-to-market pipeline**, covering fundamental research, proof of concept, technology readiness, intellectual property, financing and industrial deployment.

Recommendations of the NITI Aayog Report:

Unified Project Management System:

A **Unified Project Management System** can create a common digital architecture for planning, funding, monitoring and evaluating publicly funded R&D projects.

Such a system can improve coordination, reduce duplication and provide greater visibility over public expenditure on research.

Simplification of Research Procedures:

India should develop **single-window digital systems** for research grants, procurement, approvals and financial reporting.

Researchers should receive greater flexibility in using grants while maintaining clear **outcome-based monitoring and financial accountability**.

Strengthening Industry–Academia Collaboration:

Universities, national laboratories, industries and startups should be connected through **research parks, innovation clusters, collaborative doctoral programmes and industry-funded research**.

Stronger collaboration can improve technology transfer and reduce the gap between academic research and industrial requirements.

Improving Research Careers:

India should provide more predictable career pathways, competitive fellowships, adequate research infrastructure and long-term funding opportunities.

The report recommends increasing **postdoctoral fellowships in science and technology by 20% annually for the next few years** to strengthen the national postdoctoral ecosystem.

A proposed **Vigyan Nidhi** platform can provide structured digital support for postdoctoral researchers, mobility grants and industry-linked research opportunities.

Broadening the Research Funding Base:

ANRF should strengthen funding access for **State universities, emerging research institutions and other higher-education institutions** while maintaining excellence-based competitive selection.

Research funding should balance **excellence, inclusion, institutional capacity-building and strategic national priorities**.

Major Government Initiatives:

Research, Development and Innovation Scheme:

The **₹1 lakh crore RDI Scheme** was approved in July 2025 to catalyse private-sector participation in high-impact R&D and strategic technologies.

The scheme focuses on areas such as **deep technology, quantum computing, robotics, space, artificial intelligence, energy security and climate technologies**.

The RDI Fund operates through a two-tier structure under ANRF and seeks to mobilise private capital for transformative research and innovation.

Anusandhan National Research Foundation:

The **Anusandhan National Research Foundation**, established under the 2023 Act with its statutory provisions coming into force in February 2024, seeks to provide strategic direction to India's research and innovation ecosystem.

ANRF is intended to strengthen collaboration among **academia, industry, government and research institutions** and expand the national research base.

Its catalytic funding model increasingly seeks to use public funding to unlock larger contributions from industry, philanthropy and other non-governmental sources.

National Quantum Mission:

The **National Quantum Mission** seeks to develop capabilities in quantum computing, quantum communication, quantum sensing and quantum materials.

It is important for India's technological sovereignty because quantum technologies have applications in **defence, cybersecurity, communications, healthcare and advanced computing**.

National Supercomputing Mission:

The **National Supercomputing Mission**, launched in 2015, provides advanced computing infrastructure to universities, research institutions and government agencies through the **National Knowledge Network**.

High-performance computing is increasingly important for climate modelling, drug discovery, materials science, artificial intelligence and strategic research.

India Semiconductor Mission and IndiaAI Mission:

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The **India Semiconductor Mission** seeks to establish an integrated semiconductor and display-manufacturing ecosystem and reduce dependence on critical technology imports.

The **IndiaAI Mission** aims to build accessible computing infrastructure and strengthen artificial intelligence capabilities for Indian research, startups, industry and public-sector applications.

These initiatives demonstrate the shift from conventional R&D support towards **mission-oriented technological capability building**

Way Forward:

From Funding to an Integrated Innovation Ecosystem:

India needs to move from a predominantly **government-funded research model** towards a diversified ecosystem involving government, industry, universities, startups, philanthropy and international collaboration.

Public funding should remain important for fundamental and high-risk research because such research may have uncertain commercial returns but significant long-term national benefits.

From Publications to Products:

Research policy should place greater emphasis on **technology readiness levels, patents, prototypes, technology licensing, startups and industrial adoption**, without undermining basic science.

Dedicated translational funding can bridge the gap between laboratory discoveries and commercially viable technologies.

From Institutional Concentration to Distributed Excellence:

India should develop multiple regional and thematic research centres rather than relying disproportionately on established institutions.

Competitive funding should reward excellence while simultaneously building capacity in **State universities and emerging research institutions**.

From Compliance-Driven to Outcome-Based Governance:

Research institutions should receive greater operational autonomy accompanied by transparent **milestone-based evaluation, independent audits and measurable outcomes**.

Digital monitoring can reduce administrative friction without weakening accountability.

Conclusion:

India's R&D challenge is not merely a question of increasing expenditure; it is also a question of **how effectively research resources are allocated, governed, connected and translated into societal and economic value**. The NITI Aayog report highlights the need to reduce administrative barriers, diversify funding, improve researcher careers, strengthen industry-academia linkages and coordinate the fragmented research ecosystem.

The **RDI Scheme, ANRF, National Quantum Mission, National Supercomputing Mission, India Semiconductor Mission and IndiaAI Mission** provide important building blocks for a technology-driven development strategy. However, India must complement these initiatives with higher R&D intensity, stronger private-sector participation and wider institutional access to competitive research funding.

The ultimate objective should be to build an **open, distributed, industry-linked and mission-oriented R&D ecosystem** capable of converting India's demographic and scientific capabilities into technological leadership, strategic autonomy and inclusive economic growth.

Value Addition for UPSC:

Key Data Points:

GERD: Around **0.64% of GDP**.

Business-sector share of GERD: About **41%** in India, compared with **77% in China, 75% in the United States and 79% in South Korea**.

ANRF funding concentration: More than **80%** of ANRF R&D funding goes to the IIT system, according to the NITI Aayog report.

RDI Scheme: **₹1 lakh crore** corpus for strengthening private-sector-led R&D.

NITI Aayog consultation: **400+ institutional leaders and 850+ scientists and researchers** contributed to the exercise.