

CHAPTER ELEVEN

IIT-INDUSTRY LINKAGE

*“The philosopher may be delighted
with the extent of his views,
the artificer with the readiness of his hands,
but let the one remember that
without mechanical performance
speculation is an empty dream
and the other that without theoretical reasoning
dexterity is little more than brute instinct”*

*Samuel Johnson
(1709-1784)*

CHAPTER ELEVEN

IIT-INDUSTRY LINKAGE

While research was the focus of Chapter 7 and innovation of Chapter 10, the present chapter addresses the connection of research as well as innovation to industry and business. This last bridge has proven the most difficult to conquer for the researchers and innovators in the country. How is this to be tackled will be the concern of this chapter.

11.1 THE PROSPECT

IITs were created by the Government of India for the benefit of the society, an important part of which is the industrial sector. Industry absorbs students graduating from the IITs. Several sections of the industry actually go out of their way to seek talented students from the IITs. Some of these have risen to high positions and have provided leadership to the companies - a list of such achievers has been presented in Chapter 1. Is industry stake in the IITs to be limited to this aspect only? It is good to note that industry in the developed world has reaped a harvest of gains from entrepreneurial universities carrying out cutting-edge research in their state-of-the-art laboratories.

Industry are indeed in a position to pose challenges and generate opportunities, actually research opportunities for the IIT faculty and students. The prospect of IITs and the Indian Industry forming a formidable consortium of a kind is yet to be fulfilled. For this to happen, a favourable economic environment is also needed. For several decades since the inception of the IITs, such an environment was practically non-existent and consequently the IIT-Industry linkage was at best tenuous. However, there have been radical changes for the better since the 1990s. The New Industrial Policy of 1991 and the advent of WTO in 1995 have brought about significant changes. How then are we to trigger the IIT-Industry partnership to click in a way that IITs benefit by way of challenges requiring advancement in their research programmes and the industry gains in terms of development of novel processes and products. The overall result will then be such as to bring to reality **Nehru's dream of "building the nation towards self-reliance in her technological needs"**.

11.2 THE PRESENT STATUS

The IIT-Industry interface was institutionalised predominantly through units dedicated to industrial consultancy and sponsored research (IC&SR). These brought about a dialogue between industry and the IIT faculty through a number of consultancy projects. Such consultancy has been growing at a significant rate of 45% over the past four years (Figure 11.1).

However, most of the consultancy projects are small in size. The project size increased from about Rs. 1 lakh per project in 1999-00 to about Rs. 2.5 lakh per project in 2002-03. As many as 2880 projects earning less than Rs.70 crore is indicative of the nature of industry participation.

It would be interesting to understand the typical customers of these projects: i.e., what proportion are MNCs, large Indian industries-private and public, SMEs, also by nature of the industry.

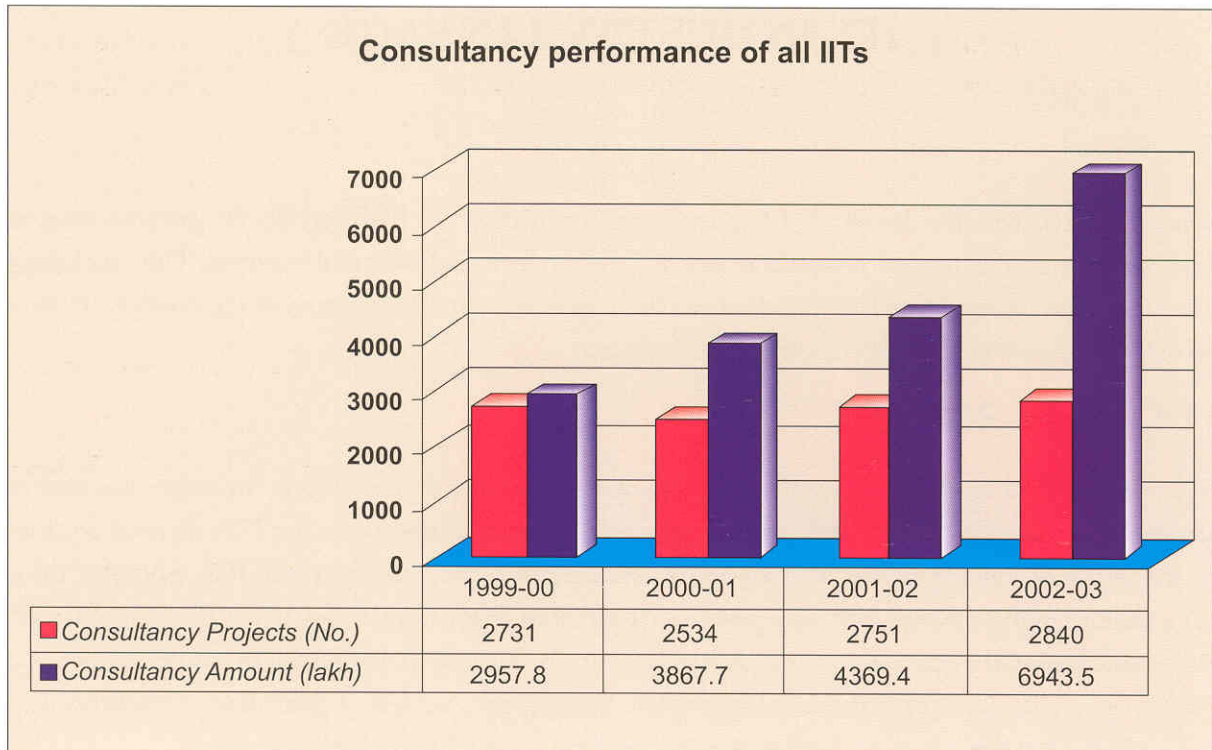


Figure 11.1: Consultancy performance of all IITs

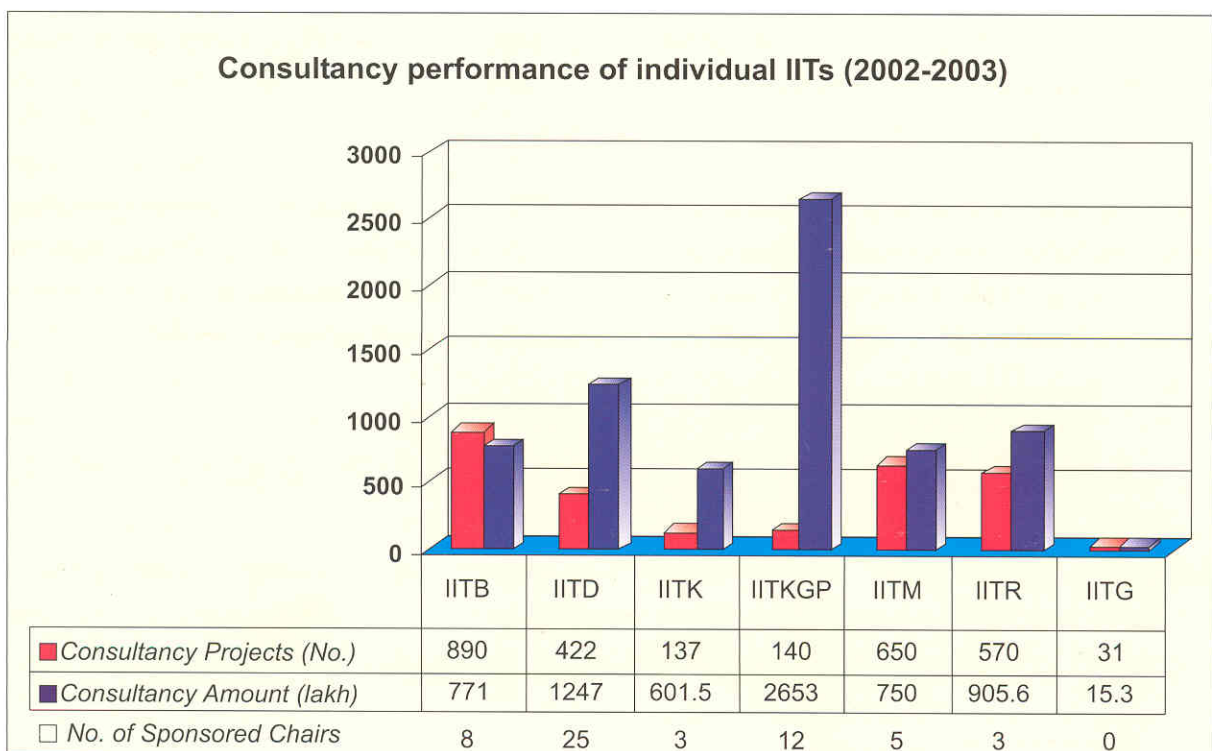


Figure 11.2: Consultancy performance of individual IITs (2002-2003)

Apart from industrial consultancy, the number of sponsored chairs provides an indicator of the degree of industry interaction. The total number of sponsored chairs in IITs increased from 46 in 1999-2000 to 56 in 2002-2003 (Figure 11.2) and this growth during the recent years is not sizeable.

The industry interactions, however, differ across the institutes (Figure 11.2).

- IITKGP accounts for a significant proportion of the consultancy revenues.
- IITKGP also has largest consultancy projects (average Rs.18 lakh per project), which is significantly above that of the other older IITs.
- IITG has the smallest (Rs.50,000 per project). This is not only because IITG is new but mostly because of its remote location (Chapter 16).
- A majority of the Chairs is accounted for by IIT Delhi (25 out of 56). IITR and IITK have the lowest-3 Chairs each (as of March 2003).

It is clear, therefore, that much like the IP asset scenario delineated in the previous chapter, presently the industry-oriented and industry-sponsored activity represents a level much below that which would correspond to the awesome potential that is inherently present in the research capabilities and capacities of the IITs.

11.3 IC&SR CELL AND AUTONOMOUS BODY MODELS

There are two distinct models that have evolved in the IITs. Lessons from implementation of these models give us useful pointers for the future. The two models are the following::

- i) **an internal cell completely within the system, namely IC&SR cell/centre (the nomenclature varies in the different IITs) and**
- ii) **an autonomously governed industry-interface foundation.**

IC&SR historically is the first approach that started in 1972 in IITM. The cell is headed by a Dean holding exclusive charge or the Dean (Research) holds ex-officio charge of this portfolio. The cell operates as a window for various services that the IITs can offer as well as serve as a techno-commercial interface. Traditionally, it was the faculty that brought projects with their individual efforts and the cell provided the commercial coverage. Presently, the cells have taken a more pro-active role for marketing and business development with a professional outlook. Further, the cells have also taken up IP related activities, bridge and certificate courses relevant for industry and periodic dissemination of scientific and technical information.

The IT explosion has also contributed to an impressive growth in this segment of industry interface. The impact and success stories in this model are varied but a few pointers do emerge. It has been possible to do a large number of projects for wide ranging clientele as demonstrated by IITB and IITKGP. This is a positive feature as it can serve the small and medium enterprises with shoe-string budgets and in short time durations. Projects with large outlays and involving setting up of dedicated research centres have also been in place as in the case of Rice-Processing Research Centre of IITKGP, VLSI Design Centre in IITKGP, Software Validation and Verification Centre in IIT Bombay (These are mentioned only as examples to illustrate the point being made.

It is not intended to make out a full list of such programmes here). Another success story, alluded to in Chapter 1, is the development of WLL technologies from one research group in IITM which resulted in many a start-up company and significant impact. Enabling facilities and systems for start up companies are essential for success of cutting-edge technologies appropriate to the Indian scenario.

While it has been possible to effectively leverage the research competence and domain specialisation for providing technical solutions to the clients, it has most often been on a bilateral and on a one-one basis leading to a large number of projects, each of low value. The impact of the IC&SR activities has to be gauged on many fronts and levels, namely

- (i) ability to serve SMEs,
- (ii) leveraging of R&D output to large corporates that have significant R&D budgets (for example: top 100 in the country and the Fortune 500),
- (iii) enable entry of IITs into new and emerging areas through engagement with industry in frontier areas and
- (iv) provide continuous, innovative and ever-evolving-symbiotic interface.

IIT Delhi created in July 1992 a new forum called the Foundation for Innovation and Technology Transfer (FITT), as an autonomous industry interface organization to take care of IPR as well as technology transfer and industry interface issues. Registered as a society and an autonomous body, this interface organization was designed to take up a more proactive role to reach out to the industry on the one side and to the IIT Delhi faculty and researchers on the other. In contrast to the IC&SR cells, FITT functions as an independent body with one leg inside the IITD and one leg outside. The management of the society is under a Governing Council and is headed by an independent Managing Director. The society is financially autonomous with independent staff comprising professionals. Over the last decade, FITT has been able to handle contract research, technology transfer, training programmes and certificate courses and on an average is able to attract major projects for IITD. In the recent past, it has graduated to set up and manage a Technology Business Incubation Unit (TBIU). This initiative is an experiment in enabling technology-based start up companies and R&D interface units of companies in the incubator phase. IISc Bangalore has also adopted an autonomous society model in the creation of Society for Innovation and Development (SID).

The autonomous body model offers certain advantages. The relationship between the user agencies and the institution can be managed with greater flexibility in an autonomous system. This system offers an excellent umbrella facility to enter into omnibus MOUs and contracts with big corporates and leverage large projects of multi-disciplinary character with many departments and research centres within the institution and even other institutions. As the Society has to be self financing, it does not depend on the institution for its budget support other than for the initial seeding requirement, and it can obtain finances from wide-ranging sources. Furthermore, the centre is in a position to take up quality non-academic professionals as its staff without burdening the institution, which allows better business development and interface with the industry.

11.4 NURTURING THE IIT-INDUSTRY INTERFACE

- It is worth noting that the IIT-industry interface can be nurtured only when mutually beneficial win-win paradigms are put into place and the successful endeavours clearly bear out this aspect. While the benefits to the industry in sourcing research outputs and human resource training from the IITs can be a driving force that can bring the industry to the IITs, the gains that accrue to the IITs require careful attention. It is important that the interface systems promote a virtuous cycle and tangible benefits such as growth of research base, development of state-of-art core competence in specialized areas apart from resource generation for the faculty, staff, researchers and the institution. Recognising the growing demand for highly trained microelectronics engineers in the IT hardware industry, IIT Bombay and TCS collaborated to create an advanced microelectronics laboratory at IITB. Thus, 50 M.Tech.s in microelectronics are coming out of this IIT. The IBM, TATA Infotech and NIIT research centres at IITD illustrate the potential and the possibilities of high level research base creation. Recently, the India Semiconductor Association (ISA) has announced what they have termed “ISA Technnovation Initiative” to promote technology and innovation in the Indian semiconductor industry. Their intention is also to generate world-class talent in large measure by promoting higher education and research in the Indian Universities. At the same time, IITKGP has proposed twin knowledge-parks, one in Kharagpur and another in Kolkata, for semiconductor companies. These are highly welcome developments.
- The Principal Scientific Advisor of the Government of India has recently taken an initiative to promote industry-academy collaboration, again on the plane of the personnel. After extensive deliberations with industry representatives, a new proposal has been mooted by him. According to this proposal, it is suggested that industry should allow some of the engineers, recruited during placement interviews and having talent for research, to pursue higher studies in the IITs leading to Ph.D. in the field of engineering and technology. These engineers should be encouraged to work in the broad area of interest to the company without limiting them to solving short-term problems of the company. That means, in all respects, they are no different from the other research students. During the four years or so that the young person would spend in the IITs for his Ph.D., he would be paid the salary in the same way as if he were to be holding a job in the company for which he has been recruited. This principle may be pursued by the IITs.
- The Principal Scientific Adviser to the Government of India has also taken another initiative whose mention is relevant here. This initiative pertains to promoting R&D in the automotive area by bringing together industry leaders in this sector with promising researchers from the academic system, most of whom are actually drawn from the IITs. The Principal Scientific Adviser has named this initiative The CAR (Core Advisory Group for R & D in the Automotive Sector) Project, funding for which has been derived from more than one source in the government. This shows yet again that the financial burden for such collaborative projects does not have to fall entirely on a single government agency. This strategy needs to be developed in other areas of industry interest.

11.5 SUMMARY OF RECOMMENDATIONS

(1) There are four critical areas to be addressed when higher technical institutions like the IITs propose to work with the industry. These are

- (i) **The issue of sharing intellectual property rights,**
- (ii) **The pace at which industry projects are executed in the educational institutions,**
- (iii) **Formulation of enabling policies, including tax incentives, for industry to invest in industry-IIT partnership programmes, and**
- (iv) **A framework in the IITs to encourage, assist and reward entrepreneurship.**

The industry's greatest concern is that when they make substantial investments in a project, in association with the academic institutions, they should be able to derive as much financial and technical dividend as possible. Losing proprietary knowledge generated in such a project is also a concern. **So the foremost requirement for industry-IIT joint endeavours to succeed and be sustainable would be to have an IP policy in place.** Further, based on that policy, the participating partners should arrive at a written understanding for sharing the intellectual property rights.

Since time is money for the industry, IITs should do everything possible to maintain schedules and an acceptable pace in execution of the projects. **This will invariably call for institutionalising separate mechanisms for fast track procurement procedures and for speedy utilisation of funds for various mutually agreed purposes.**

The above-mentioned critical factors need to be adequately addressed for the IITs to progress rapidly towards creating and sustaining innovation clusters around their campuses. Such cluster developments elsewhere in the world have yielded rich dividends in terms of economic impact as well as growth of high technology R&D in the academic institutions.

(2) Further, collaboration with industry is significantly accelerated and deepened when industry personnel are able to work in the IIT environment for substantial periods of time. There are various modes of achieving this and some are already in operation. These are mentioned below:

- (i) With the help of funding from All India Council for Technical Education (AICTE), the Indian National Academy of Engineering (INAE) supports short duration visits by the interested industry personnel to academic institutes in the country including the IITs. This has proved to be a reasonable success and should be built up to a much larger scale (a Professor from IIT, Delhi is actually in charge of this programme on behalf of the INAE).
- (ii) Visiting chairs provide another avenue to bring industry executives and technical leaders to the IIT system. In this regard, it is often observed that the emoluments provided to the industry personnel are meager, compared to the compensation they get from their parent company.

Tata Steel has overcome this problem and their example is worth mentioning here. They have positioned their Chief of R&D in IIT Kharagpur for a duration of three years or so, during which period they are continuing to pay their person the same emoluments as he would be drawing in Tata Steel. Although it has created a disparity in the compensation level of Professors in IITs and the person who came from Tata Steel, the IIT Kharagpur authorities have not raised any objection. This example has to be commended and is likely to open doors for more people from the industry to spend substantial periods of time in the IITs.

- (iii) This Committee further recommends instituting **Senior Fellowships for working level industry personnel** to visit and spend time in the IITs on joint projects. These fellowships should carry a sumptuous stipend and should be given a prestigious name. The details may be decided upon by the IIT Council, once this recommendation is accepted. One possibility is to **name this fellowship for industry personnel, the N.R. Sarkar Fellowship**, to honour the person who chaired the first Committee that led to the creation of IITs.
- (iv) Finally, there is a need to encourage industry to recruit research trained graduates like Ph.D.s for employment in their companies either for R&D or even for general purpose engineering. Such highly trained personnel will clearly make a difference to the quality of work even in an industrial environment. Unless this is done in an increasing measure, doing a Ph.D. in engineering will continue to be an unattractive proposition to youngsters.
- (3) **This Committee has recommended, in Chapter 7, tax incentives to the industry, specifically in relation to their hiring Ph.D. level personnel. The details of tax incentives are best worked out by MHRD, if these recommendations are accepted.**
- (4) **Similar encouragement is needed to motivate the industry to invest in major joint research projects with the IITs. It is reported that the Government is allowing 150% tax exemption to the industry for investment in automotive R&D. Our recommendation is that, in an analogous manner, if industry invests in-house for a joint project with the IITs, tax exemption of 150% should be permitted.**
- (5) In Chapter 4, while discussing Vision for the IIT system, it was pointed out that nurturing the spirit of entrepreneurship in IIT students was required to be articulated more forcefully in the vision statements of the IITs. Apart from educating about entrepreneurship in management and related courses, technology incubators in several countries have been instituted for the purpose of encouraging entrepreneurship. IIT Bombay (IITB) has experimented with this model of technology incubators in their campus. Quite a few groups of students, after graduation, have made bold to try their hand at setting up business operations based on their own skills as well as innovation. These operations have been in terms of developing innovative products or providing technology solutions to clients, often in the area of IT. The IIT faculty have been extending a helping hand. IITB has provided facilities in their campus, like built-in space and utilities, for the young entrepreneurs to develop their entrepreneurial activities in the incubators. (It is possible that some of the other IITs have done likewise). IITKGP was one of the earliest to set up a science and technology entrepreneurship park (STEP).

- (6) The Department of Science & Technology (DST), Government of India has a dedicated set-up to manage programmes in entrepreneurship and extend funding for entrepreneurial activities. Science and Technology parks and technology incubators come well within their purview. DST also oversees the Technology Development Board (TDB). TDB is committed to support commercialisation of technology developed in our academic institutes or in national laboratories or in industry in-house R&D laboratories or in a technologist's own enterprise. An IIT Bombay graduate has actually been financed by TDB to set up a small scale industry to produce clean high-speed steel alloys. It would be refreshing to witness more examples of this nature.
- (7) **The Committee, therefore, recommends that serious attention may be paid to develop a framework for the IIT system as a whole, as well as for individual IITs, to encourage, assist and reward entrepreneurship of their graduates as well as of their faculty.** The observations made in this chapter are intended to provide the backdrop for such a framework to be developed. With the country witnessing entrepreneurial sparks flying all over the different sectors of the economy, the IIT graduates have to be in the forefront of this revolution.