

CHAPTER TWO

**SCOPE AND OBJECTIVES  
OF THE REVIEW**

*“The conquest of the technical frontier,  
like the conquest of the geographical frontier,  
requires a varied initiative by millions  
of individuals”*

*MILTON FRIEDMAN, NL*

*(Consultant to India's  
Ministry of Finance 1955)*

## CHAPTER TWO

SCOPE AND OBJECTIVES  
OF THE REVIEW

The terms of reference given to the Committee and the methodology adopted by the Committee in its review work are presented in this chapter.

## 2.1 CONTEXT OF THE IIT REVIEW

Three factors are relevant to the IIT Review 2004.

**First**, the review is occurring at the turn of a new era, at the beginning of the 21st century coinciding with the dawn of the third millennium. Rapid and global changes in technological, economic, social, political and ecological dimensions at this time are not only creating opportunities for growth, but also posing developmental challenges for the nation. India has emerged as one of the five largest economies in the world (in terms of purchasing power parity). However, India's standing in terms of per-capita income (World Bank index), human development (UNDP index) and the global competitiveness survey (involving more than 60 countries) is low. This is a matter of serious concern for the world's second largest populous nation. While the nation has taken strides to embrace the increasingly knowledge intensive and global economy, it faces immense challenges in terms of poverty, social security, and environmentally sustainable development. How then can India achieve development that is more inclusive?

**Second**, this review comes at a time when there is an increasing realisation among national and international agencies that higher education and R&D are critical for development in this region, to address prevalent problems of poverty reduction, facilitate sustainable human and social development and improve competitiveness of the country to participate effectively in the emerging knowledge economy. Science and technology have traditionally been a critical component of the knowledge infrastructure. India started, soon after independence, providing a strong thrust to development of human capital and R&D in science and technology from early 1950s through the establishment of several government departments such as the Department of Atomic Energy, the Department of Defence Research, the Department of Space, the Departments of Science and Technology, Scientific and Industrial Research, Biotechnology and Ocean Development, Ministries of Non-Conventional Energy Sources and Information Technology, the premier Indian Institutes of Technology and a large number of engineering colleges, both public and private. These initiatives have led to visible improvement in the technology scenario in areas piloted by the respective agencies. So also in agriculture, the country experienced the green revolution and increased food security. However, India's position on the technology achievement index<sup>1</sup> is still behind that of several other countries. One could argue that such indices are fallacious. However, it cannot be denied that India has not made a mark, commensurate with its size and stature, in internationally competitive R&D based manufactured products. How is this lacuna to be corrected?

<sup>1</sup> Technology Achievement Index is a composite index of four criteria: (a) technology creation (patents and receipts of royalty and licence fees from abroad), (b) diffusion of recent innovations (ICT and exports of higher and medium technology products), (c) diffusion of old innovations (telephones and electricity), and (d) human skills (average years of schooling and gross tertiary enrolment in Science, Mathematics and Engineering). (See Human Development Report 2001)

**Third**, this review is taking place alongside a national initiative to improve the quality of technical education in the country. The initiative seeks to improve the quality of undergraduate engineering education in a number of institutions. Government colleges that are at a level below IITs are being identified as lead centers for focused improvement through measures such as greater autonomy in academic, financial and administrative aspects and increased funding, as has happened in the conversion of erstwhile Regional Engineering Colleges into National Institutes of Technology. Improvement of engineering education across the country is expected to address shortage of qualified faculty and good quality students for post-graduate education. The onus on the IITs is then to generate high calibre PGs and Ph.D.s and cater to the nation's dire need for quality technical manpower. IITs have also to excel in research, innovation and extension activities in a way as to be counted among the world's best research universities. What strategy may result in such excellence being accomplished?

It is in the context delineated above that the present review has been undertaken.

## 2.2 TERMS OF REVIEW (2004)

The Terms of Reference (TOR) handed down to the IIT Review Committee (2004) (herein after referred to as the Committee) are shown in Table 2.1

**Table 2.1: Terms of Reference for the IIT Review Committee**

1.	To review the <b>Vision, Mission, and Goals</b> of the IITs, and the strategies needed for achieving them, taking into consideration the current & future national priorities and emerging global scenario. In particular, whether there is need to reorient their entire thinking so that they are geared to solving the manpower & research problems pertaining to the critical sectors of the Indian Economy, especially those that have impact on the lives of our rural population & disadvantaged sections.
2.	To review the <b>performance of the IITs in relation to their Vision, Mission and Goals</b> , both in quantitative and qualitative terms. This will include the performance in manpower development in terms of capacities, levels and disciplines, as well as provision of Continuing Education for teachers and working professionals. The Committee should also give their recommendations on <b>increase in intake</b> , opening <b>new campuses</b> within the country and outside and possibility of operating two-shifts by optimum utilization of their physical infrastructure and faculty resources. The services and recommendations may also include academic and sponsored research, in terms of national priorities, thrust areas, and new and emerging areas of technology.
3.	To review the extent and intensity of <b>interaction with industry</b> for technology development & consultancy, as well as alliances with carefully chosen partners, both nationally & internationally.
4.	To review the management structures and <b>governance mechanisms</b> as also <b>financial management</b> and make recommendations on potential improvement.

5. To review the nature & scope of academic offerings in the context of emerging technology requirements such as bio-technologies, nano-technologies & new energy technologies and assess the responsiveness of the causes & **curricula** to the changing demands of the profession. The issue of inclusion of diversified inputs in **Physical and Biological Sciences, Social Sciences and Humanities** in the preparation of students may also be examined and recommendations made thereon. The Committee may also review the pedagogical approaches and suggest modifications, if any, that should be made in order to produce autonomous learners who are flexible, adaptable and possess the skill of **'learning to learn'**. Further, it may also make recommendations on the potential of, and actions needed for, **technology enhanced learning**.
6. In particular, the Committee should suggest ways and means of creating a mindset among the students that is based on human values of truth, good conduct, peace, non-violence and love. The IITs should produce students who are patriotic and think mainly of India and its problems. The tendency to look westwards in everything needs to be eschewed.
7. To review the contributions of IITs in serving as role models for other technical institutions in the country, and in providing leadership and playing a pro-active role in setting benchmarks for the national technical education system. The Committee may also review the extent to which IITs have succeeded in establishing **networking partnerships** and other educational & research institutions for resource sharing and academic partnership, and make recommendations for the future.
8. To review and make recommendations on faculty recruitment, retention and development processes in order to **induct high quality faculty, retain it and motivate it** to perform consistently at high levels of excellence. The Committee may also review and make recommendations on recruitment criteria in order to provide healthy participation of SC/ST communities in the IIT faculty.
9. To review the procedures of students admission to different programmes and assess how effective they have been in **admitting high quality diversified student body while maintaining the constitutional provisions for SC/ST** and providing adequate access to disadvantaged weaker sections of society. The Committee may wish to review the **methodology of JEE** and recommend improvements that can be made therein in the light of proliferation of coaching industry.
10. To review the **state of physical infrastructure** of the IITs in order to make recommendations relating to their modernization, removal of obsolescence and future development consistent with their anticipated role at national and international levels.
11. To review the position regarding number of **IIT Undergraduates enrolling themselves for Post graduation/Research Studies** and those opting for other professions.

## 2.3 ANALYTICAL FRAMEWORK

The eleven terms of reference for this review cover multiple dimensions of the IIT system and also point to many pressing concerns/expectations from IITs as institutes of national importance. This aspect is different from that of the previous reviews. In the past, mostly individual IITs were reviewed. The first PAN-IIT Review (review of all the IITs together) was by a committee chaired by Professor Y. Nayudamma. Shri Hiten Bhaya was the Vice-Chairman and Professor C.N.R. Rao, Shri Nanubhai Amin, Shri J.A. Kalyanakrishnan, Shri M.S. Padmanabhan and Shri Jagdish Narain were members, apart from the officials of the Ministry. The report of the Nayudamma Review Committee, submitted in 1986, was used in formulating the present Committee's approach to review the progress since registered by the IITs in the last seventeen years and to consider possible directions for their future growth and enhanced performance.

In order to ensure that the richness of the IIT system is fully appreciated at multiple levels and all the key concerns are clearly addressed, this review uses an analytical framework as shown in Figure 2.1.

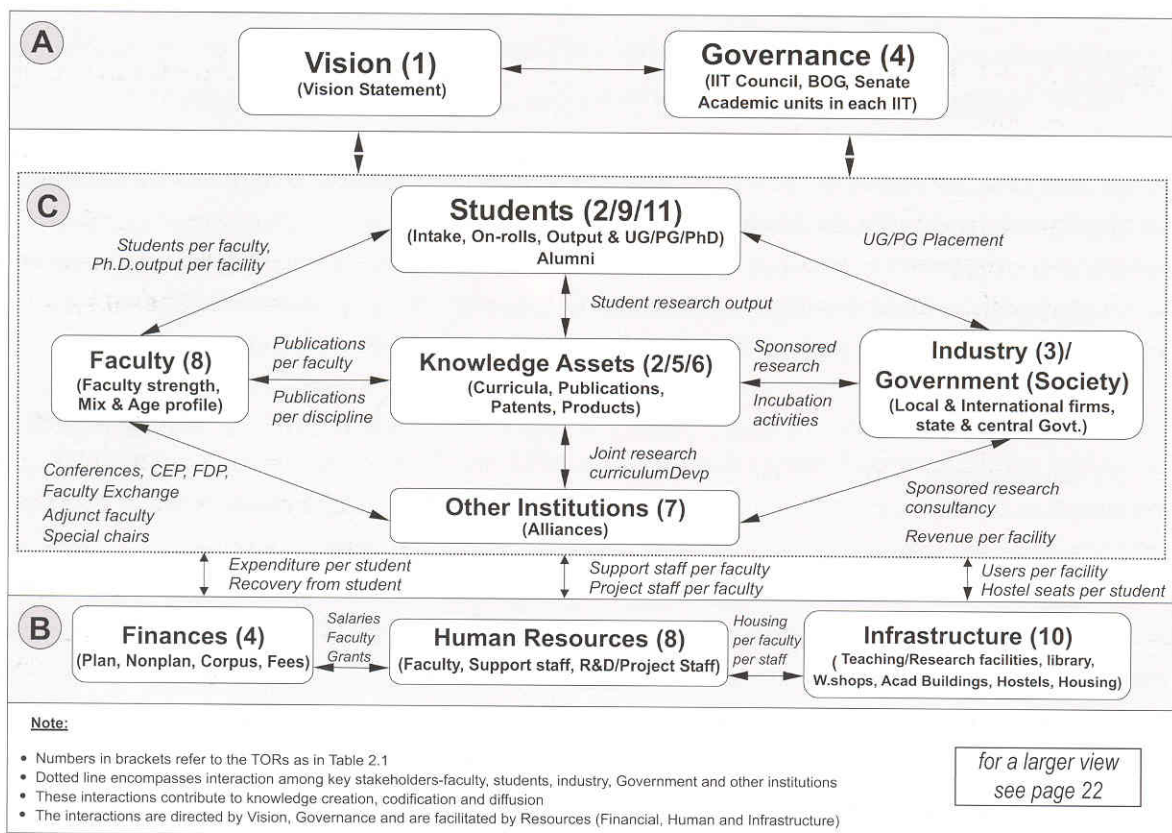


Figure 2.1: Framework for IIT Review

The framework classifies the TOR elements into three broad categories as indicated in the box below:

**A. AT THE APEX:**

**Vision** and **Governance** that provide the necessary authority, support and direction to performance

**C. AT THE CENTRE:**

The mechanisms to facilitate interactions among the key stakeholders – **Faculty, Students, Industry** (within and outside the country), **Government** (in the States and at the Centre and the National Laboratories) and **other institutions** (academic as well as non-academic, here and elsewhere) - around core **knowledge assets** such as **curricula, publications, patents and knowledge intensive products.**

**B. AT THE BASE:**

The **Financial, Human** and **Infrastructure** resources required to facilitate performance of the IIT system

The framework provides a backdrop to appreciate the impact, present and potential, of the IIT system (as institutions of national importance) in the emerging knowledge society. It is more comprehensive than the traditional as well as the more recent models of the educational system, as brought out below.

The traditional model regards faculty as the centre of a university system (von Humboldt model). More recent models argue in favour of a learner-centric model. However, both these models require presently to take into account the fact that learning, knowledge and innovation are becoming far more pervasive and involve many other institutions such as industry, government, and society at large. IIT products (alumni) are participating and shaping different spheres of human activity (industry, government, NGOs). Industry is investing a lot more in R&D and training. Governments are concerned about life-long learning. The framework is designed to connect the discussion on IITs to these changes happening in different dimensions. The framework when applied recursively at multiple levels can reveal the unique characteristics of individual IITs, their contribution to the brand of the IIT system, and the contribution of the IIT system to the wider innovation system.

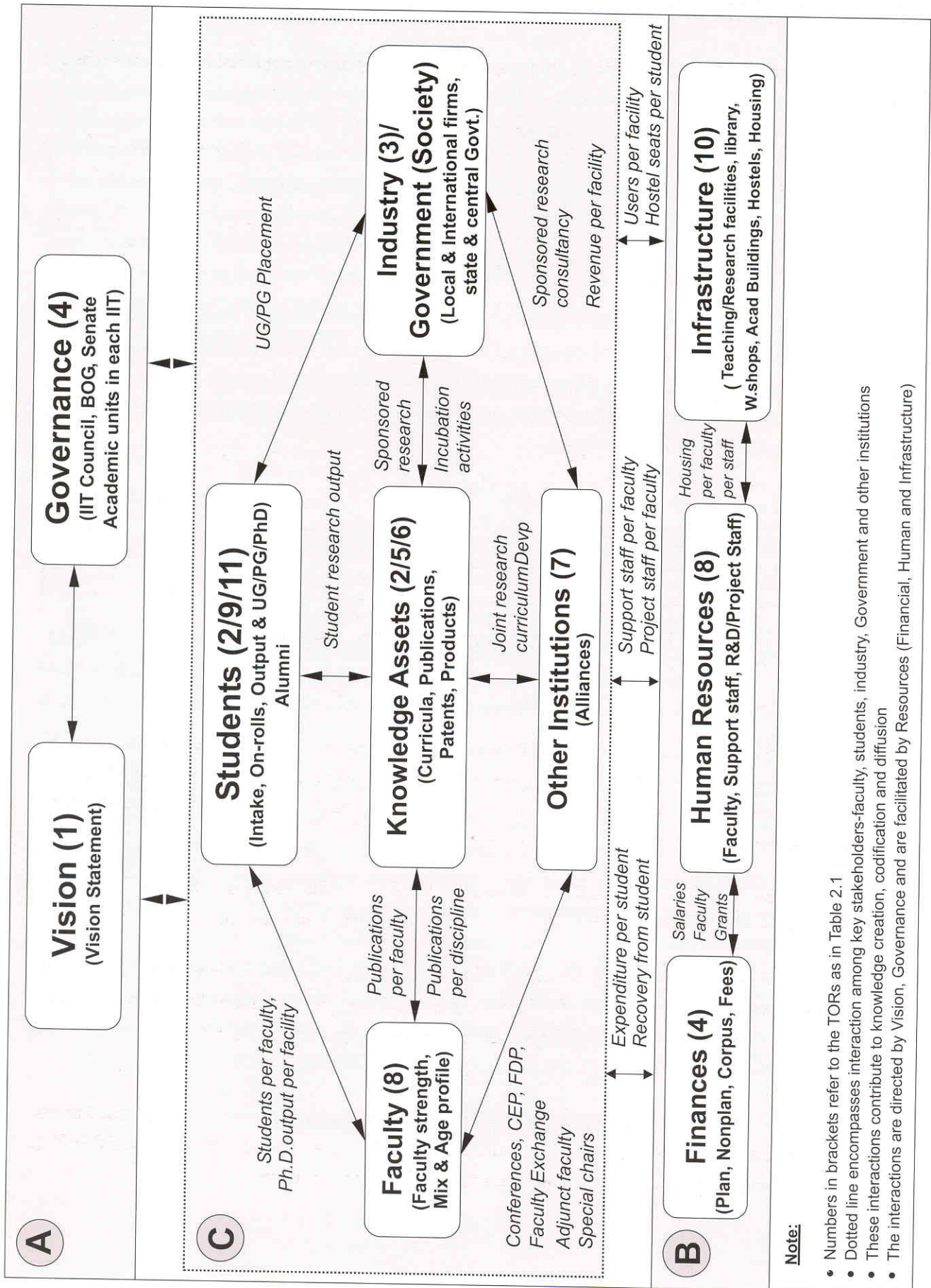
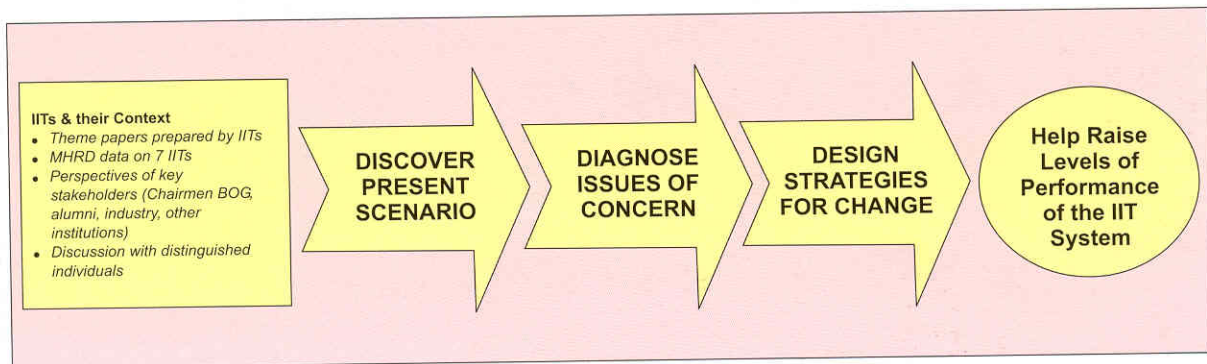


Figure 2.1: Framework for IIT Review

## 2.4 METHODOLOGY

The system framework has been applied through a methodology involving three broad steps (shown in Figure 2.2):

- Step 1: Discover the present scenario of IITs and assess the degree of interaction with key stakeholders
- Step 2: Diagnose the key issues of concern that are inhibiting desired interactions, especially those arising out of vision, governance and resources
- Step 3: Design strategies for enhanced performance



**Figure 2.2: Methodology for the Review**

Both qualitative and quantitative data were collected for analysis:

- Data provided by the MHRD was supplemented with specific questionnaires sent out to IITs; additional queries were posed during the visits and in correspondence with the Directors, interactions with other interest groups such as alumni (within the country and abroad), industry captains, past Directors and former professors.
- Visits to the 7 locations where IITs are situated to obtain a first hand feel for the facilities, to listen to the faculty, the students, the non-teaching employees and alumni.
- Distinguished academics in the country, Chairmen of the Boards of Governors, DG CSIR, Secretary to Government of India, Science and Technology, Secretaries to Departments of Space and Atomic Energy have all been most gracious in providing inputs to the work of the Review Committee.
- The Terms of Review were divided into 10 themes. Eight of the themes were assigned to the IITs and the remaining 2 to Chairman, AICTE and Indian Institute of Science (See Table 2.2). The ten theme papers constituted an input to the Review Committee.



**Table 2.2: Theme papers prepared by IITs**

Theme paper No.	Subject	Prepared by
Theme: 1	Vision, Mission, and Goals	IIT Kharagpur, IIT Delhi
Theme: 2	Increase in intake/new campuses both within and outside the country	Chairman, AICTE
Theme: 3	Special thrust on Post-graduate education and research	IIT Kanpur, IIT Bombay
Theme: 4	Partnership with industry and national and international linkages	IISc, Bangalore
Theme: 5	Management structure and Governance Mechanisms	IIT Kanpur
Theme: 6	Academic Offerings – Curriculum and Pedagogic issues, human values and use of technology for on-campus programmes	IIT Delhi
Theme: 7	Networking with other technical and research institutions – Distance & web-based education issues	IIT Delhi IIT Madras*
Theme: 8	Faculty related issues	IIT Bombay
Theme: 9	Admission and Fee related issues	IIT Roorkee
Theme: 10	Infrastructure Related issues	IIT Kharagpur

\* subsequently assigned.

## 2.5 STRUCTURE OF THE REPORT

The rest of the report is organized as follows. Chapter 3 presents a macro-view of the IIT system. The remaining chapters discuss the issues pertaining to the various elements of the framework and suggest areas of improvement.

- Chapter 4 probes the vision of the IIT system and that of the individual IITs
- Chapter 5 analyses the governance structure
- Chapters 6 and 13 discuss issues pertaining to faculty and non-faculty staff
- Chapters 7 and 10 analyse research performance and IPR issues
- Chapters 8, 9, 12 and 15 discuss issues related to education, JEE, technology in education and expansion in India and overseas campuses
- Chapter 11 discusses industry interactions
- Chapter 14 discusses funding policy for IITs
- Chapter 16 refers to the special case of IIT Guwahati