



सत्यमेव जयते
Ministry of
Human Resource Development

Select Case Studies of Academia-Industry Collaboration



Confederation of Indian Industry



Confederation of Indian Industry

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Note

In a country the size of India, with 28 states and 7 Union territories, geographical spread of 3,287,240 square kilometers and a population of 1.2 billion, there are myriad interactions taking place at various levels. Our country has the third largest higher education system in the world, after the US and China, with more than 600 universities and over 35,000 colleges. The Gross Enrolment Ratio in higher education has increased from 12 per cent till five years back to roughly 18 per cent now. There are centrally funded institutes, state-run universities, state-legislated private universities and various autonomous institutes.

There is good work going on at various places, at various levels. While policy makers grapple with numbers and remain focused on the larger picture, it is essential to also look at each part of the jigsaw puzzle closely, minutely and analyse how the systems are working at the micro level.

In the area of industry-academia collaboration, there can be no denying that a lot needs to be done. But that does not mean that a lot is not taking place already. While it is essential to debate and discuss how things can be improved, it is also essential to document how things are at present. This report is a first in a series of case studies which the Ministry of Human Resource Development will be bringing out, in collaboration with the Confederation of Indian Industry (CII), examining how industry interactions are taking place at different institutes. In this report we have looked at select Indian Institutes of Technology (IITs)--IIT-Bombay, IIT-Kanpur, IIT-Madras, IIT-Delhi and National Institute of Technology-Karnataka (Surathkal). There are many success stories which deserve closer examination and study--major ones being IIMs, NITs and IISERs. Many institutes have developed successful models which are industry-led and are driven by the actual requirement of the market.

The subsequent editions of this report will look at all these models. The purpose of these case studies is to have well-documented, well-researched and nuanced analysis of successful collaborations so that others can learn from them and strive to follow them in their own institutes.

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INTRODUCTION

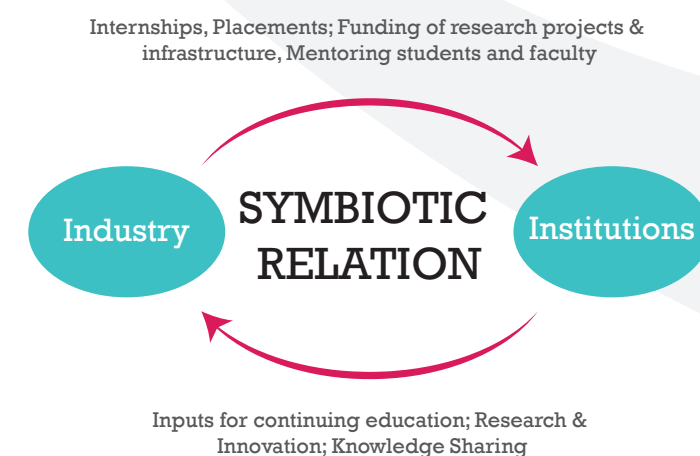
The importance of academic -industry relationships has been emphasised from the early 1980s, and recently, it has become the necessity of both academic institution and the industry. Several efforts have been made by the industries, institutions and the Government to promote this relationship and facilitate the transfer of knowledge between academic institution and industries, such as establishing of legal frameworks, increasing mobility of researchers to industries and large cooperative R&D Programs among others.

Industries approach institutions to help design appropriate curriculum and courseware that could enable development of market-relevant workforce or enhance capacity of existing workforce to meet the evolving market challenges.

A more long term mutually-beneficial relationship results from research collaborations between the institutions and the industry. The industry relies on Universities to provide the conceptual background and theoretical foundation, and Universities rely on the industry to provide opportunity for real-time application and prospects for commercialisation of the 'innovation ideas'. Institutions are acknowledged for their strong 'conceptual understanding' and 'theoretical knowledge', and the ability of the researchers to take an independent view-point (beyond well-accepted industry practices and standards). This enables the Universities to carry out an open assessment the problem and develop 'conceptual' and 'experimental' approach to problem solving (supported by scientific, technical and technological principles, and beyond experiential and evidence-based resolving). Industries on the other hand, provide opportunity for the Universities and researchers to put to test their 'conceptual approaches' and 'innovative ideas' in real-time situation, and help establish concrete solutions for real-time industry challenges. Industries in return have an 'innovative' solution that could enable 'performance excellence'. Academic (Research) Institutions on the other hand, have also strived to develop or provide an 'enabling environment' for 'innovative ideas' (conceptually appropriate and duly researched) to get translated into 'industrial or entrepreneurial ventures', through appropriately structured and nurtured incubation facilities.

Thus, academic institutions are important for the innovation process because they are able to solve very specific problem, transfer important scientific and technical knowledge (in the form of products or services or application-oriented solutions) and develop a more competitive (knowledge-driven) market place.

Further more, collaboration between the industry and academia ensure that there is a steady (reliable) source of talent from these Universities that are industry-ready as students from these institutes have engaged with these companies in various forms-working on sponsored projects and participating in short term internships. Thus,the interaction between industry and academia helps mobilize capacity, harness creativity, access market expertise, create value & drive growth. However, to maintain & develop these relationships, institutes need to be open to inputs from the industry & the industry in turn needs to be involved in the relationship right through the process- idea formulation, funding and development



Case Study 1 IIT BOMBAY

Society for
**Innovation &
Entrepreneurship**

THE IIT-BOMBAY SUCCESS STORY

Why did industry partner with the Institute?

Quality Research at Competitive costs, Consistent contributions to technological innovations, Strategic location (proximity to industrial hubs), and long standing history of success, are the critical factors favouring the IIT-B among the industries.

What value did the institute add to industry?

IIT-B through SINE has been instrumental in a wide range of successful technological innovations, which were patented, commercialised and promoted as entrepreneurial ventures, cutting across the sectors like energy and power, IT& software, green technology, AI& robotics and manufacturing among others.

What did the institute gain from working with industry?

This collaboration benefits IIT-Bombay by providing a platform for industry experts to mentor their incubatee companies and help students and faculty commercialise the Intellectual Property developed through the entrepreneurial ventures.

What does it take to keep this phenomenon successful?

Ensuring active participation and involvement of its alumni, consistent investment into collaborative research, maintaining the status of being dependable source of cutting edge innovation that lead industries to find a competitive place within the market, and consistent meaningful engagement of industries and relationship management, are some of the factors that ensure continuity of this success.

What can other institutes learn from this case study?

Following in the footsteps of IIT-B and/ or with collaboration with IIT-B, other engineering institutions could find their means to strengthen their Research portfolio in relating to real-time industry challenges, and thereby support industries to innovate and in return secure the require fund-support from them. In addition, contribute to the larger economy by promoting/ incubating entrepreneurs.

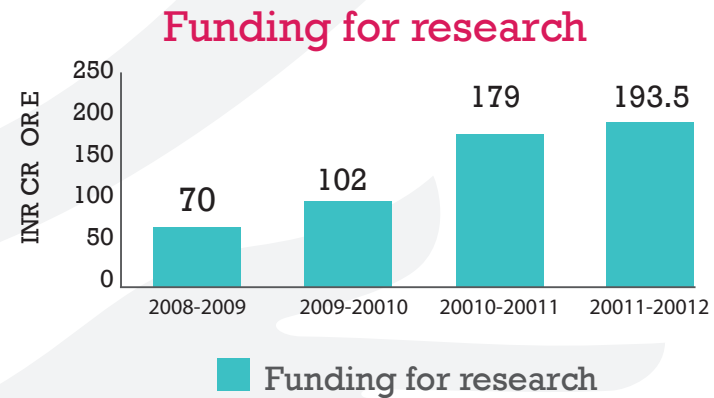
Overview of Industry Collaborations at IIT-Bombay

Due to its strategic location, industry collaborations have formed an important part of IIT-Bombay. The Institute interacts with industry through several channels including consultancy projects, industry sponsored research, industry-sponsored laboratories, collaborative research, technology business incubators, continuing education programs, industry sponsored student fellowships, summer placements of faculty and students in industry and faculty members acting on the Boards of Directors of Industry.

Select MoUs signed by IIT-Bombay include collaboration with Oil and Natural Gas Corporation (ONGC) (relating to the exploration of India's Hydrocarbon and un-mineable Coal Reserves), with Infosys (for Research and Development interaction with Centre for Aerospace Systems Design and Engineering), National Thermal Power Corporation (NTPC) (for promotion of Research and Development in Areas of Generation, Renewable Technology and Environment Issues, CFD and Technology Development for Cost Reduction), Mahanagar Telephone Nigam Limited (MTNL) (for setting up a Centre for Excellence in Telecom Technology and Management), Khadi & Village Industries Commission, Mumbai (for collaboration towards strengthening rural industrialization), Bharat Earth Movers Limited (BEML), Bangalore (for collaboration in the technical areas of Product design, Structural Analysis, Mechanics and Dynamics, Rapid Prototyping, Virtual Reality, Concurrent Engineering, Expert Systems, Robotics) and Verifone India Pvt. Ltd, Bangalore (to promote academic pursuit and research in the area of Databases).

On an average, research funding from Government organisations and industry to IIT-Bombay has witnessed more than 25% increase each year, during the past 4 years. As evidenced in the chart during the year 2009, the institute received INR 70 crore for research. However in 2010, the funding increased to INR 102 crore which is approximately 40% more than the previous year. This amount further increased to INR 179 crore in 2011 and to INR 193.5 crore in 2012.

The University attributes this increase in funding to a realisation among the global industry that Indian institutes are able to deliver quality research at competitive costs. While the majority of research funding comes from Government agencies, the industrial sector also contributes through licensing of patents.



Introduction: Society for Innovation and Entrepreneurship (SINE)

The Society for Innovation and Entrepreneurship (SINE), hosted by the Indian Institute of Technology Bombay (IIT-Bombay) in 2004, is an umbrella institution to promote 'innovation' and 'technology-based entrepreneurship' at IIT Bombay. SINE administers a business incubator (established on April 28, 2005) which provides support for technology based entrepreneurship.

The Society aims to provide a framework for multiple modes of interaction between the industry and the institute by

- identifying innovations that have potential to be developed into commercial ventures and
- facilitating networking opportunities for the incubatee companies with professional resources including mentors, experts, consultants and advisors to enable the commercialisation of the Intellectual Property developed through the entrepreneurial ventures.

Key Stakeholders

The current SINE Governing Board comprises of:

1. Prof. Devang Khakhar, (Chairman, SINE Governing Board)
2. Prof. Ashok Misra
3. Prof. R. K. Shevgaonkar
4. Prof. Milind Atrey
5. Prof. K. Sudhakar
6. Mr. Deepak Satwalekar
7. Mr. Ranjit Pandit
8. Mr. Pravin Gandhi
9. Mr. Abhay Havaladar
10. Prof. A. K. Suresh
11. Mr. Nabankur Gupta
12. Mr. Pramod Chaudhari

- **Patrons & Partners:** The Department of Science and Technology (DST); the Technology Development Board (TDB); the National Entrepreneurship Network (NEN); the Ministry of Communication and Information Technology of the Government of India (MCIT); IIT Bombay alumni; and the Entrepreneurship Cell (eCell)
- **Angel investors and Venture capitalists:** Indian Angel Investors, Inventus Capitals, SIDBI Ventures, Gaja Capital, Cannan Partners, Navam Capital, Seedfund, Nurture Talent Academy, etc. There is a formal arrangement between the SINE and India Angel Network.
- **Joint-research partners:** Tata Consultancy Services, British Petroleum Plc., Tata Steel, Bharat Forge, Nomura, Cummins India, Unilever, ONGC, Larsen & Toubro, Yahoo, Microsoft, IBM, Siemens, Boeing, Applied Materials, Bosch and Intel, and industry associations such as National Association of Software and Service Companies (NASSCOM).

The Institution

SINE is registered under the Societies Registration Act, 1860 and is run as a not-for-profit organization chaired by the Director, IIT-Bombay.

The Governing Board comprises 12 members with representation not only from the institution but also from reputed industries. The Governing Board, in addition to directing the activities of SINE, also contributes through their technical and industrial expertise. Of the 12 member in the Board, 6 are sourced from within the Institution and 6 external members are appointed from various industries with commitment to mutual development.

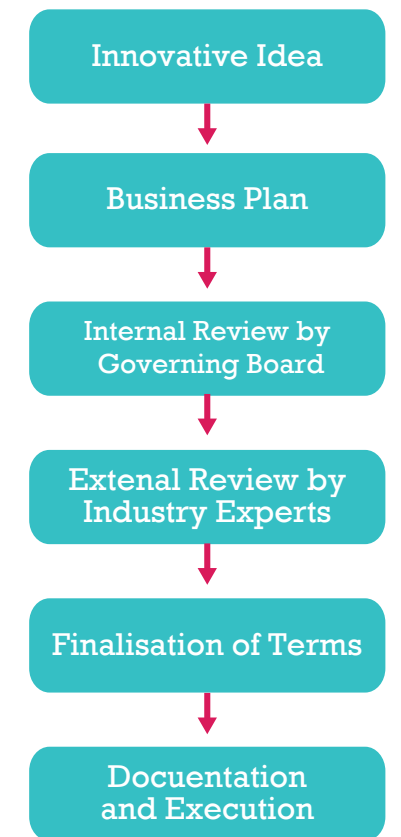
Funding and Financial Management

SINE is financially supported by IIT Bombay, DST, MCIT and NEN of the Wadhwani Foundation, and each incubatee company receives angel funding either from high net worth individuals (HNI), angel networks or through the industry.

Companies funded by VCs, Angel Investors, Financial Investors and banks	25 Nos.
Funding range	INR 0.50cr. to INR33 cr.
Funding Valuations	INR 4cr. to INR 85 cr.

The DST has extended financial assistance to SINE to provide seed support to incubatee companies, being incubated at SINE. The seed support is extended in the form of grants, interest free loans, soft loans or equity participation over a period of five years.

The MCIT has extended seed grant support to SINE under the 'Framework for National Entrepreneurs Support Program for IT at Premier Institutes'. The grant is meant for extending seed support in the form of soft loans to incubatee companies in IT and IT-enabled services areas. Despite these funding arrangements, the main form of assistance from the industry has been through mentoring of the incubatee companies.

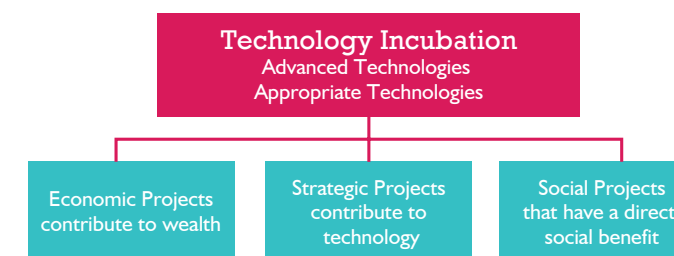


Resources

Spread over 10,000 sq.ft., the incubator at SINE provides full support to the incubatee companies including provision of physical infrastructure, shared resources and support systems for business incubation, in addition to empowering incubates to bid for competitive R&D projects and enabling access to opportunities for the creation of joint ventures. Additionally, SINE provides Seed Fund support on a case to case basis

SINE emphasises the ecosystem over physical infrastructure. As it result, it lays a great emphasis on providing networking and mentoring support, organising showcasing events for incubatee companies with industry experts and conducts training Programs for the entrepreneurs. SINE also gives incubatee companies access to the resource centre sponsored by the National Entrepreneurship Network (NEN).

Operational Model



Companies Incubated	46
Companies presently incubated	14
Companies acquired/graduated	25
Companies folded up	7

SINE mainly incubates 3 types of companies – commercially oriented technology venture, strategic projects (such as defence etc.) and social companies. Thus far, SINE has incubated about 46 companies. Out of these, 25 have been acquired or have graduated from the incubator, and 7 have folded. Of these, 20 companies have some level of faculty involvement. Further more, 4 companies are of strategic importance and 4 companies are social ventures. Currently, 14 companies are being incubated.

Once SINE receives research ideas in the form of a business plan from its faculty members (current and in the recent past), students or alumni, it invites industry experts with technical, business and financial expertise to review these business plans and identify those with appreciable innovation and commercial potential.

Start-ups are required to pay a nominal fee and are permitted to stay in SINE for an initial period of 18 months. At its own discretion, SINE may permit some start-ups to extend their stay for a maximum period of another 18 months. Incubatee companies will graduate from the incubator if they have managed to raise substantial investment from angel investor / Venture Capital Fund / any other investor (to the tune of INR 2 crore or more) or when the annual revenues of the company exceeds INR 2 crores for when a company achieves a Profit Before Tax of INR 60 Lakhs. Premature exit from SINE can result due to underperformance or un-viability of the business proposition.

For 'technological ventures' that cannot sustain themselves as stand-alone businesses, the institute helps with filing patents and licensing the technology to the industry, allowing developers to retain 70% of the licence fees. The founders of incubatee companies first have to approach IIT-B for transfer of / licensing of/ permission to use IP in favour of prospective incubatee companies. This will be followed by a letter to Dean-R&D, IIT Bombay and SINE requesting the transfer of IIT-B IP in favour of a start-up company in the Business Incubator intended to be promoted/ supported by the inventor. The companies or promoters/founders will pay consideration in lieu of the transfer / licensing of/ permission to use IP in their favour, which will be decided by SINE. IP for incubation purpose is assessed based on whether any seed grant (from public or private sources) has been used in developing the technology which will go into the product(s) of the proposed company. If so, details of the understanding with the funding agency in terms of sharing of the IP are considered. Currently, there are 18 companies with IIT-B IP.

Products and solutions incubated at SINE include engine management system, solution for fracture and fatigues analysis, numerical software solutions in CFD, access networking solution for Ethernet, soil and water purification biotechnology, hardware equipments for wireless communication, hardware for remote patient monitoring, VLSI simulation accelerators and hardware emulators, financial modelling based on statistical physics and quantum mechanics, business information security firewall, internet technologies, engineering software simulations, management decision support framework, energy, GIS technologies, mobile products, robotics, audio technologies, security and safety devices using nanotechnology, diagnostic kits for water and other fluids, nonconventional energy products, social media marketing solutions, solutions for machine management and data acquisition systems.

Experience Sharing

The number of companies incubated at SINE tripled over the past 5 years. The first batch of eight companies incubated included eInfinetus Technologies India Pvt. Ltd, funded by Sicom Ventures and Righthalf.com, acquired by Rakesh Mathur's Purple Yogi, Inc. Other such venture include SEDEMAC Mechatronics, a company providing energy efficiency solutions for the automotive and renewable energy markets which was founded by Prof. Shashikanth Suryanarayanan, a professor from IIT Bombay. Another success story is ideaForge, a company founded by three IIT Bombay alumni. ideaForge is in the business of developing alternative energy charging devices for various consumer electronic products and developing high end technologies in the field of autonomous aerial vehicles. It received INR 15 lakh government funding from the Technology Development Board and, more recently, an undisclosed funding from a clean-tech focused angel investor. It has also branched out into building small, remote-controlled air vehicles.

The table below presents details of companies that have graduated from SINE and the current incubatee companies.

Sector	Graduated Company	Current Incubatee
Energy and Power	Geosyndicate Power Pvt Ltd,	Enelek Power
IT & Software	Herald Logic Pvt. Ltd, Voyager2 Infotech, Myzus Technologies, Seclore Technology Pvt. Ltd, Eisodus Networks Pvt. Ltd, Quantum Phynance Pvt. Ltd	Agrocom Software Technologies Pvt. Ltd, Bhugol GIS Pvt. Ltd, Coll Craft Technology Pvt. Ltd, FEAST Software Ltd, Vegayan Systems, Webaroo Technology India Pvt. Ltd, Zeus Numerix Pvt Ltd, InOpen Technologies Pvt
Green Technology		C-Tech Labs Pvt. Ltd, Vision Earthcare
AI & Robotics		iKen Solutions Pvt. Ltd, TRI Technosolutions Pvt
Manufacturing		Polymericensors Pvt. Ltd, WILCOM Technologies, COVACIS Technologies Pvt. Ltd
Others	eInfinetus, Mobiance Technologies Pvt., Powai Labs Pvt. Ltd	3D Foundry Tech Pvt Ltd, Setu Net Pvt Ltd, SensiBol Audio Technologies, A3 Remote Monitoring Technologies

Source: List of companies has been taken from the SINE website. Categorisation into sectors has been compiled by the authors and is based on the description on the respective companies websites

While SINE has seen its share of successes, there have also been some failures. However SINE believes that these failures are learning opportunities that give both SINE and the incubatee an opportunity to develop a better, more innovative, relevant and practically viable solution. SINE, IIT-Bombay has seen a steady growth in entrepreneurial ventures. As of 2012, ~25% of the students did not sit for placements and have instead chosen to take the entrepreneurial route. One of the factors that contribute to its success is that it is one of the few incubators that have an active participation of industry experts on its board and not only academics.

Using its learnings and experiences, IIT-B plans to help other engineering schools follow suit through a partnership that will encourage entrepreneurship on their campuses. Towards this end, IIT-B has started working with faculty from other engineering colleges through a series of workshops which focused on procedures, methodology, accessing funding, mentoring, among other activities that are vital to setting up and sustaining a business incubator.

- NEN was established in 2003 with a mission to create and support high-growth entrepreneurs, driving job-creation and economic growth in India. NEN was co-founded by IIT Bombay; IIM Ahmedabad; BITS, Pilani; SP Jain Institute of Management & Research, Mumbai; Institute of Bioinformatics and Applied Biotechnology, Bangalore. It is primarily supported by the Wadhvani Foundation, a philanthropic initiative of Dr. Romesh
- If any person other than the applicant has worked on the technology and if their work is incorporated in the product(s) then, the other person has a right in IP ownership, and the same is appropriately considered.
- SEDEMAC has developed electronic control modules, which increase the fuel efficiency and reduce emissions of small engines. It is working with some of the leading two wheeler companies in India and with global renewable energy firms. Recently, SEDEMAC received a large fund injection from a VC fund, Nexus India Capital.

Case Study 2

IIT BOMBAY

Monash University Collaboration

THE IIT-BOMBAY-MONASH ACADEMY SUCCESS STORY

Why did industry partner with the Institute?

Consistent record in collaborative research and high degree of market acceptance, combined with openness to multi-disciplinary research with complementing strengths had enabled the triangular relationship between two research institutions of excellence with several industry partners to enable this collaborative arrangement.

What value did the institute add to industry?

Spurt in the growth of the number of research projects (30 in FY 2009 to 230 in FY 2013) stands a witness to the confidence the industry holds on the collaboration. Within the short-span of time of its existence the Academy has contributed to the industry in some vital aspects in the areas of advanced computational engineering, infrastructure engineering, clean energy and others.

What did the institute gain from working with industry?

This is a distinct collaborative arrangement IIT-B could boast of as a one of its kind intervention. Both students and staff get to benefit from multi-country and multi-disciplinary exposures, and experience of a wider span of industry challenges in specialised areas of economic and social relevance.

What does it take to keep this phenomenon successful?

Clear understanding and acceptance of distinctive roles and contributions, equitable opportunities between the academia partners, well laid principles of collaboration, resource sharing, commercialisation and others.

What can other institutes learn from this case study?

Other Institutes could identify appropriate partner institutions with complementing skills, and establish common challenges across borders with wider implications. This will enable establishing collaborative multi-disciplinary research facility through cross-learning.

Introduction: IIT Bombay-Monash Research Academy

In January 2008, IITB and Monash University, Australia partnered to establish a Research Academy that aims to provide the industry with innovative research solutions through collaborative, multi-disciplinary programs in areas of strategic importance to industry both in India and Australia. The research scholars at the Academy will receive guidance not only from professors in the two universities but also from industry experts, commercial organisations and governmental agencies in both countries.

The Academy aims to attract talented students through its PhD and post doctoral program. As a part of the PhD program, the academy offers students a health scholarship. Typically, Indian students in the joint IITB-Monash PhD program receive INR 280,000 per annum scholarship, a grant of up to A\$11,000 for their stay in Australia and a waiver of international student tuition fees at Monash University. Moreover, students receive a dual PhD degree from IIT Bombay and Monash University. The Academy expects to grow to a steady-state of about 350 PhD scholars by 2017.

Key Stakeholders

Key stakeholders of the Academy include the two Governments as well as industry, the community, funding bodies and philanthropists from both countries. Industry partners include: BHP Billiton, the Department of Innovation, Industry, Science and Research, the Department of Science & Technology, Infosys, Orica Mining Services, JSW Foundation, the Reliance Group, Tata Consultancy Services, Thermax, Piramal Life Sciences, Intel and Proctor & Gamble.

Current Members of the Governing Board

- Professor Devang Khakhar (Director, IIT Bombay)
- Professor Subhasis Chaudhuri (IIT Bombay)
- Professor Shiva Prasad (Dean Academic Programs, IIT Bombay)
- Professor H. S. Pandalai (Deputy Director, FEA, IIT Bombay)
- Professor Rangan Banerjee (Dean Research and Development, IIT Bombay)
- Professor Ed Byrne AO, Chair (Vice-Chancellor and President, Monash University)
- Professor Edwina Cornish (Deputy Vice-Chancellor Research, Monash University)
- Ms. Loren Miller, Director - Business Strategy, Monash University
- Professor Tam Sridhar (Dean, Faculty of Engineering, Monash University)
- Mr David Pitt (Vice-President, CFO, Monash University)

Current Members of Research Advisory Council

- Mr Narayana Murthy (Chair), Founder and Chief mentor of Infosys
- Professor Ramesh Mashelkar (Deputy Chair, Former Director-General CSIR, India, Chairman of Marico Innovation Foundation and President of the Indian National Science Academy)
- Prasad Menon (MD, Tata Power)
- Dr Hari Gopal (DST)
- Sir Professor Gus Nossal (Chairman of the Advisory Committee of the Global Foundation)
- Dr Swati Piramal (Vice Chairperson, Piramal Life Sciences Limited and Director, Piramal Healthcare Limited, India)
- Dr Megan Clark (CEO, CSIRO)
- Mr Subu Goparaju (SET Labs, Infosys)
- Mr Jez Smith (Manager/Executive Vice President, Global Marketing and Technology, Orica Mining Services)

The Institution

The Academy was established as a not-for-profit, autonomous institution with an independent Governing Board and Advisory Council, comprising of representatives from industry and the academia, a CEO and research staff and seconded staff from IIT Bombay/Monash University.

The Research Academy is managed by the Board which comprises an equal number of representatives from each of IIT Bombay and Monash University. The Research Advisory Council's membership consists of eminent researchers, academics, and industry and government leaders appointed by IIT-B and Monash. The role of the Research Advisory Council is to provide advice to the Board concerning research priorities and strategies or any other matter requested by the Board.

Funding & Financial Management

The Academy is currently funded by both, the industry and the two Governments. However the aim is to eventually make the academy self-supporting. Specifically, the Indian Government has provided funds to build the infrastructure and fund scholarships.

Industry funding is provided on a program basis and the funds are released to the Academy on an annual basis. Funding provided for programs vary between INR 2 crore and INR 10 crore.

Resources

The Academy is located at the Powai campus of IIT Bombay. It draws on existing facilities at IIT Bombay and Monash University. Researchers at the Academy will have access to internet and high performance computing resources, state of the art laboratories, equipment and collaborative workspaces.

Operational Model

The Academy's intention is to organise research into classes of problems that seeks to address a key research-theme or sector-goal. Six key research themes have been identified, namely:

- Advanced computational engineering, simulation and manufacture
- Infrastructure engineering
- Clean energy
- Water
- Nanotechnology
- Biotechnology and stem cell research

Industry's role is not confined to funding alone. They are involved right from the formulation stage of the program. Together with academia at IIT-Bombay, industries suggest, formulate and develop ideas that have the potential to address the 'grand challenges' faced by society today. Typically, the a program can be developed in two ways- either industry approaches the Academy with an idea for which they think can best be executed by the faculty and students of the Academy.

However, industry's role does not end there. There is a continuous interaction between industry experts and the faculty during the lifetime of the project. Alternatively a faculty member conceives an idea and then approaches the industry leader in that field to contribute their expertise to the program.

However, programs are not restricted to these areas and as long as it aims to provide an innovative solution and address "grand challenges", programs across multi-disciplines are encouraged. Programs typically run for 6 years and comprise multiple projects. Each project is typically assigned to a PhD student. At the end of the program, the expected outcome is to create a bank of innovative technology specifically, significant and innovative research for business and government.

Rights for Intellectual property created are considered on a case-to-case basis. Very often, the purpose of the project namely whether it is capacity building project or a commercial ownership is considered before ownership rights are granted to either the company, the University or if it is shared..

Experience Sharing

The academy has grown from 30 projects and 41 Ph.D students in 2008-09 to ~230 projects and 100 students as of 2013. Thus, the industry-academia collaborations under this program ensure benefits for industry, Universities and society at large. For academia, these interactions help faculty and students understands industry's needs so that they can provide inputs that are industry relevant. Furthermore, through the creation of research teams containing high calibre research staff and high quality doctoral students, these collaborations help shape talent and thus contribute to societal development.

Case Study 3

IIT KANPUR

Collaboration with Boeing

IIT-KANPUR-BOEING SUCCESS STORY

Why did industry partner with the Institute?

Boeing identified IIT-Kanpur (among other universities) to participate in the Boeing-University Relations Program and the Boeing Technical Externship program. IIT-Kanpur was selected due its ability to provide expert technological research support in the form of operating models (simulation or prototypes), designs and analytics.

What value did the institute add to industry?

For Boeing, this collaboration helps assimilate new ideas and innovative processes not only to meet the emerging needs in the country but also to meet the requirements of the global aerospace industry. IIT-Kanpur also provides Boeing with the human capital to carry out projects and a platform for intellectual discourse.

What did the institute gain from working with industry?

This collaboration with Boeing provides IIT-Kanpur with an opportunity to contribute to industry research and gain hands-on real time experience from the best in the business. Over the past 5 years, Boeing has funded several projects at IIT-Kanpur in the four departments of Mechanical Engineering, Aerospace Engineering, Electrical Engineering and Wind-Tunnel Engineering. Though IIT-Kanpur is one of the 8 institutions signed-up with Boeing, IIT-Kanpur is able to derive higher returns in this collaboration than others.

What does it take to keep this phenomenon successful?

To maintain this successful collaboration and to continue creating value and driving growth, IIT -Kanpur has remained open to inputs from Boeing and continues to maintain its commitment to technological research support.

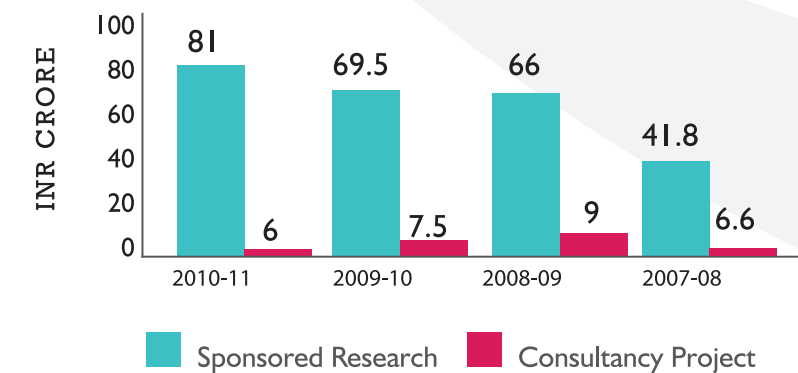
What can other institutes learn from this case study?

Similar to Boeing there are a wide range of speciality industries requiring multi-disciplinary research support. Developing a concept similar to the Boeing collaboration and distinctive contributions like that of IIT-Kanpur, other Institutions could venture on specialised fields of study, and also establish industry-supported externship.

Overview of Industry Collaborations at IIT-Kanpur

IIT-Kanpur has industry and institutional collaboration arrangements with a wide range public and private owned entities of research excellence. The institute currently has over 60 ongoing research engagements with the private sector, where the institute's faculty provide expert technical and technological research support in the form of operating models (simulation or prototypes), designs and analytics. Some of the notable industry partners include Moser Baer India Limited, Boeing, Chevron Corporation (USA), Hindustan Petroleum Corporation Limited, Qualcomm Incorporated, Intel etc.

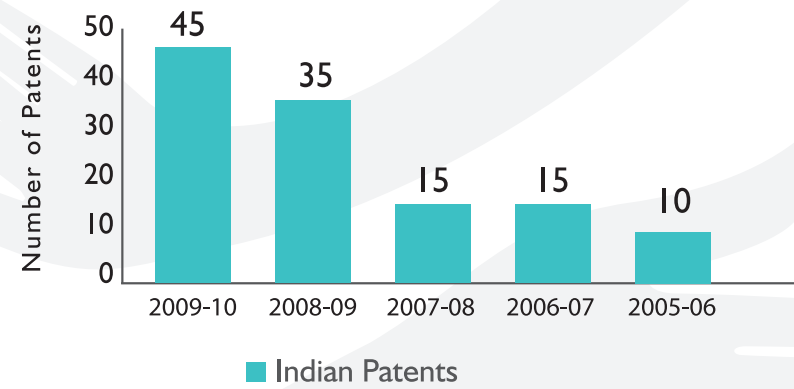
Funding received for Research



The institution also covers a number of sponsored research, consultancy engagements, conferences and courses through its R&D establishment.

Funding for sponsored research includes funding from research promoting departments, ministries and establishments of the Government of India and public institutions of excellence, which include the Department of Science & Technology (DST), Bharat Sanchar Nigam Limited (BSNL), Ministry of Commerce and Industry, Council for Scientific and Industrial Research and ISRO among others.

Indian Patents filed by IIT - Kanpur



As a result of industry collaboration and active research, IIT-Kanpur was able to increase the number of patent filing in India by over 4 folds in the past 5 years. In addition to Indian Patents, the institute has also filed for 4 international patents and has contributed to 24 technology transfers after 2009 worth approximately INR 67 lakh. A majority of the patents proposed by the faculty and students have been procured by Intellectual Ventures (IV) Ltd., a Bangalore-based multinational company. In 2010, IIT Kanpur was the top source of inventions for IV India, both on invention volumes and filed patents.

Notable alumni include N.R. Narayana Murthy, (Founder, Infosys); Pradeep Sindhu, (Founder, Juniper Networks); Jitendra Malik, (Arthur J. Chick Professor, EECS University of California at Berkeley); Ashok Jhunjhunwala, (Padma Shri and Professor, Dept of Electrical Engineering, IIT Madras); Abhay Bhushan, (Author of File Transfer Protocol); Amitabh Thakur, (Indian Police Service, Social activist, Writer); Anil K. Rajvanshi, (Director), Ashoke Sen, (FRS and Padma Shri, String theorist); Ayyalusamy Ramamoorthy, (Scientist in the area of NMR and biological membranes); Chandra Kintala, (Professor and Director of Software Engineering at New Jersey Institute of Technology; Director(Retd.), Bell Labs, USA); Duvvuri Subbarao, (22nd Governor of Reserve Bank of India) and Rajeev Motwani, (Computer Scientist, Professor of Computer Science at Stanford University), etc.

Introduction: Collaboration with Boeing

In 2008, Boeing identified four IITs, namely Bombay, Madras, Kanpur and Kharagpur and launched the Boeing-University Relations Program to promote 'aerospace engineering' as a career alternative among students.

The aim of this program are:

- to provide scholarships to undergraduate and master students in Aerospace related engineering disciplines to encourage the uptake of aerospace engineering.
- to support design competitions that encourage students to innovate and think outside the box to produce working prototypes of autonomous vehicles. In addition to providing an opportunity for innovation, these competitions also help students gain hands-on exposure.
- to provide students with an opportunity to interact directly with aerospace experts, practitioners and executives from Boeing.
- to extend funding to undertake industry-relevant research in areas of mutual interest.

In addition to the student driven research, Boeing started a Boeing Technical Externship program in 2009 in IIT-Kanpur among other universities. The Externship is a 'student-oriented experiential learning opportunity' designed to expose a select group of third year undergraduate engineering students to the aerospace industry. The externship aims to provide students with a better understanding and opportunity for practical application of engineering and technology skills in aerospace.

Key Stakeholders

The main stakeholders in this collaboration are (a) the Boeing Company, (b) Boeing Commercial Airplanes; and (c) the faculty and students of IIT-Kanpur.

Over the past 5 years, Boeing has funded several projects at IIT-Kanpur in the four departments of Mechanical Engineering, Aerospace Engineering, Electrical Engineering and Wind-Tunnel Engineering. The projects are assigned to professors within these departments. Students are invited to enrol into the projects on nomination basis. Projects generally allow 4-5 students to participate and collaborate on a project. While Boeing provides the funding and allows for interaction with the Boeing experts, the University provides the human capital and a platform for intellectual discourse.

In addition to the key stakeholders specified above, companies such as Infotech Enterprises Limited and Tata Consultancy Services (TCS), are engaged through appropriate partnership arrangements to support the Boeing Technical Externship program.

The Institution

A Master Project Agreement is signed between 'Boeing' and 'IIT-Kanpur' that lays out all program guidelines for each of the project. As per the terms of the Externship, the Project report that results from the externship will be publishable in the public domain. A faculty member is appointed as the focal contact and as a guide for each project and he/she will also act as a liaison between Boeing and the project team at the University. Furthermore, 2 confidentiality agreements are signed- One, with the students that are participating the project and the other, with the faculty that will be guiding and coordinating the project. The confidentiality agreement serves to protect the company's proprietary information that the student/faculty may gain access to while working on the project.

Funding & Financial Management

As per the agreement with IIT-Kanpur, Boeing provides project-wise funding. This funding is renewed annually and has to be used specifically for the project that it is designated for. Detailed project-wise account is required to be presented at the end of each year.

The Technical Externship Program, scheduled for an on-site duration of 9-weeks is sponsored by Boeing Commercial Airplanes. Thus far, Boeing has provided a total funding of approximately US\$ 12.5 lakh over the past 5 years.

Resources

The students and faculties enrolled on these projects are required to utilise the existing research facilities, laboratories, libraries and other resources (incl. support infrastructure) available at the University. However, for the Externship Program, Boeing has tied up with other industry partners/specialists such as the Infotech and the Tata Consultancy Services that provide the students with the required physical infrastructure and other support facilities.

Additionally, Boeing allows students to interact with experts and practitioners at Boeing so that they get a complete understanding of the aeronautical industry and project-specific details.

Operational Model

Boeing, together with (key designated staff at) IIT Kanpur, identify research topics in areas of mutual interest. Boeing researchers work hand in hand with faculty members and students to further develop these ideas into working and commercially viable prototypes. 10-12 students are involved in this project. IIT-Kanpur and Boeing have several ongoing and completed projects. The duration of these projects vary from a year to 2-6 years depending on the complexities involved. Currently, Boeing is working on developing an 'autonomous navigation vehicle'.

Topics for the projects that can be undertaken as part of the externship are identified by Boeing, and students may choose to contribute to any project of their interest. The Externship is open to any IIT-Kanpur third year (going into fourth year) bachelors engineering students (over 18 years of age) from any branch of engineering who have an interest in aerospace engineering. Students are selected by Boeing based on their academic performance and are provided with a stipend of INR 45,000 per month, which covers travel and other incidental expenses during the externship period. Every year, 6 students from the university are selected for this externship. So far, 30 students have benefitted from this program.

Intellectual property of any kind created as a result of any of these projects will be jointly owned by IIT-Kanpur and Boeing, as the intellectual property was created with the significant use of funds provided by Boeing. Thus far, this collaboration has resulted in 1 IPR however the patent is still pending.

Experience Sharing

One of the noteworthy projects that have resulted from this collaboration is the integration of passive and active radio frequency identification (RFID). The aim of this project is to integrate Radio Frequency Identification (RFID) and sensor systems into a computer network which can be used to achieve awareness about objects such as tools and consumable supplies in the manufacturing environment. Boeing has extended immense support for this project and has been well pleased with the research output in the area of RFID and Condition Based Monitoring (CBM). This has resulted in Boeing continuing their support for the fifth consecutive year.

The other project being funded by Boeing is the designing and building of ABHYAST-an autonomous navigation vehicle capable of navigating in unstructured and unknown environments. The user needs to specify only the end coordinates where he/ she wants the vehicle to reach, and the task of reaching there would be taken by the vehicle itself, requiring no intervention by the user. The vehicle is equipped with high end sensors like GPS, IMU and SONARS to navigate and avoid obstacles in its vicinity.

The other Boeing funded project was on High Lift Aerodynamics that seeks to enhance understanding of high lift flow physics to obtain highly accurate and detailed measurements for two-dimensional high-lift geometry. In addition, Boeing has also funded the development of a large format PIV system with an advanced flow diagnostic capability.

This collaboration with Boeing, provides IIT-Kanpur with an opportunity to contribute to industry research and gain hands-on real time experience from the best in the business. The university showcased its contributions to the industry at the Annual Network Enabled Manufactures Technology Roadshow at the Boring Headquarters in Seattle, USA.

Through these channels, the collaboration between Boeing and IIT-Kanpur helps mobilise capability, harness creativity, access market expertise, create value and drive growth. It also ensures that there is long term, on-going and mutually beneficial interaction between University and industry. For Boeing, this investment helps assimilate new ideas and innovative processes not only to meet the emerging needs in the country but also to meet the requirements of the global aerospace industry.

IIT Kanpur-Boeing Projects

Year	Project Details	Funding
2011-12	SPONSORED PROJECT: Investigation into the thermo-oxidative and mechanical response of commercial polyimide resins and polyimide nano-composites for Aerospace application	INR 59,59,800
2011-12	CONSULTANCY PROJECT: Predicted models for sheet thinning and spring back and incremental sheet forming	INR 8,76,277
2010-11	SPONSORED PROJECT: RFID and Condition Based Monitoring (CBM)	N/A
2009-10	SPONSORED PROJECT: Kinetic Monte Carlo Simulation studies of silicon- germanium thin films	INR 70,29,116
2009-10	SPONSORED PROJECT: Analysis of gas injection systems and gas heavy metal separation system target for accelerator driven system target for accelerator driven system	INR 24,53,856
2009-10	CONSULTANCY PROJECTS: Aluminium coating technology	INR 35,12,250
2008-09	SPONSORED PROJECT: Design and development of an autonomous vehicle	INR 20,25,000

Compiled from IIT Kanpur Annual Reports

Case Study 4 NITK

Bosch Power Tools Training Facility

THE NITK-BOSCH SUCCESS STORY

Why did industry partner with the Institute?

There is a high market potential for power tools in the State of Karnataka. In order to tap into this market and enable market-relevant skilling, the Bosch Power Tools Training facility was established at NITK. Quality of skilled manpower from NITK and proactive engagement of NITK with Bosch had resulted in this successful collaboration.

What value did the institute add to industry?

This collaboration offered the industry with a platform to ascertain the market need for power tools. Additionally, with the guidance of the NITK faculty, industry could develop custom tools to suit the local needs.

What did the institute gain from working with industry?

Through this lab, faculty and students at NITK have the opportunity to interact with industry experts on a regular basis as the experts from Bosch conducted free training programs for faculty and students. As a result, students now use power tools in their regular class work and project work.

What does it take to keep this phenomenon successful?

To maintain successful collaborations such as this, NITK ensures that it holds periodic review s through meetings of the joint working group dedicated to the industry. Also, it conducts joint workshops to keep up-to-date with the emerging trends in the sector.

What can other institutes learn from this case study?

Other institutions could identify skill gaps in the market and potential for industry collaboration to ensure mutual benefits, and benefits to the society at large.

Overview of Industry Collaboration at NIT-Surathkal

INDUSTRY	RESEARCH FACILITY
National Instruments	Data Acquisition Systems
XILINX Inc	FPGA Boards
ABB Ltd.	Substation SCADA system
Allen Bradley	PLC system
Yokogawa	Industrial Distributed Control System
Manitoba Corporation	IPSCAD / EMTDC Software
Integrated Electric Company	Electric Drive System
Doble Inc	Power System Simulator
Power Research and Development Consultants	Power System Protection System Printed Circuit Board Prototyping Unit

NITK conducts academic programs across sectors including applied mechanics and hydraulics, chemical engineering, chemistry, civil engineering, computer science and engineering, electrical and electronics engineering, electronics and communication engineering, humanities, social sciences and management, information technology, mathematical and computational sciences, mechanical engineering, metallurgical and materials engineering, mining engineering and physics.

NITK has several modes through which it facilitates industry-institute collaborations. One such channel is through research and consulting projects for clients such as Ace Manufacturing systems, the Indian Railways, Bharat Electronics and National Instruments among others. Furthermore, several industries have established research facilities inside the NITK campus.

These include, among others, a state-of-the-art laboratory in Automotive Power Train Electronics by Bosch in the Department of Mechanical Engineering, an Embedded Systems Lab in the Dept. of ECE. Set up by Intel under the Intel Embedded Initiative. IBM has set up Open Power Systems laboratory at Computer Science and Engineering department. Under this collaboration, equipments worth Rs.90 Lakhs were provided by IBM for research in Open power system. Several student projects are carried out using this laboratory. With the contribution from industries the following research facilities have been established in the department of Electrical & Electronics Engineering.

Additionally, NITK ensures that their curriculum is upto date by receiving regular inputs from industry specialists. A new joint M. Tech Program in Design and Precision Engineering with CMTI (Central Manufacturing Technology Institute) Bangalore will be implemented in academic year 2013-14. Several scientists from CMTI and participating industries like Moog, Volvo, Mercedes-Benz, Ace Manufacturing Systems Limited, Bosch, Auma etc will be involved in teaching, training and joint research work. NITK ensures that the university also contributes to this relationship by training industry personnel. The institute runs a Center for Continuing Education (CCE) that facilitates conduction of regular short term training programs in upcoming areas of Science and Technology to industry personnel. Working professionals from CPRI, CMTI, Udipi Sri Krishna Technologies, Om's Patent Services are enrolled for M. Tech. and Ph. D Programs. The Department of Electrical and Electronics is offering regularly training to companies such as MRPL, MCF, BSF and MESCOM among others.

Lastly, the university organises industry internships for four week duration. This is compulsory for all B. Tech and M. Tech students. Some of the industries that regularly participate in this internship program including IBM, AMD, DELL, TI, Intel, CMTI, Volvo, Bosch, ACE, Moog, CPRI, MRPL, MCF, NMPT, Coal India, ISRO, NAL, CISCO, TCS and INFOSYS.

Introduction: Bosch Power Tools Training Facility

Funded by the Technical Education Quality Improvement Program (TE-QIP) and supported by the Power Tools Division of Bosch, the MICO-Bosch Power Tools Laboratory and Training facility was established at the National Institute of Technology, Karnataka (NITK) in 2007.

The special focus of this collaboration was to provide the students and faculty of the institution, to have access to the state of the art power tools facility, and to be trained hands-on with the support of the industry experts from MICO-Bosch. In addition, the initiative also aims at improving curricula to make it market relevant and to bring emphasis on self-learning and increased creative and innovative thinking.

Key Stakeholders

Key stakeholders include: (a) the Institution/ University; (b) the TEQIP; and the MICO-Bosch. In addition, over 800 students of the Mechanical Engineering discipline and the faculties actively participate and reap benefits under the intervention.

The Institution

As per the agreement between Bosch and NITK, the laboratory and training centre is owned by NITK.

Funding & Financial Management

Approximately INR 70 lakh was spent on developing the MICO-BOSCH power tools training centre at the University. This amount was funded out of the INR 24 crore that the University received from the TEQIP grant. NITK was the first institution to receive entire allocated fund based on its success in achieving academic excellence and in the utilization of the grant. The revenue generated (in any) as a result of the training courses, curriculum and other Programs, will be at the discretion of NITK authorities and utilization as per the rules of NITK.

Depending on the location of the various trainings for the students and the staff of the NITK, the boarding and lodging costs of the trainings are borne either by NITK or by MICO-Bosch.

Resources

The centre is equipped with latest tools that are required for industrial needs. Tools available at the Centre include drills & impact drills, screwdrivers and impact wrenches, rotary hammers and measuring technology, metalworking tools, sanders and planers, routers, saws and bench-top tools among others. Through this lab, faculty and students at NITK have the opportunity to interact with industry experts on a regular basis.

The benefits have been two-fold. Not only do the advanced infrastructural facilities provided in the Power Tools Laboratory help encourage innovation but, the interaction with industry experts through workshops and training programs and seminars that are organised by MICO-Bosch on campus helps in curriculum development and knowledge enhancement.

Additionally, MICO-Bosch has prepared an encyclopaedia and interactive CDs that have been made available to NITK for reference. Lastly, MICO-Bosch provides Design Support to the university.

Operational Model

Immediately after the inauguration of the Power Tools Centre, an in-house 'Introductory Bosch Power Tools Training Program' for NITK Faculty and staff was organized by TEQIP. This was followed by a Train the Trainer program, a 4 day program conducted by expert trainers from MICO-Bosch which was meant to orient the faculty and technicians of NITK with the technology and tools provided in the laboratory. 15 Faculty and 62 Technical staff attended the program.

MICO-Bosch provides inputs through a variety of interactions. Firstly, through the regularly scheduled workshops and trainings, student and faculty are kept upto date with the latest technology. As per the MOU, students of the university that attend these training programs receive a proficiency certificate in the use of power tools. In addition to the periodically scheduled trainings, MICO Bosch supports the university in preparation of the modules by providing curriculum inputs to ensure that the courses are more practical and industry-friendly. These inputs usually try to incorporate the latest technology in the market so that students are acquainted with this before they step into the job market.

Expert Engineers from Bosch visit the campus on pre-determined, mutually agreed dates to provide training for NITK faculty and students. The main form of interaction is through a series of workshops and training programs held both, in the laboratory on campus and at the National Training Centre at MICO-Bosch, Bangalore. As per the norms, the themes, topics and frequency of these trainings and workshops are also mutually agreed upon between MICO-Bosch and NITK thus providing a good mix of theoretical and practical experience.

Thus far, activities in the laboratory have not resulted in any patents however, in the event that a technological innovation does result in a patent- it will be reviewed on a case-to-case basis depending on the resources and funding that was utilised to determine whether the IP will be shared or awarded to one party alone.

Experience Sharing

For TEQIP, this collaboration is adding to the research capacity of the country and is helping provide opportunities for technological innovation. For MICO-Bosch, the facility allows an opportunity not only to interact with current students but also to influence the curriculum being taught in Universities so as to ensure that it has both theoretical and practical elements that guarantee that the students are not only academically qualified but also trained in practical skills that are relevant to the market.

One noteworthy outcome from the Power Tools Training centre is that the university is also utilising the laboratory as a part of its social responsibility initiative. Lab facilities and the expertise gained from the trainings attended are being used for Community Development Programs for skilling local carpenters, electricians, plumbers and masons. This initiative is a first of its kind in India and includes a combination of product demonstrations and training to empower self-employed artisans to further their trade. These trainings and workshops are organised by the Mechanical Engineering Department in collaboration with Bosch. The focus of the workshop is to train the rural artisans to upgrade their skills with modern technology. In the year 2008 this Unique Community Development Program on the use of Power Tools was organized for two days and was spread into six sessions.

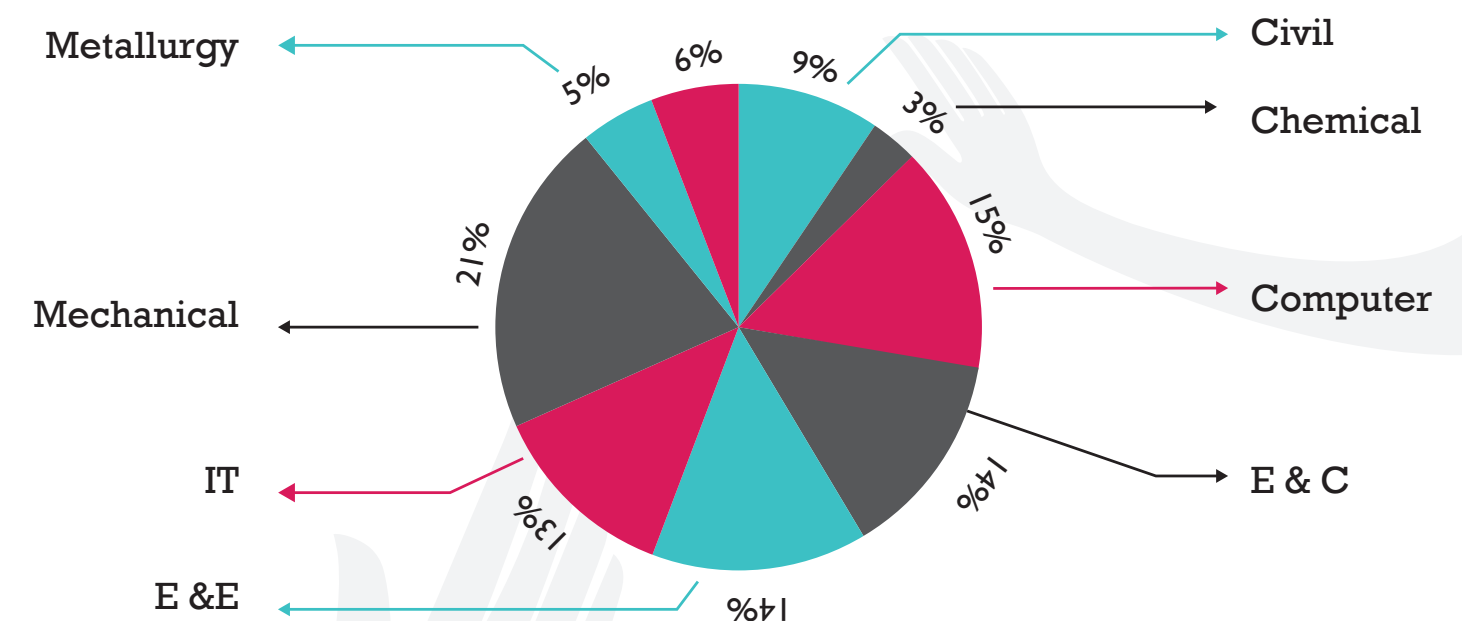
The workshops were organised for a variety of different participants such as women, SC/ST participants and local high school students among others and received a good response from the local community. Approximately 420 (skilled and unskilled) community members have been trained so far. Participants were given theory session for two hours on different power tools. This was followed by a hands-on experience of using power tool for carpentry, metalworking and construction. NITK along with Bosch is planning on making these workshops a regular event to help rural artisans upgrade their skills.

In addition to giving back to the community, the inputs provided through the MICO-Bosch, training labs have helped the Mechanical Department at NITK a niche for itself in the areas of teaching, consultancy and community services. Furthermore, it has helped NITK come to the forefront in research in the areas of design, manufacturing, materials, thermal and Mechatronics Engineering.

Placements in the Mechanical Engineering Department of NITK are among the best when compared to the other streams in the institute. In 2001-12, of all the students placements 21% comprised students from the Mechanical engineering department. Moreover within the mechanical engineering department, ~91% of all eligible students were placed.

In a recent ranking by NASSCOM, IDC and Dataquest Magazine, NITK was ranked 3rd best for placements in India. The curriculum inputs and practical expertise gained through this collaboration have also resulted in the introduction of new courses such as the M.Tech. Research Program. Furthermore, NITK has been recognized as 'Centre for Quality Improvement Program for M.Tech'.

Placements by Stream in 2011-12



• TEQIP is a World Bank assisted project implemented by Ministry of Human Resource Development (MHRD) that aims to improve the quality of technical education in engineering colleges across India by providing funding for inputs like modernization of laboratories/workshops, library, faculty development, networking between institutions, curricula development, research.

Case Study 5

IIT MADRAS

Centre for Industrial Consultancy & Sponsored Research (IC&SR)

IIT-MADRAS- INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH SUCCESS STORY

Why did industry partner with the Institute?

Given the institute offers to conduct quality research and consulting projects at competitive prices (cost of research is almost half of what it would be in private labs), it had helped the centre attract renowned and a diversified mix of clients ranging from corporates to quasi government; for both sponsored as well as consultancy projects

What value did the institute add to industry?

Several technologies developed with support from the centre have been transferred to industry for commercialization. Such technologies have led to concept, process and product development; creation of intellectual property and utilization through patenting and technology transfer; thus making important contribution to design and development of the industry and the country at large

What did the institute gain from working with industry?

This interaction with industry has helped IIT Madras align itself to the changing need and environment as well as enable effective utilisation of its resources. The institute also gains by leveraging the relationship for securing scholarships, internships and placements for the students.

What does it take to keep this phenomenon successful?

A well defined framework for undertaking such projects with all required systems in place ensures speedy initiation and implementation of the projects. Alongside, initiatives to maintain a long lasting association with the client make this collaboration successful.

What can other institutes learn from this case study?

Other Institutions should as well believe that their existence is for serving the industry needs, while in turn they could secure funds, knowledge-share, and hands-on experience to solving real-time challenges of the industry, and thereby contributing to the society at large.

Overview of Industry Collaboration at IIT Madras

IIT Madras has been in the forefront in promoting Industry - Institute interaction through several innovative schemes. Since IIT Madras realized the importance of interaction with industries in its formative years it has been able to adapt itself to the changing needs and the environment by entering into strategic alliances with various industries at national and international levels to leverage resources for meeting the challenges from the competition.

During the last two decades the emphasis on interaction between Industry and the Institute has shifted to joint research projects leading to concept, process and product development, creation of intellectual property and utilization through patenting and technology transfer and also venture capital.

The nature of interaction with industries covers a wide spectrum of activities, namely:

- Academic
- Research & Consultancy
- Centers of Excellence
- International Collaboration
- Infrastructure Development
- Industrial Associateship Scheme

The Institute plans to strengthen the interactions in the future with focus on IPR issues and exploiting the economic potential of its intellectual capital

Introduction: Industrial Consultancy & Sponsored Research (IC&SR)

The centre for Industrial Consultancy & Sponsored Research (IC&SR), hosted by the Indian Institute of Technology, Madras (IIT Madras), is an attempt towards promoting 'industry-institute interventions' through various 'innovations'.

Established in early 1973 as Industrial Consultancy Centre (ICC) and later renamed as Centre for Industrial Consultancy & Sponsored Research (1981), the centre aims at encouraging and channelizing the relationship of IIT faculty with industry and external agencies by undertaking:

- Collaborative research,
- Technology transfer, and
- Specialized human resource development

IC&SR works as a nodal agency to provide support service to project; MOU with Industries; setting up of R & D cells; and Technology Missions.

Key Stakeholders

This centre has played a vital role in bringing together the people from the Industry and the faculty of the Institute, resulting in important contributions to design and development in the country. Industries from all sectors avail the expertise of the faculties and utilise the research facilities at the institute.

- Patrons & Partners: Department of Science and Technology (DST); National Technical Research Organization (NTRO); Naval Research Board (NRB); Aeronautical Development Agency, Atomic Energy Regulatory Board(AERB); Board of Research in Nuclear Science (BRNS); Council for Scientific & Industrial Research (CSIR); Indian Space Research Organisation (ISRO); Indira Gandhi Centre for Atomic Research(IGCAR); Defence Research and Development Organization (DRDO); and Ministry of New and Renewable Energy (MNRE). Private organizations like the Murugappa Group; Orchid Chemicals and Pharmaceuticals; etc.
- Joint Research Partners: International collaborative joint research Programs of common interest undertaken through Indo-US, Indo-German, Indo-Australian and Indo-European research initiatives. Assignments have been undertaken with American Industries and Laboratories such as Boeing Industries, Analog Devices, Argonne National Laboratory, International Lead Zinc Research Institute, Ericsson Inc., Delaware Water Gap Science, Deluge Inc., Praxair Inc., Ford Motor Company, South Bank University, UK; European Commission, Oregon Graduate Institute of Science & Technology, DuPont, Columbian Chemicals.

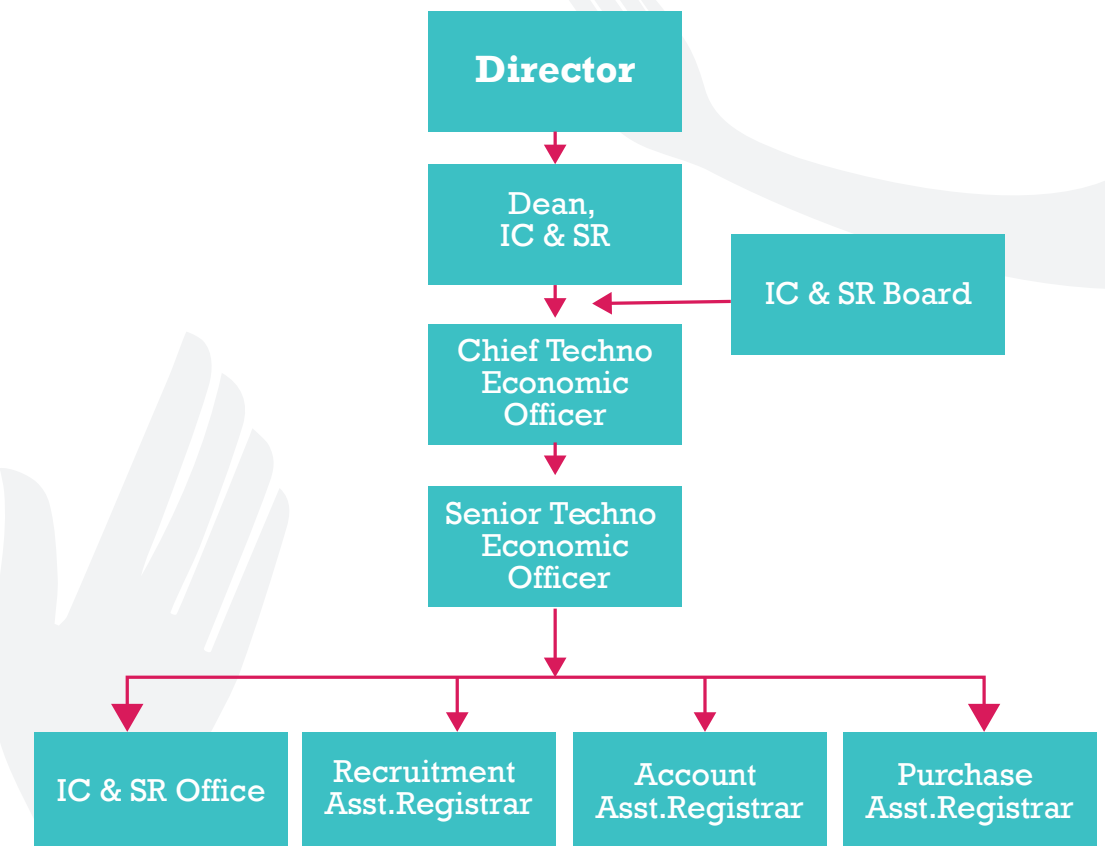
The Institution

IIT- Madras has a well laid framework to carry out these consultancy and sponsored research Programs. The Dean, Industrial Consultancy & Sponsored Research is responsible for implementing the policies framed by a Board, constituted under his Chairmanship. This Board consists of members of the Institute who are active in consultancy and sponsored research Programs. The policy guidelines recommended by the Board is approved by the Director, IIT-Madras and implemented as the rules of the Institute for carrying out projects.

For speedy implementation of the projects, Dean IC & SR has been delegated with various administrative powers and responsibilities. Under the administrative control of the Dean, the office of IC & SR coordinates the various aspects of project administration including maintenance of project accounts, project procurements, recruitment of project staff, maintenance of personnel files and distribution of honorarium to consultants and institute staff. Under the dean there is a Chief Techno Economic Officer (CTEO) who reports to the dean who is further supported by an Assistant/Deputy registrar.

With ISO 9001-2000 certified systems in place, IC & SR facilitates and administers the operation of various Centres of Excellence:

- Centre for Computational Fluid Dynamics (Funded by DST)
- Centre for Finite Element Analysis and Design (Funded by Group of Industries)
- ADI-IITM DSP Learning Centre (Funded by Analog Devices Inc, USA)
- Centre of Excellence in Intelligent Optical Networking (Alumni Funding)
- MIT – Media Lab Asia
- Non-Destructive Evaluation Centre



Industrial Consultancy and Sponsored Research (IC&SR) works closely with industrial houses for a fee to deliver research output that can be commercialised by the latter. The activities are undertaken under three groups:

- Research-based industrial consulting (RBIC)
- Institutional research (IC)
- Retainer research (RC)

Major areas of consultancy offered by the institute are: Foundation Engineering; Design & Analysis of Industrial Structures, Bridges & Offshore structures; Design & Development of Equipments (Mechanical & Electrical) and Manufacturing System; Maintenance Engineering, Vibration, Acoustics & Seismic Studies; Process & Product Development in the areas of Communication, Materials, Chemical & Bio-Medicals; Failure Analysis; Metallurgical & Instrumental Analysis; Software for Industrial Applications; and Modelling & Simulation Studies.

Funding & Financial Management

IC&SR is responsible for maintaining and administering funds generated through the consulting and sponsored research projects undertaken by the various departments and centres at IIT, Madras. The consultancy charges component include apart from cost of materials used; equipment utilization cost, charges for using central facilities, value of stores consumed from IIT, value of items purchased from market, charges paid for using facilities from outside, expenditure towards salaries/wages of staff appointed for the project, charges for subcontracting part of the work, if any, and other expenses like travel etc.

Guidelines have been given to estimate the consultancy charges over which the institute overheads are added for providing infrastructural and administrative facilities. The allocation of overheads towards Corpus Fund, Departments/Centres and IC & SR, for various types of consultancy is given below:

Type	Total	Corpus	Dept. /Centre	IC & SR	Contingency
IC/RC	29%	15%	5%	4%	5%
RBIC	21%	10%	5%	3%	3%

The amount available after expenses in the project is distributed such that 70% goes to the consultant/staff involved in the project as honorarium/remuneration and the 30% goes to the Institute Corpus Fund. If there are no expenses, this works out to 50% of the total value of the project.

The earnings through interactive Programs like consultancy and sponsored research projects are approximately 20% to 25% of the grants received from the Ministry of Human Resource Development for the institute. IIT Madras's total revenue from these funded activities is estimated at INR 15-17 crores annually. Based on the nature of research, the faculty involved gets a share as a percentage of the income.

Fig 1: Value of sponsored projects handled in last 3 years

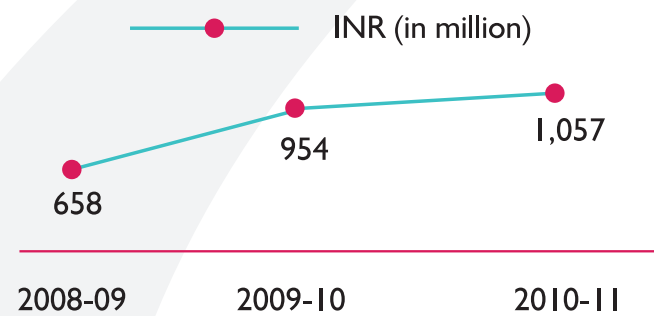
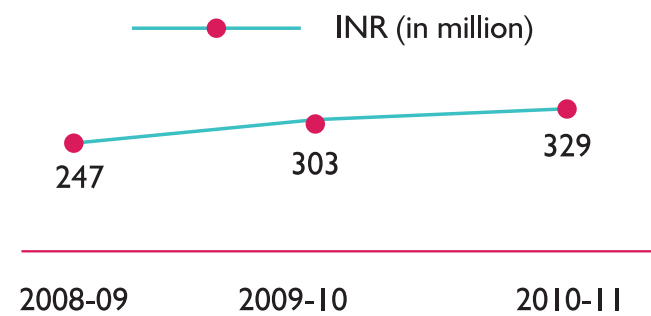


Fig 2: Value of Consultancy projects handled in last 3 years



Currently the centre is working on assignments worth INR~1500 million.

There has been considered growth in revenue coming from sponsored projects in past 3 years. Revenue from consulting projects is also following a rising trend

Resources

Faculty members of the institute are the most valuable resource for the centre. With regards to human resource deployment; on an average around 300-350 faculty members are engaged in consulting projects on a per day basis. The engagement duration ranges from 10 days to several months and years. While most of the activities are carried in-house, some are outsourced to part-time and guest faculty. Students can also work on certain consulting projects subject to certain honorarium.

Institute's laboratories and libraries can be accessed for the projects subject to budget provision for these facilities. The library extends information services through E Journals, CD-ROM, apart from lending of books. Other services offered by library include Photocopying Services from books/journals/documents on payment; Document Procurement Service from foreign sources on payment; Literature Search Service; Linkages through MALIBNET and a network of major libraries through Internet facility.

An exhaustive website on IC & SR activities is present on the campus network. All necessary information such as procedures for applying for projects, running the projects, incentives to the Coordinators with downloadable forms is available on the portal.

Apart from the above mentioned infrastructure, the institute provides administrative support services to carry out project related manpower recruitment, equipment purchase, maintenance of accounts etc. The institute also provides support to IC&SR by monitoring its activities in terms of customer interface and subsequent progress, industry co-operation, and visible research output wide publications.

Operational Model

The Centre for IC & SR facilitates, coordinates and administers Sponsored and Consultancy projects. It also identifies and protects IP Rights and manages transfer of technology and commercialization.

1. Sponsored projects are Research & Development projects funded by Government departments and agencies, industries or other institute with a view to generate new knowledge, to develop new technology or to create new products in nation building. These are long term assignments in emerging areas and in highly specialized fields of science and technology and require considerable amount of studies and research/ development work to be put in by the investigator(s)

Ongoing acclaimed sponsored projects	Value
Establishment of a Nano Functional Materials Technology Center (NFMTC) with Murugappa group and Orchid Chemicals and Pharmaceuticals (Department of Science and Technology)	INR 240 million
National Centre for Catalysis Research	INR 180 million
Smart and Secure Environment (National Technical Research Organization)	INR 80 million
Facility for Spatially Resolved Magnetic Resonance: Methodology Development and Applications to investigation of a Composite Materials & Biological System (Department of Science and Technology)	INR 68 million
National Program in Marine Hydrodynamics (Naval Research Board)	INR 45 million

2. Consultancy projects are for a specific duration where Industries from all sectors avail the expertise and facilities of the Institute in areas of design work, theoretical analysis or experimentation required for generating information and data for the problem solving operations. These assignments are heavily dependent on the existing know-how and expertise of the faculty and available facilities and are mostly related to the application of known technologies. Various avenues for undertaking such projects are:

- **Institutional Consultancy (IC):** These are specific assignments that can be executed readily utilising the professional knowledge and expertise of the faculty and facilities of the Institute. Facilities of the Institute can be utilised for the assignments, but budget provisions must be given in the project for using the facilities. These assignments involve purchase of materials and employment of staff specifically for the consultancy work along with availing of external assistance and subcontracting. Students can be employed in such projects on a part time basis by paying honorarium for their association. In such assignments clients have the first right of the know-how developed as part of the consultancy assignment. If the know-how is transferred to a third party, royalty is to be shared equally between the client and the Institute.
- **Retainer Consultancy (RC):** Under this arrangement, the faculty is consulted for technical advice / guidance on any aspect of interest to the industries concerned for a specific duration. This may be carried out either at the institute or at the premises of the client, but no institute facility can be utilised.
- **Research Based Industrial Consultancy (RBIC):** Assignments which require applied research fall under this category. Under RBIC an industry or a group of industries can jointly sponsor a project of interest to them in an area where they agree to share the know-how generated. These projects have the following features:
 - a. The project proposals are submitted jointly by the faculty and the client.
 - b. All the central facilities of the Institute can be utilised for which financial allocations towards the charges have to be met from the project.

To protect intellectual property rights the institute enters into a Memorandum of Understanding on case-to-case basis while understanding consultancy projects.

As per the existing norms, the first right of the 'know-how' lies with the industry. If the industry concerned does not commercialise the technology, it can be transferred to a third party with the royalty being shared by both the institute and the industry. If the work leads to any patentable inventions, the patent can be taken jointly in the name of the industry and the institute. Publication of technical and non-commercial results can be done with the concurrence of the industry concerned. The institute also ensures to have a strict confidence of the information received by using the data only for the purpose for which it is received and does not divulge to any other industry or agency.

Experience Sharing

Over the years, the centre has progressed in terms of getting renowned and a diversified mix of clients on board ranging from corporates to quasi government; for both sponsored as well as consultancy projects. Among other notable engagements, the Centre is currently working with Nissan's R&D Centre in India (RNTBCI) on an initiative titled 'Nissan Support Program' where 4-5 projects are chosen for funding every year in the area of Engineering, Science, Management, Humanities and Social Sciences with an objective to develop the automobile sector.

Several Technologies developed by IIT-Madras have been transferred to industry for commercialization. These include energy saving devices such as fluid energy mills, high speed drilling machines, grinding wheel abrasives, pre stressed concrete sleepers, super plastic forming of alloys, etc. One of the successful transfers of technology to industry in India and abroad is the Wireless in Local Loop Technology -CorDECT.

Certain innovations which have made a mark would be the wood pulp-based sanitary napkin (branded Relax) is available at INR 2.30 a piece while commercially available products from famous brands cost INR 5 and upwards.

Remote diagnostics like ReMeDi allow doctors sitting in district headquarters to take healthcare delivery mechanisms where even mobile hospitals cannot reach. At the simple tap of a mouse, doctors can see live ECG graphs on their computer screens and hear the heart beat. This kit even allows health workers to measure blood pressure remotely - all of it over regular Internet channels without any broadband. There is even a video conference system on display that works well on low-band width, as low as 16Kbps, while conventional systems expect downlink speeds in the range of 640Kbps to 1.6Mbps.

An attractive feature that attracts researchers and innovators to this centre is the cost of research. Though there is no concrete data available on the same, it is believed that the cost is almost half of what it would be for conducting similar research in private labs. While the centre is doing well with regards to presence of good professors and researchers; one issue the centre is facing is inadequacy of support staff in the form of research assistants to facilitate the emergence of distinct research groups doing sustained research.

Case Study 6

IIT DELHI

The Technology Business Incubation Program

IIT DELHI- TBIU SUCCESS STORY

Why did industry partner with the Institute?

IIT Delhi enjoys a pre-eminent position in the country as being one of the foremost academic institutions. Industry partnered with the Institute to utilise the intellectual and strategic calibre of the faculty, scientists, technicians and students and build and maintain partnerships to facilitate knowledge transfer and economic good

What value did the institute add to industry?

The industry has benefitted from the development and commercialisation of several technological innovations and development of custom tools suited to local needs

What did the institute gain from working with industry?

IIT Delhi benefits from the guidance and mentorship of its industry affiliations. The presence of several industry experts among Board members is crucial for the successful spinouts of entrepreneurial ventures of the TBIU and commercialisation of the Intellectual Property developed.

What does it take to keep this phenomenon successful?

IIT Delhi ensures consistent and collaborative engaging of industry associations and corporate members and also facilitates active participation of its alumni in industry-related projects, research and collaborations.

What can other institutes learn from this case study?

Other institutions should learn that their institutions are not just meant for developing skilled workforce, but understand and appreciate the necessity for translating research into successful entrepreneurship.

Introduction: The Technology Business Incubation Program

The Indian Institute of Technology Delhi lays strong emphasis on continuous and meaningful industry-interaction in the world of science and technology. The Institute has a long standing history of undertaking industrial consultancy projects and has earned credibility in this regard as a center of excellence in the context of nation's socio-economic development. During the past 50 years of its existence, the Institute has not only given due emphasis to investigation of problem of direct relevance to the needs of the country through time bound sponsored and consultancy project aimed at solving live industrial problems, but has also given special attention to emerging areas like atmosphere science, laser application, industrial textiles, biotechnology, energy, transportation, microprocessor application, computer science, optical communication, signal processing, computer aided design & manufacturing, and artificial intelligence and robotics.

The Foundation for Innovation and Technology Transfer (FITT) is the Industrial Interface of IIT Delhi. For more than 20 years now, the FITT has been enabling innovations, business partnerships, R&D initiatives, industrial consultancy, professional development programs and corporate membership to facilitate industry-academia interaction for mutual benefits.

As a part of the ICICI/World Bank Funded Technology Institution Program (TIP) implemented at IIT Delhi, the Institute established a Technology Business Incubation Unit (TBIU) in its campus. This TBIU is operated by the FITT to encourage entrepreneurship based on technological innovation by promoting partnership with new technology entrepreneurs and start-up companies..

The TBIU has been in active operation since the year 2000 and is foremost among the platforms for technology commercialization. As part of the TBIU program, modular space is provided to incubate units for setting up a work station within the Campus for:-

- Promoting interactions with members of academic staff, research scholars of the Departments and Centres of the Institute, and industry experts.
- Incubating novel technology and business ideas into viable commercial ventures.

Key Stakeholders

The current TBIU Board comprises of:

1. Prof. R K Shevgaonkar, Director, IIT Delhi
2. Prof. S N Singh, Dy. Director, IIT Delhi
3. Prof S K Koul, Dy. Director, IIT Delhi
4. Prof Suneet Tuli, Dean (RSI), IIT Delhi
5. Prof Ashok Gupta, Dean (Infrastructure), IIT Delhi
6. Mr Ajay Chowdhry, former Chairman & CEO, HCL Infosystems
7. Mr Rajan Pandhare, Irene Health Care, New Delhi
8. Mr Pradeep Gupta, Cyber Media (I) Ltd
9. Dr Anil Wali, MD, FITT

The TBIU facilitates strategic partnership among the entrepreneur, the Institute (the technological resource in its 13 departments and 10 centres) and the government, the FIs, Venture Capitalists and industry at large.

The TBIU Board comprises select Institute faculty, MD of the FITT and industry experts. Depending on the requirements of the admitted applicants, academic staff, research scholars of the Departments and Centres of the Institute, members of industry associations, students and industry experts & representatives, faculty from premier management schools, etc shall be involved in the incubation Program.

Currently, the following categories of entrepreneurs are eligible for the incubation Program:

- An incubator nursery Program initiated by one or more members of academic staff, students or alumni of one of the Institute or a faculty-student led company.
- A start-up company formed by one or more first generation entrepreneurs.
- R&D division of existing Small & Medium Enterprises (SMEs).

The Institution

The FITT was established as a Registered Society in July 1992. While the responsibility of administration and day-to-day management of the TBIU is vested with the FITT, the TBIU is managed and run by an Institute level Empowered Committee known as the TBIU Board. Apart from select Institute faculty and the Managing Director of FITT, the Board comprises industry experts cutting across various fields.

The Board, as on March 31st 2012, comprised of :

The TBIU Board manages the interface of the TBIU by engaging in finalization of the membership criteria and terms & conditions for the applicants, screening and scrutiny of business proposals submitted for final selection, periodic monitoring of the progress of the members with focus on the technical collaboration with the Institute faculty, sharing of resources, etc.

FITT facilitates marketing of TBIU among potential clients including IITD faculty and scholars, entrepreneurs and high tech industries abroad and in India and disseminates information to industry associations, government departments, financial institutions and Venture Capital Companies etc.

The TBIU leverages on the corporate membership which FITT has with a large number of industry associations and user service organizations. At present, FITT has over 130 corporate members who are regularly apprised of Institute programs and opportunities for strategic collaboration. Some of these organizations include LG Electronics India, Luminous Power Technologies, Danfoss Industries, Canon India, Ester Industries, Bony Polymers, Reliance Industries, Rico Auto Industries, Shriram Polytech, Hero MotoCorp, Tata Chemicals, Tata Industries, Larsen & Toubro, Vardhman Textile, Jubilant Organosys, etc.

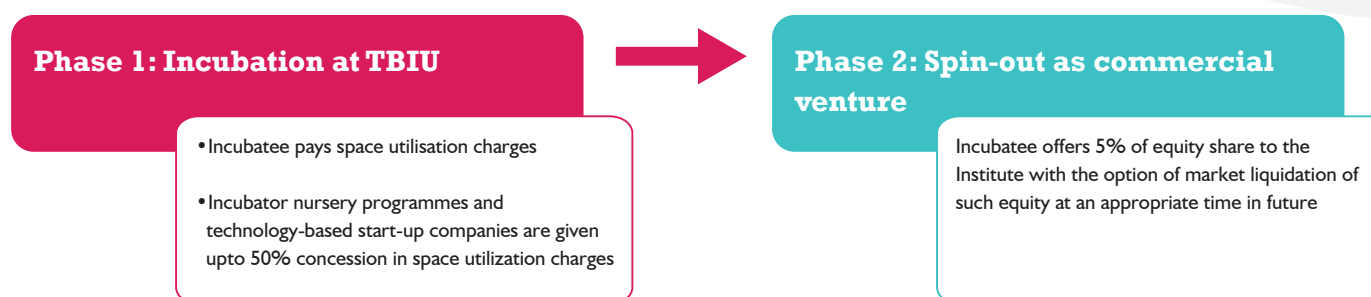
Each applicant approved for membership by the TBIU Board, executes a License Agreement for space utilization with the Institute and a tripartite MOU on synergistic collaboration with the Institute and FITT. The MOU contain provisions to monitor the progress of TBIU residency to ensure that significant collaboration/association with the Institute through the faculty and/or research laboratories/facilities are manifested in the technology incubation of the admitted member.

Funding & Financial Management

The capital cost of physical establishment of TBIU was borne by IIT Delhi, and the costs of repairs and renovation work and establishing and maintaining common facilities are borne by the FITT.

The TBIU Board gives membership of TBIU to promising entrepreneurs who have novel technological ideas and provide partial financial support through the 'Technology Incubation Nursery Fund' which has been created to offer fellowships, research assistance and other financial assistance to entrepreneurs for 6-12 months. Prior to creation of this Fund, the 'FITT Project Promotional Fund' (FPPF) was utilized for the same purpose. Apart from the utilization of 30% retention money from Scientific & Technical Fees payable to faculty experts in industrial consultancies, the FPPF also included contributions made by Industry associations, financial institutions, Department of Science & Technology, Technology Development Board and other big industry houses.

TBIU has a stake in the resident projects/companies incubated in the unit.



All start-ups are expected to identify their own funding sources the only exception being incubator nursery Programs for which the Committee shall consider loan/seed funding for fund shortages during incubation period. The TBIU facilitates the interaction of the resident member units with venture capitalists, PE and fund raisers during corporate events.

The TBIU networks with Investment Companies for equity investment in TBI resident companies during the early stages. A MoU was executed between FITT and M/S Beacon Venture East Global Fund for considering proposals for funding either or both initial seed capital and venture capital to start-ups of faculty-student led TBIU resident companies. Moreover, FITT also facilitated interactions between TBI resident companies and portfolio companies of M/S Beacon Ventures for furthering mutual business interests.

The TBIU also sources funds to support eligible start-ups in meeting fund shortages and working capital. The Department of Information Technology provides grants to the TBIU to support start-ups in ventures addressing IT / IT Enabled services through seed money. The Department of Science & Technology provides grants for seed support to start-ups in technology-based incubation ventures. The Technology Development Board also provides grant assistance to FITT for providing financial support to start-up units incubated at TBIU. FITT ploughs back each year a part of the operational surplus for supporting incubates in obtaining funds for infrastructure/ equipment/ software as well as recurring expenses in the initial stages, particularly for student-faculty promoted start-up companies in technology based ventures.

The Annual Accounts of the FITT is regularly presented along with the Annual Report.

Resources

In addition to subsidized office space, it offers access to IIT library, knowledge resources, faculty and even students, who can be roped in for a project. A faculty mentor and his team are assigned to every project for collaborating and sharing resources and expertise.

Incubation units can avail shared facilities in for conferencing and meetings and business facilities like FAX, photocopying and mail handling. The TBIU also supports and promotes networking with premier management institutes and other incubators for facilitating techno-managerial support in forging business partnerships and entrepreneurship development.

Operational Model

The entrepreneur desirous of establishing an incubation unit at the TBIU is required to submit a proposal to the FITT Board which, after preliminary screening of the business model, forwards it to the Standing Screening Committee comprising of senior faculty scientists and industry experts. The Committee scrutinizes the incubation proposal and the proposed business model for appraisal of feasibility, sustainability and synergy with the Institute.

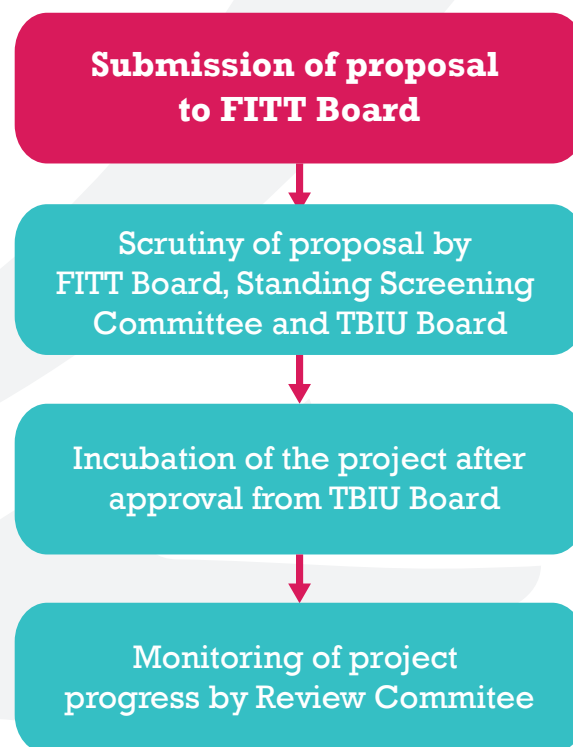
Following the Standing Screening Committee's approval, the proposal is forwarded to the TBIU Board. After the TBIU Board's approval, the proposal goes live.

Preference is given to applicants who have previous records of interaction with IITD or other premium academic institutions, applicant who wish to develop a technology transferred from IITD and also have plans for long term collaboration with the faculty/departments/centres of IITD.

After the project goes live, a Review Committee is constituted to monitor its progress. The Committee tracks the progress in terms of the commitments/milestones mentioned in the business plan which was submitted to the Screening Committee, the value-add to the Institute in terms of number of students placed as interns and faculty learning & exposure, any change in governance/ethical standards of the company, etc.

Residency period is normally for two years, extendable by another year in special cases, depending on progress of incubation. The TBIU facilitates product development, product innovations, software testing, simulation and prototyping, pilot experimentation, training and similar other technology related work. Routine sales and marketing operations are not permitted from the TBIU. However, the entrepreneurs can consult with faculty and industry experts to gain insights into specific product/ concept commercialisation.

The Intellectual Property Rights are usually owned by the start-up. However, if the idea or innovation has been conceived by the faculty of IIT D, then the IPR rests with FIIT and the license to use it shall be provided to the start-up.



Experience Sharing

The TBIU has been instrumental in helping start-up companies in their scale up and commercial operations. It has contributed significantly towards encouraging and supporting technologists and scientists to convert their novel products, processes and technologies into sound commercial ventures.

In the first five years of operation of the TBIU, there were 6 resident technology start-up companies out of 14 units admitted. The initial successful spin-outs included INRM Consultants incubating GIS based Integrated Watershed Management, Kritikal Solutions based on Computer Vision and Image Processing, Virtual-Wire Technologies based on Wireless Communication, Sanmotech Labs promoting the development of new macrocyclic metacyclophane (MMC) molecules for innovative applications for industry and Mechartes Researchers promoting software products for simulation of product development in auto component industry.

The FITT Annual Report 2011-12 mentions that, as on March 2012, there were 12 technology start-up companies resident at the TBIU out of the 37 units admitted since the launch of the program. The following start-ups have been resident at TBIU during 2011-12:-

Sl. No:	Name of start-up company	Technology/Product/Process in incubation	Department of IIT Delhi involved
1	Advantage Organic Naturals Technologies Pvt Ltd	Embedding garments with natural dyes with medicinal properties	Various
2	Gram Vaani Community Media Pvt Ltd	Transmission box for community radio broadcast	CSE
3	Innovative Transport Solutions Pvt Ltd	Innovative scientific solutions for traffic and transport systems	TRIPP
4	Global Motortech Pvt Ltd	Technologies for motor design and analysis software	DEE
5	Faros Technologies Pvt Ltd	Similar subcomponents, simulators and simulations services	DME
6	Yonyx Technologies Pvt Ltd	Business support solutions	CSE
7	Innovative Mechatronik Solutions Pvt Ltd	Micromachining systems, finishing process and mechatronic embedded systems	DME
8	Simplyfy Softwares Pvt Ltd	Analysis and sharing of information from bio pharmaceutical processes	Chemical Engineering
9	Shalya Medical Technologies Pvt Ltd	Product development and process development of medical implants	Mechanical Engineering
10	Genesis Location Services Pvt Ltd	Location based products and services	DEE
11	Novo Informatics Pvt Ltd	Novo-genomics, Novo-proteomics, Geno-analyzer and Disease-specific database	SCFBio

Approximately 50% of the resident units have become successful commercial ventures. Prominent among these are VirtualWire Technologies, Kritikal Solutions, EnNatura and MeChartes. Virtual-Wire Technologies Pvt Ltd., a company that operates in the area of wireless data was incubated at IIT-Delhi and received funding around 10 months back for the research and development of its so called 'ultrawide bandchip' for short-range wireless applications and personal computers and laptops, from the Council of Scientific and Industrial Research (CSIR) under its New Millenium Indian Technology Leadership Initiative, or NMIT-LI. The total cost of the project was INR.15 crore, and CSIR funded less than half of that amount. The TBIU helped the company to benefit from three government schemes; CSIR's 'Support International Patent Protection in Electronics' scheme, the IT (SIP-EIT) scheme and the financial assistance provided by the Technology Development Board (TDB) which is a statutory body under the Department of Science and Technology.

Founded in 2002, KritiKal was the first student-led startup from IIT Delhi. It is a technology design house creating technologies and products which hone applications and services, Security & Surveillance, Telecom & Networks, Traffic & Transportation, Imaging & Video and Banking. Through its associations with IIT Delhi, other IITs, IIIT-Hyderabad and IIM Ahmedabad, it continues to absorb faculty research to create technology IP and motivating talents to do technically challenging work. Some of the start-ups have not taken off successfully because of several factors like improper business models, technology being ahead of time and unforeseen circumstances like early withdrawal by the promoter.

Case Study 7 IIT MADRAS

Madras-Research Park

KEY HIGHLIGHTS OF IIT MADRAS- RESEARCH PARK (IITMRP)

Why did industry partner with the Institute?

IITMRP promotes a collaborative relationship between the clients and the institute promoting them to set up a base in the park. It provides high quality infrastructure for companies to set up an R&D base. Industry gets the opportunity to tap into the research wealth of one of the leading technological institutions in the country as IITMRP enables the industry to leverage the specialized expertise of the faculty, research scholars, students and utilize their research facilities.

What value did the institute add to industry?

IITMRP adds value by creating a technologically fertile environment to encourage and enable R & D activities which are aligned to potential needs of the industry and thereby avoiding brain drain, providing ample opportunities to the students pursuing higher education and R&D activities available at the Research Park

What did the institute gain from working with industry?

IITMRP helps the institute work towards its goal of bringing together three distinct entities — industry with its knowledge of the market, faculty members with their domain expertise and students with their ability to be highly creative; for mutual benefits of the stakeholders as well as the society at large

What does it take to keep this phenomenon successful?

Access to world class infrastructural facilities and a dedicated space on minimal monthly charges along with an opportunity for the companies to actively collaborate with the institute on a sustained basis is the mantra for success.

What can other institutes learn from this case study?

Effective leverage their available resources towards creation of advancements in R&D and Innovation.

The Imperative of Industry Academia Interaction

- The pace of technological change has been rapid
- Significant innovations come from synergies than from lonely geniuses
- It is important to innovate smartly
- The key is to reduce innovation cycle time and increase success rate
- External knowledge sourcing can increase a company's innovativeness
- Open Innovation has proved to be a more successful model.
- Strategies such as partnerships, joint ventures, license agreements are the way forward
- At the core of technology transfer lies the academia – industry interaction

Successful Industry - Academia Interaction- Wold Over

Companies started by academic researchers are tools of technology and knowledge transfer.

Network Systems Industry

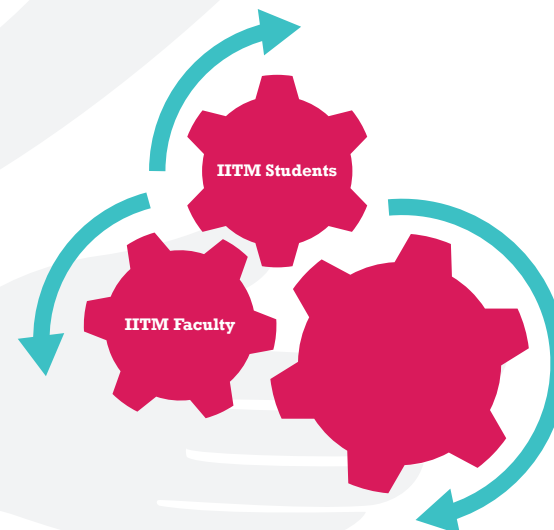
- CISCO Systems
- Amati Communications
- Growth Networks
- Transportation and Logistics CPLEX Optimization
- CAPS Logistics
- 35% of Proctor & Gamble's new products are based on inputs from external sources
- Corporate research entities such as Bell Labs, IBM and Xerox are changing due to, Highly mobile scientific skilled workers
- High tech start ups
- Successful corporate research labs at the Universities
- For ex: Microsoft and Cisco do very little basic research but mastered open innovation
- The flow of ideas from an external source (Academia) is determining success

The Golden Triad® - Catalyzing Innovation

IITMRP has been initiated with a mission to create a Knowledge and Innovation Ecosystem through collaboration between the industry and academia to enable, encourage and develop cutting edge technology and innovation that exceeds global standards.

Incorporated under Section 25 of 'Companies Act' in 2007 with an aim to facilitate the promotion of research and development; the research park works on following key principles:

- Creating a collaborative environment between industry and academia;
- Developing a self-sustaining and technologically fertile environment;
- Encouraging and enabling the alignment of R & D activities to potential needs of the industry;
- Enabling development of high quality personnel and motivating researchers within organizations;
- Aiding technology and business skills sharing between the university and industry tenants



Innovations thrive when faculty, students and experienced industry personnel interact in a formal / informal atmosphere

Key Stakeholders

IITMRP works on the principle of bringing together the golden triad of industry personnel, faculty and students working together to give them a higher probability of successful innovation. The key stakeholders are:

- Patrons & Partners: DRDO, BHEL, Healthcare Technology Innovation Centre, Tata Consultancy Services; Ernet India, Cognizant Technology Solutions India Private Ltd.; ARCI; AMADA Soft India; Caterpillar, Maveric Systems; The Centre of Excellence in Wireless Technology (CEWiT); NMS Works Software; Telecom Centre of Excellence; Yalamanchili; Net Access (India) Private Limited; Tata Elxsi Limited; Villgro; Parthys Reverse Informatics; XMOS Semiconductor India Pvt. Ltd; Sconce Solutions; Everest Edusys and Solutions Pvt Ltd.; Powergear; Forbes Marshall; Titan Innovation Centre, Numeric Power, IFMR Trust, Renault Nissan, CGN, Tata Communications, Sasken Communication Technologies, Indix Internet, De Espat Pvt Ltd, Sagezza India Pvt Ltd, Guidanz Systems, Trivitron Innovation Centre.
- Incubator and Incubatees: Rural Technology and Business Incubator (RTBI); Uniphore Software Systems (Uniphore); Invention Labs; DesiCrew Solutions; ROPE; Dhvani R&D solutions Pvt. Ltd.; Myeasydocs.com; Aaum Research and Analytics Private Limited (Aaum); GyanData Pvt. Ltd, Rope India Pvt Ltd, Santa Fe Partners, EMPCR

The Institution

- IIT Madras Research Park is an independent company promoted by IIT Madras and its alumni and was incorporated under Section 25 of the Companies Act 1956.
- The Chief Operating Officer at IITMRP spearheads the operations of the Research Park and focuses on the R & D clients to understand their expectations to facilitate research interaction with IITM. The Board of Directors comprises Professors from the Institute, government officials and industry experts from organizations of international repute.

Resources

- The IIT MRP is a world-class facility with a built-up space of 1.2 million sq. ft.
- The First tower with 0.5 million sq.ft. Started functioning from March 2010.
- Typical floor plate of 36,000 sq.ft, partitioned for 1 to 8 tenants
- Incubation Area in First floor
- Prime location in Chennai on the IT Corridor, Easy access to International/Domestic airports and adjacent to IIT Madras.
- Green building features with climate-responsive design
- Internationally recognized safety standards
- Amenities like food court, ATMs and a restaurant as part of the complex
- 100% Power back-up and centralized air conditioning and provision for fiber optic connectivity
- Transit accommodation

Institute's laboratories and libraries can be accessed for the projects subject to budget provision for these facilities. The library extends information services through E Journals, CD-ROM, apart from lending of books. Other services offered by library include Photocopying Services from books/journals/documents on payment; Document Procurement Service from foreign sources on payment; Literature Search Service; Linkages through MALIB-NET and a network of major libraries through Internet facility.

The current Board of Directors of IITM Research Park comprises:

1. Prof. Bhaskar Ramamurthi, Director, IIT Madras
2. Ashok Jhunjhunwala, Faculty-In-Charge
3. Prof. Krishnan Balasubramaniam, Dean, IC&SR
4. Thiru N.S. Palaniappan IAS, Industries Secretary, Govt of Tamil Nadu
5. Thiru Rajeev Ranjan IAS, Revenue Secretary, Govt of Tamil Nadu
6. Thiru S.K. Prabakar IAS, Secretary, Govt of Tamil Nadu
7. Mr. S. Gopalakrishnan, CEO and MD, Infosys Technologies Ltd.
8. Mr. B.Muthuraman, MD, Tata Steel
9. Dr. V.Sumantran, Executive VC, Hinduja Automotive Ltd
10. Mr. B. Santhanam, MD, Saint Gobain Glass India
11. Mr. Viji Santhanam, Chairman, Sundaram Finance Limited.
12. Dr. Pawan Goenka, President- Automotive Sector, Mahindra & Mahindra
13. Sunil Wadhvani, Chairman and Co-Founder, iGATE Corporation
14. Mr. Girish Venkat Reddy, CEO, Managing Partner, Founding Partner, and Director, Prisma Capital Partners LP

Funding and Operating Model

IIT Madras Research Park is an independent company promoted and funded by IIT Madras and its alumni. It was incorporated under Section 25 of the Companies Act 1956. The Park aims to facilitate a collaborative relationship between its clients and IIT Madras where clients can have the opportunity to leverage the specialized expertise of IIT Madras faculty, utilize their research facilities, while providing part time employment and experience to the students. Mentioned below are some prominent companies/ incubatees that are leveraging IITM Research Park services and infrastructure:

Companies/ clients of IITM Research Park

Activities performed

DRDO	DRDO has the following departments collaborating with IIT Madras: Centre for AirBorne Systems, DRDO, Bangalore. TBRL, GTRE, Radiation Effects of Fireballs from Rocket Explosion, Collaborating Organization: ITR (DRDO), Chandipur, Orissa, DRDL Hyd , Vehicles Research and Development Establishment (VRDE) etc
Centre of Excellence in Wireless Technology (CEWiT)	CEWiT is a public private initiative, striving to make India a leader in research, development and deployment of wireless technology. CEWiT believes that the broadband wireless technology may expand rapidly if its performance is good and cost effective. As research on wireless technology is moving from the third to fourth generation, CEWiT seeks to enact a proactive role in assisting public institutions in policy making, spectrum management, and regulation and be a force multiplier for Indian wireless industry. Key Areas of Research <ul style="list-style-type: none"> • Indigenous wireless technologies • Broadband wireless technologies
Tata Consultancy Services (TCS)	TCS has its own research and development wing known as the innovation labs. TCS plans to showcase its innovations and the state of the art technologies to clients, partners and among the student community with an idea to add features that were not originally envisaged. The broad area of interests would be sensor networks, semantic web, web 2.0, software tools etc
Cognizant Technology Solutions India Private Ltd.	At IIT Madras Research Park, Cognizant plans to take up research activities in areas such as virtualization, machine learning, bots, semantic web and text mining as they are decisive in managing and utilizing computing resources and unstructured digital assets
AMADA Soft India	AMADA from Japan has identified IITM as its innovative partner to bring about innovative engineering solutions
Tata Elxsi	The Tata Elxsi center at the IITMRP is actively engaged in the research, development and deployment of next-generation technology and products in the broadcast and communications industries. The center includes state-of-the-art labs and a culture of high innovation and R&D, focused on developing and delivering technology solutions and products for the connected world
Uniphore Software Systems (Uniphore)	Uniphore was formed with incubation support from IITM's Rural Technology and Business Incubator (RTBI) with an aim to redefine the way information is accessed today. Uniphore is doing in-depth research to understand the dynamics of information needs, linguistic modeling, impact creation, demand of information etc. for rural India and is creating value by developing innovative applications on its patent pending VoiceNet system.
Invention Labs	Invention Labs is being incubated by IIT Madras' Rural Technology and Business Incubator (RTBI) and is funded by RTBI to pursue its product development activities. Invention Labs provides product design services for businesses, which are looking for innovative solutions to their needs.
Invention Labs	Invention Labs is being incubated by IIT Madras' Rural Technology and Business Incubator (RTBI) and is funded by RTBI to pursue its product development activities. Invention Labs provides product design services for businesses, which are looking for innovative solutions to their needs.
Aaum Research and Analytics Private Limited	Aaum Research and Analytics Private Limited (AAUM) are founded by IIT Madras alumni and consist of IITM Professors and industrial veterans as board of advisors. AAUM offers management consulting services in three specific lines of business

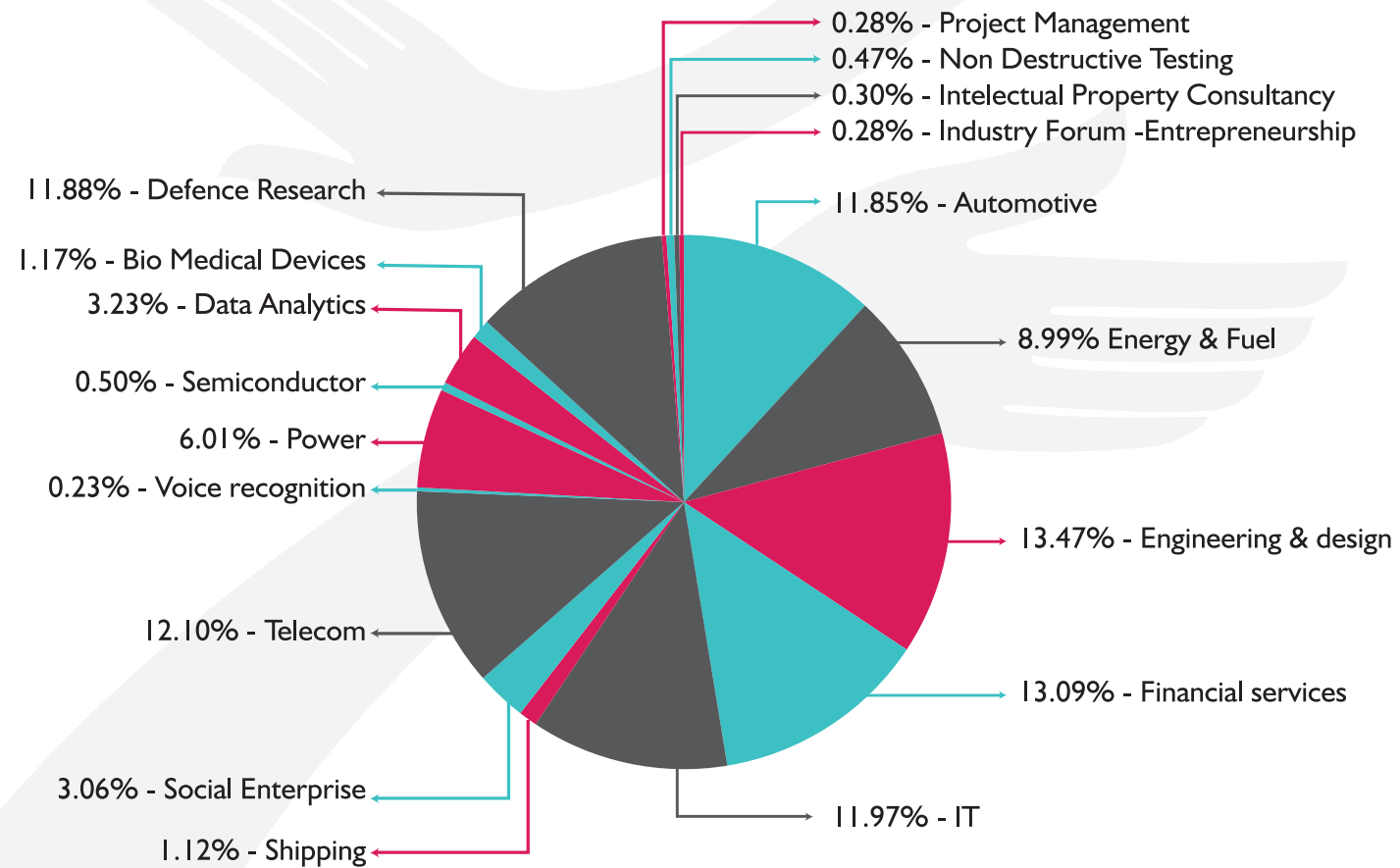
The Research Park helps the industry to create, integrate, and apply advancements in knowledge. The resulting synergy leads to technological innovation and transfer. At the park, space is allocated to companies/ clients on rates as decided by IIT Madras Research Park and monthly maintenance charges based on actuals. An incubated company/ start ups may be charged differently. Any company desirous of establishing an incubation unit at the IITM Research Park is required to submit an R&D proposal detailing proposed activity at Research Park. The proposal is reviewed and approved by a screening committee post which there is feasibility check done on the company's structural requirements for its facility at the research park. Post that, if all criteria are met there is an agreement signed between the two parties and facilities are provided for the commencement of work.

Post commencing its operations, the company/ client is required to actively collaborate with IIT Madras on a sustained basis throughout their tenancy at the Research Park, thus ensuring that the benefit of being in such an ecosystem is leveraged. There are multiple ways in which a company could engage with IIT and each of these would earn a certain number of credit points calculated based on a proprietary credit system developed and used by IIT Madras to measure the extent of every collaboration. Credit is an acronym for Collaboration in Research and Engagement with Departments in IIT Madras. Success is premised upon adequate engagement between the companies and IIT Madras. The Credit system ensures that the necessary levels of engagement continue on a sustained basis to ensure the companies benefit out of the ecosystem. Hence each company has to earn a certain minimum number of Credits each year depending on the space occupied.

The Credit Point System is as follows:

Activity	Credits*
R&D projects to Industrial Consultancy & Sponsored Research IC & SR (credits per Rs 10 Lakhs)	200
Consultancy to Industrial Consultancy & Sponsored Research , IC & SR (credits per Rs 10 Lakhs)	200
Royalty (credits per Rs 100k)	100
Sponsored Ph.D Students	100 per year
Sponsored M.S Students	75 per year
Adjunct faculty	200 per year
Teaching by Industry Personnel	2 per hour
Joint Ph.D guidance	100 per year
M.S/M.Tech guidance (per student)	75
B.Tech guidance (per student)	50
Part time employment for B.Tech students	2.5 per month
Part time employment for MS/Ph.D students	5 per month

IIT Madras Research Park is aimed at promoting research and development in partnership with the industry, nurturing innovation. While IIT Madras Research Park is modeled along the lines of successful research parks elsewhere in the world, it has a larger agenda that focuses not just on incubation efforts but also on propelling successful innovation in established R&D focused companies. Strategically, IIT Madras Research Park has chosen to bring in a diverse set of companies straddling multiple domains, so that there is adequate interaction with as many of the 16 departments in IIT as possible.



The Best External Sources of Knowledge are the Universities that can be Engaged

- To employ student and faculty talents on part time basis
- Research consultancy for faculty
- Joint research projects, bidding for research grants
- Technology based spin-off companies
- Transfer of technology from academic research to industry

Experience Sharing

The incubation space at IITMRP is hugely sought-after by start-ups, not merely because of the quality of infrastructure but also because it is a congregation point for entrepreneurs and industry folk alike and helps in building some strong networks.

Among others, Rural Technology Business Incubator (RTBI) is one of the most successful initiatives of the IITMRP. It is one of the very few incubation centres that are focussed on the rural areas. The RTBI group works on principles of using technology to tackle the problems and requirements of the rural areas. Presently RTBI has 14 companies, six of them have graduated in that they have obtained funding from outside which is a huge milestone.

In December 2012, Saint-Gobain, the world leader in the habitat and construction market and IIT Madras Research Park (IITM RP) jointly launched Saint-Gobain Global Research Centre in India. SGRI works for all of the Saint-Gobain's industrial activities and will drive initiatives to develop sustainable habitat solutions for the region in the form of transversal programs such as energy solutions for hot climates, energy efficiency in buildings, affordable mass housing, etc. AMADA has partnered with the IIT Madras Research Park to bring about innovative engineering solutions in the CAD/ CAM domain.

NMS Networks collaborated with the Research Park to develop distinct and comprehensive software solutions in Network, Services and Business Layers across a spectrum of communication networks - Wireline, Wireless, Next Generation and IP Networks.

