



Department of Science & Technology  
Govt. of India



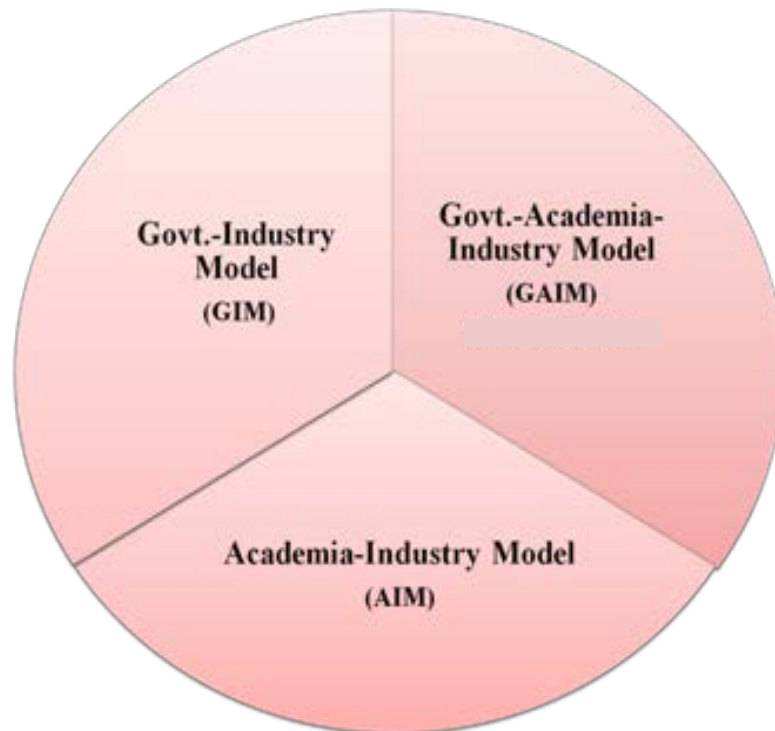
## DST-Centre for Policy Research at PU, Chd.

(DST/PRC/CPR-03/2013)

### **REPORT-2**

(May, 2015-Aug., 2016)

## *Existing Models of R&D under Public Private Partnership (PPP) Mode*



## CONTENTS

<b>Title</b>	<b>Page No</b>
<b>1. Introduction</b>	<b>1-3</b>
<b>2. Government-Industry Model (GIM)</b>	<b>4-17</b>
A. Research Institutes (Public and Private)	4-13
➤ Indian Plywood Industries Research and Training Institute (IPIRTI)	4-8
➤ Automotive Research Association of India (ARAI), Pune	8-13
B. Industry Oriented Programmes of Funding Agencies	13-14
C. Incentivization of Private Sector by DSIR	15-17
<b>3. Industry-Academia Model (AIM)</b>	<b>18-21</b>
A. Industrial Set ups in Academic Sector	18-19
B. Scholarships/Fellowships/Chairs	19-20
C. Industry Supported I-A Cells	21
<b>4. Government-Academia-Industry Initiatives</b>	<b>22-34</b>
A. Autonomous Academic Institutions	22-23
➤ Bombay College of Pharmacy (BCP)	22-23
➤ Institute of Chemical Technology (ICT, Mumbai)	23
B. Dedicated Agencies	23-25
C. Programmes of Funding Agencies	26-27
D. Government Initiatives	27-34
<b>5. Summary</b>	<b>71-74</b>
<b>6. Annexures</b>	<b>38-76</b>

## **Introduction**

In this era of competitiveness, national economic growth needs to compete with rest of the world by means of creating strong and powerful national innovation system. A robust innovation system is essential for wealth creation, economic and societal development of the country. Since the beginning of the 21<sup>st</sup> century, the emphasis of the Indian government has been to develop national infrastructure under PPP mode. The emergence of India as a major global economic power calls for high levels of technological freedom but unfortunately the growth of technology has remained disunited and unlinked. This is due to the fact that the R&D activities of both the public and the private sector have remained disconnected from each other thereby creating a large gap in technology development and technology deployment. Synergies between academic basic research and industrial applied research have to be established to generate mutual added worth. To achieve this synergy it is imperative to create a PPP framework engaging both the public and the private sectors leading to multivariate use of knowledge, innovations, technologies and value creation of R&D activities. Government of India has instituted various R&D schemes at national level to promote innovations leading to technology development and utilization. But on the other hand, private sector role in R&D has remained superficial. Government is making continuous efforts for adoption of Public Private Partnership (PPP) by launching various innovation and technology development support programmes. Government efforts have catalyzed creation of robust interface between public owned research and academic institution and industry. Indian private sector needs to be incentivized to invest in R&D activities. In present Indian scenario, public funded research institutes and higher educational institutes are skewed towards basic and fundamental research rather than applied research. To attract the industry to drive PPP in R&D domain, research should be equally focussed for fundamental and applied areas. Innovations result of Industry-Academia interface can lead to knowledge creativity and productivity that will lead to socio-economic benefits.

In this decade of innovation (2010-20), government's thrust relies on PPPs to foster innovative ecosystem in India and PPPs are acting as one of the effective measures for industry to contribute to national innovation system. Keeping in mind the importance of PPPs in R&D, it is imperative to study existing models of PPP in R&D and associated PPP programmes of government funding agencies to present a successful examples of R&D under

PPP that can be replicated and promoted at different levels such as state and central universities, public owned research institutes and government funding agencies.

In the present chapter, detail overview of existing PPP models for promoting R&D activities is presented. Figure 1 presently the overlay of the chapter. Under each category, existing PPP mechanisms are elaborated. PPP models are discussed under three categories which are:

- Government-Industry Model (GIM)
- Academia-Industry Model (AIM)
- Government-Academia-Industry Model (GAIM)

# Existing PPP Models of R&D in India

## 1. Government-Industry Model (GIM)

- A. Autonomous Institutes
- B. Industry Oriented Programmes of Funding Agencies
- C. Incentivization of Private Sector by DSIR

## 2. Academia-Industry Model (AIM)

- A. Industrial Set Ups in Academic Sector
- B. Scholarships/Fellowships/ Industrial Chairs/ Scientist Specific
- C. Industry Supported I-A Cells

## 3. Government-Academia-Industry Model (GAIM)

*Triple Helix Model*

- A. Autonomous Academic
- B. Creation of Dedicated Agencies
- C. Government Funding Schemes/Programmes and Government Initiatives

# Existing PPP Models of R&D in India

## 2. Government-Industry Model (GIM)

B. Autonomous Institutes

B. Industry Oriented Programmes of Funding Agencies

C. Incentivization of Private Sector by DSIR

## 2. Academia-Industry Model (AIM)

B. Industrial Set Ups in Academic Sector

B. Scholarships/Fellowships/ Industrial Chairs/ Scientist Specific

C. Industry Supported I-A Cells

## 3. Government-Academia-Industry Model (GAIM)

*Triple Helix Model*

B. Creation of Dedicated Agencies

C. Government Funding Schemes/Programmes and Government Initiatives

# 1. Government-Industry Model (GIM)

## A. Research Institutes (Public and Private)

- **Research Institutes Established by Government and Industrial Sector**

First category focuses on PPP models instituted by government and industry together leading to initiation of industry oriented research institutes, such as Indian Plywood Industries Research and Training Institute (IPIRTI); Bengaluru ([www.ipirti.gov.in](http://www.ipirti.gov.in)) and Automotive Research Association of India (ARAI), Pune ([www.araiindia.com](http://www.araiindia.com)) which are discussed in the coming sections. These institutes were established by Government with an aim to provide technological support to industries and are now working in close association with industrial associations.

- (i) **Indian Plywood Industries Research and Training Institute (IPIRTI); Bengaluru; [www.ipirti.gov.in](http://www.ipirti.gov.in)**

IPIRTI is an autonomous body established in 1962, under the Ministry of Environment, Forests and Climate Change (MoEFCC), GoI. The Institute is a co-operative research association of the Plywood Industry and the Council of Scientific and Industrial Research (CSIR), and has evolved into a dynamic and creative organization dedicated in developing new environment friendly technologies for wood based industry. IPIRTI has been closely associated with the development of wood panel industry in the country and is also instrumental in its growth from its infant stage to the technical competence for producing high level of plywood. It has become industry driven organization. IPIRTI formulates projects based on the needs of the plywood industries. Funding support for projects is provided by various industries, national agencies like DST, NRDC, Bureau of Indian Standards (BIS), Building Materials and Technology Promotion Council (BMTPC) and international agencies like *International Tropical Timber Organization* (ITTO), International network for Bamboo and Rattan (INBAR), Department for International Development (DFID)/Timber Research and Development Association (TRADA). It has established field station/centre in Kolkata in year 1963 and Mohali in 2008 to meet the needs of industry in these regions.

IPIRTI is working with a mandate of carrying out a) R&D activities; b) education and training; c) testing and standardization services and d) extension services such as technical

consultancy to academia and industries in field of wood and panel products such as lignocelluloses and agro residues. IPIRTI is recognized by BIS for testing and licensing/certification programme of wood and related products. IPIRTI has created a notable intellectual property profile. IPIRTI is credited with 5 granted patents and 9 filed patents (Table 1). It has carried out 28 in house projects, 13 sponsored projects and 3 consultancy projects. It has successfully transferred 18 technologies to various organizations (Table 2).

**Table 1: List of Patents Granted to IPIRTI and Filed by IPIRTI**

S. No.	Title	Status
1.	Development of Matchstick from Bamboo	Granted
2.	Bamboo Mat Corrugated Roofing Sheets	Granted
3.	Nn improved process for the preparation of water impermissible resins	Granted
4.	Improvements in relating to a process for making composite boards from rice husk	Granted
5.	An adhesive based on natural polyphenols	Granted
6.	Earthquake resistant Bamboo Housing System	Filed
7.	Improved method of manufacture of Bamboo Mat Board [BMB], and Bamboo Mat Veneer Composite [BMVC]	Filed
8.	Method of manufacture of Bamboo Mat Trays and Coir trays	Filed
9.	A process for manufacture of Cardanol Phenol Formaldehyde Resin	Filed
10.	Development of mechanized E-Tester	Filed
11.	Compregs from Bamboo Mats/Veneers of Plantation Timber or a combination and a process for the preparation thereof	Filed
12.	A process for the manufacture of Bamboo mat moulded skin board doors from Bamboo mats	Filed
13.	A process for the manufacture of Bamboo mat Ridge Cap roofing with Bamboo Mat Corrugated Sheets	Filed
14.	A process for gluing preservative treated veneer with improved Phenol Formaldehyde Resin	Filed

**Table 2: Technologies Transferred from IPIRTI**

S. No.	Technology	Transferred to
<b>Industries</b>		
1.	Development of 50mm Compreg using Gurjan species	Indeustch International, Noida
2.	Manufacture of High Density Bamboo Mat Board	Divine Industries, Maharastra
3.	Manufacture of Bamboo Mat Corrugated Sheet	Brahmaputra Forest Industries, Lakhimpur, Assam



4.	Instru-ments for Peeling Lathe adjust-ments	Kalyan Industries, Haryana
5.	Finger Jointing Machine	Lakshmi Industries, Ahmedabad
6.	Light coloured PF	Shivhari Plywood, Nanital
7.	Shuttering grade plywood	TATA Coffee Ltd., Mysore
8.	Bamboo technology (BMT)	Natura Pvt. Ltd., Bangalore
9.	Bamboo technology (BMB and BMCS)	Timpack Pvt. Ltd., Meghalaya
10.	Bamboo technology (BMB)	Supernatural Plywood, Chandapur
11.	Bamboo technology (BMB & BMVC)	Cosmicraft Industries, Meghalaya
<b>Government organizations</b>		
12.	Bamboo technology (BMB & BMVC)	Kerala State Bamboo Corpn. Angamally, Kerala
13.	Bamboo technology (BMB)	Gramvikas, Berhmapur
14.	Bamboo technology (BMT)	BAIF, Pune
15.	Coir Tray	Coir Board, Bangalore
16.	Pine Needle Particle Board	Himachal Pradesh Forest Development Corpn. H.P.
17.	Establishment of Bamboo Composite Centre	Rain Forest Research Institute, Jorhat, Assam
<b>International</b>		
18.	Manufacture of Bamboo Mat Corrugated Sheet	Habitat for Humanity International, Nepal

Till date major technological achievements of the Institute are listed below:

- Development of processes for various resin systems
- Development of layered composites
- Development of Non-wood products
- Development in Solid Wood Products
- Protection and Enhancement of service life of wood and panel products
- Development of instruments, accessories and equipments

Moreover, for proper functioning of IPIRTI in terms of its IP profile, it has designed set of rules and regulations for IPR, technology transfer and consultancy ([http://ipirti.gov.in/Rule\\_for\\_%20Patenting.pdf](http://ipirti.gov.in/Rule_for_%20Patenting.pdf)).

IPIRTI has also started various academic programmes in association with government agencies and industries to provide education and training in field of wood and panel industry. Various courses instituted in year 2014-15 are presented in table 3.

**Table 3: Short Term Courses Conducted by IPIRTI in 2014-15**

S. No.	Name of the course	Duration and no. of candidates	Sponsored by
<b>IPIRTI, Bangalore</b>			
1.	The Post Graduate Diploma Course in Wood and Panel Products Technology	1 year, 25	IPIRTI
2.	Plywood Manufacturing Technology-II	5 days, 9	Plywood industry
3.	Testing of plywood and block boards as per international standards	5 days, 1	Plywood industry
4.	IFS Training Course: Contribution of forests plantation in livelihood support and industrial production	2 days, 10	MoEF&CC, RT Division, New Delhi
5.	Special Training: Sawmilling & Saw-doctoring and Wood working and wood finishing	10 days, 8	Kannur University
6.	International Nepal's Training course: Plywood Manufacturing Technology-I	3 days, 3	Ganpati & Shikhar Plywood, Nepal
7.	International Nepal's Training course: Plywood Manufacturing Technology-II	3 days, 3	Ganpati & Shikhar Plywood, Nepal
8.	IPIRTI-NID Bamboo Training	4 days, 45	IPIRTI & NID, Bangalore
<b>IPIRTI Field Station, Kolkata</b>			
9.	Plywood manufacturing Technology	1 month, 7	Plywood industry
10.	Low cost and special Resin for manufacture of plywood	4 days, 6	Plywood industry
11.	Testing of Plywood Block board and Flush Door	4 days, 8	Plywood industry
12.	Plywood Manufacturing Technology	1 month, 5	Plywood industry
<b>IPIRTI Centre, Mohali</b>			
13.	Testing of block board and flush door As per IS: 1659 & IS:2202 and Resin manufacturing conventional PF & UF resin	10 days, 1	Plywood industry

Source: IPIRTI Annual Report (2014-15)

IPIRTI is the only institute in India dealing with wood and panel industry. There are number of member industries of IPIRTI who are availing services offered by IPIRTI as mentioned in table 4.

**Table 4: IPIRTI Services to its Member Industries**

S. No.	Service
1.	Providing trained man power industries through one year post graduate diploma course and different short term vocational training course sponsored by industries and MoEFCC.
2.	Providing solutions to common problems of the industries and their needs through regional workshops/meetings.
3.	Extending technical support services related to processing and production of plywood
4.	Formulating specifications for the new products developed by the industry and issue of draft amendments to existing standards.

*Source: www.ipirti.gov.in*

Till date, sixty eight industries have attained IPIRTI membership. Some of the notable member industries are:

ARCL Organics Ltd., Kolkata; Aditya Industries., Navsari; Century Plyboards ( I ) Ltd., West Bengal; Fine Wood Products Pvt. Ltd., Tamil Nadu; Greenply Industries Ltd., West Bengal; Hero Plywoods & Boards, Kerala; Indian Timber Products (P) Ltd., Hyderabad; The Indian Plywood Manufacturing Company Pvt. Ltd., Mumbai; Kanara Wood & Plywood Industries Ltd., Mangalore; Kaziranga Wood Products Pvt. Ltd., Guwahati; Madras Chipboard Ltd., Rajapalayam; Plystone Plywoods Pvt. Ltd., Ernakulam; The Western India Plywoods Ltd., Kannur.

**(ii) Automotive Research Association of India (ARAI), Pune**

*www.araiindia.com*

ARAI, a Pune based co-operative industrial research unit, was established by the automotive industry in association with the Ministry of Industries (GoI) in 1966. ARAI is playing an essential role in designing less polluting, safe and more efficient vehicles. It provides technical assistance in domains of R&D along with testing, homologation, framing and certification of vehicle regulations. ARAI is known for its finest services and it is accredited with ISO 9001, ISO 14001, Occupational Health and Safety Management (OHSAS) 18001 and National Accreditation Board for Testing and Calibration Laboratories (NABL). Various kinds of services provided by ARAI are listed in table 5.

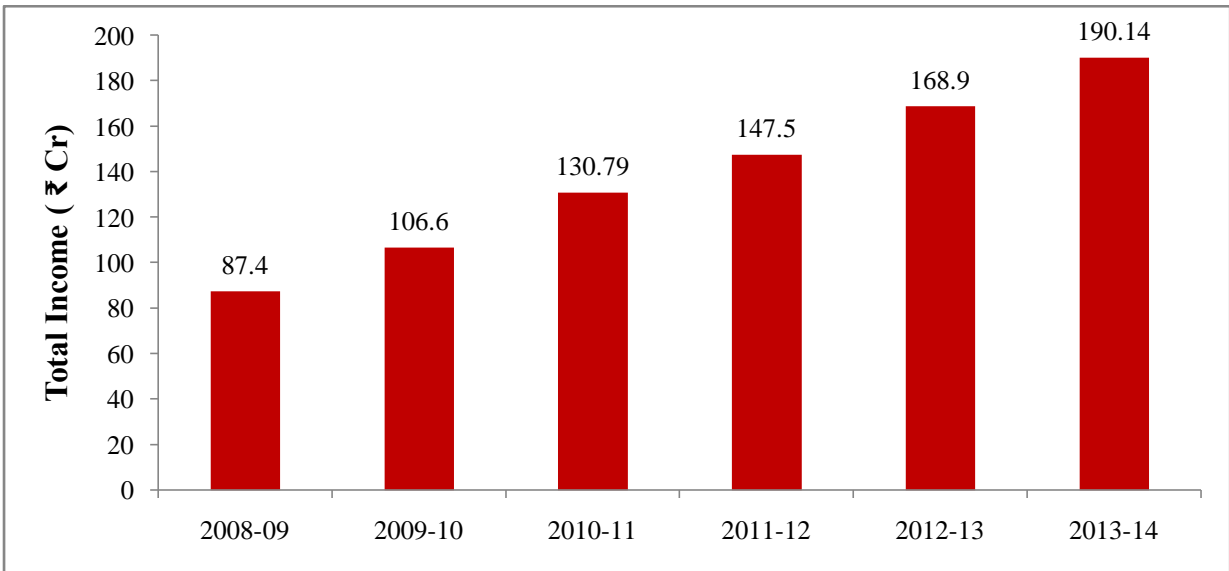
**Table 5: Services Offered by ARAI**

S. No.	Service	Brief Details
1.	<b>R&amp;D Services</b>	<p>Pursuing research in fields, such as:</p> <ul style="list-style-type: none"> <li>• Power Train</li> <li>• Structural Dynamics</li> <li>• Safety</li> <li>• Electronics</li> <li>• Materials</li> <li>• Noise, Vibration and Harshness</li> <li>• Computer aided engineering</li> </ul> <p>ARAI has successfully developed indigenous LPG and CNG conversion kits, especially for two and three wheelers to meet EURO IV emission norms.</p> <p>ARIA through its research activities in field of powertrain and electronics has generated key products of industrial importance, some of the key products are listed below:</p> <ul style="list-style-type: none"> <li>• EURO - 4 CRDI Diesel Development</li> <li>• CNG HCV For Bus Application</li> <li>• LPG Passenger Car For OEM Application</li> <li>• In-vehicle Duty Cycle and Operation Pattern Recorder</li> <li>• Conversion of legacy sensors data to CAN messages</li> </ul>
2.	<b>Education and Training</b>	<p>ARAI has built ARAI Academy to develop world-class eco-friendly education institute for masters, doctoral and professional improvement courses in automotive engineering in collaboration with National and International Universities.</p> <ul style="list-style-type: none"> <li>• VIT University, Vellore</li> <li>• VELTEC University, Chennai</li> <li>• College of Engineering Pune</li> <li>• University of Alabama, Birmingham</li> <li>• Braunschweig University, Germany</li> </ul>
3.	<b>Forging Industry Division (FID)</b>	<p>With its world class testing and validation laboratories for metallurgical and fatigue testing, product and process simulation and computer aided engineering, ARAI – FID is all set to make Indian forging a strong “Made in India” brand.</p> <p>ARAI – FID understands training requirements of the industry very well and has developed full-fledged advanced training facility.</p> <p>FID is supported and promoted by Ministry of Heavy Industries &amp; Public Enterprises, Government of India, ARAI and Association of Indian Forging Industry (AIFI)</p>
4.	<b>Certification</b>	<p>ARAI provides certification for vehicles, engines, safety components, genset, agricultural equipments, construction equipments, bus body builders, Population Check Equipment</p>

		(PUC) equipment, CNG Retro fitment, LPG Retro fitment, Conformity of Production (COP), export homologation, <i>Central Motor Vehicles Rules</i> (CMVR) Test Approval (TA) status.
5.	<b>Testing and Calibration</b>	Under testing and calibration service, ARAI offers testing services to the auto component, auto electronics, embedded and IT industry in the following areas: <ul style="list-style-type: none"> <li>• Electromagnetic interference (EMI)/ Electromagnetic compatibility (EMC)</li> <li>• Material; Chemical; Environment testing; Swirl testing Drop testing; Security product testing; Engine durability</li> </ul>
6.	<b>Standard Formulation</b>	Standard formulation are designed by ARAI under: <ul style="list-style-type: none"> <li>• Automotive Industry Standards Committee (AISC) set up under Central Motor Vehicles Rules-Technical Standing Committee (CMVR - TSC) by Ministry of Road Transport &amp; Highways,(Dept. of Road Transport &amp; Highways) (MoRT&amp;H and DoRT&amp;H) in the year 1997 to review the safety in the design, construction, operation and maintenance of motor vehicles.</li> <li>• United Nations Economic Commission for Europe (UN-ECE) is an international body having its headquarters at Geneva, Switzerland. Under the Inland Transport Committee (ITC) of UN-ECE, there are several groups which deal with transport related technical and administrative matters. The group WP.29 (World Forum for Harmonization of Vehicle Regulations) deals with the subject of worldwide harmonization of automotive regulations.</li> <li>• CMVR TAP</li> </ul>
7.	<b>Web based services</b>	ARAI provides web based services in field of homologation and regulations for DELTA application and TA certification. Along with this they provide expert advice in field of homologation.

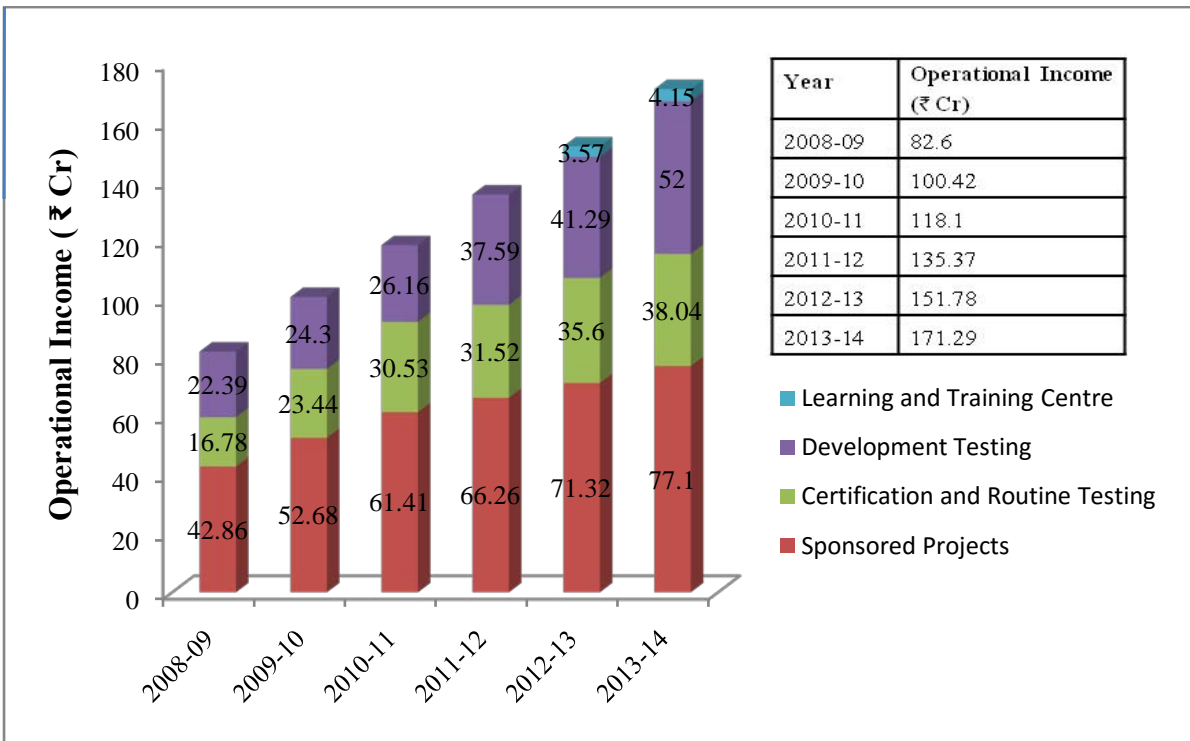
*Source: www.araiindia.com*

ARAI has completed its 50 years of establishment. In these years, ARAI has progressed in terms of total income generated. In the year 2013-14, ARAI's total income was reported to be ₹19014 Lakhs. Figure 2 represents the total income of ARAI from 2008-2014. In these 7 years ARAI has revealed continuous growth in its income profiles. ARAI is credited with 12.8% growth in its operational income and 55% of its operational income comes from non-certification business which mainly lies on its R&D activities. Year 2012 onwards, learning and training centre also contributed to the operational income of ARIA. Figure 3 depicts the breakup of ARAI's operational income in 4 sections a) sponsored projects (government and industry funded); b) certification and routine testing; c) development testing and d) learning and training centre.



**Figure 2: Total Income Profile of ARAI from 2004-2014.**

Source: 44<sup>th</sup> Annual Report of ARAI (2013-14)



**Figure 3: Operational Income of ARAI from 2008-2014**

Source: 44<sup>th</sup> Annual Report of ARAI (2013-14)

ARAI has strong industrial linkages. It has 73 member industries who are availing different services offered by ARAI. List of important member companies is presented below:

Ashok Leyland Ltd., Bajaj Auto Ltd., Bharat Forge Ltd., Bosch Ltd., Cummins Technologies India Pvt. Ltd., Delphi-TVS Diesel Systems Ltd., Eicher Motors Ltd., Fiat India Automobiles Pvt. Ltd., Ford India Pvt. Ltd., General Motors India Pvt. Ltd., Greaves Cotton Ltd., Hero Electric Vehicles Pvt. Ltd., Honda Cars India Ltd., Hyundai Motor India Ltd., Kirloskar Oil Engines Ltd., Lombardini India Pvt. Ltd., Mahindra & Mahindra Ltd., Maruti Suzuki India Ltd., Mercedes-Benz India Pvt. Ltd., Piaggio Vehicles Pvt. Ltd., Power Electronics, Skoda Auto India Pvt. Ltd., Tata Cummins Pvt. Ltd., Tata Motors Ltd., Toyota Kirloskar Motor Pvt. Ltd., TVS Motor Co. Ltd., Volkswagen India Pvt. Ltd., Volvo India Pvt. Ltd.

ARAI has successfully utilized its state-of-art laboratories, developed technologies and skilled manpower for generation of engineers to meet the demands of automotive industry. It has stretched its arms in industry as well as academia and has drawn immense benefits for the automobile industry in India.

### (iii) Government Supported Organization for Industrial Development

Many other organization/institutes have been established by GoI for assisting industrialization of MSMEs (Table 6).

**Table 6: Organizations/Institutes established by GoI for Assisting Industrialization of MSMEs**

S. No.	Institute	Brief Details
1.	<b>Mahatma Gandhi Institute for Rural Industrialization, Wardha, Maharashtra</b> <i>A National Institute under the Ministry of Micro Small &amp; Medium Enterprises, GoI</i> <a href="http://www.mgiri.org/">http://www.mgiri.org/</a>	The institute is working with an aim of developing novel technologies for rural industries, entrepreneurs and enterprises to bring industrialization and technology up-gradation. It provides S&T support and R&D guidance to enterprises to compete globally.
2.	<b>National Institute for Micro, Small and Medium Enterprises</b> <i>An organization under Ministry of Micro Small &amp; Medium Enterprises, GoI</i> <a href="http://nimsme.org/">http://nimsme.org/</a>	It is ISO 9001:2008 certified organization promoting advancement of MSMEs. Through its expertise in field of entrepreneurship development, technology development and management and informative services it has contributed to the promotion of MSMEs in India. It provides services, such as consultancy, research, training and extension to enterprises. It has carried out 885 research and consultancy projects. It is pursuing intellectual facilitation

		<p>services to MSMEs via schools of excellence which are:</p> <ul style="list-style-type: none"> <li>• School of Enterprise Development (SED)</li> <li>• School of Enterprise Extension (SEE)</li> <li>• School of Enterprise Information and Communication (SEIC)</li> <li>• School of Enterprise Management (SEM)</li> </ul>
3.	<p><b>National Small Industries Corporation</b>  <i>Facilitating growth of small enterprises</i>  <i>GoI enterprise under Ministry of Micro, Small and Medium Enterprise</i>  <a href="http://www.nsic.co.in/SCHSERV.ASP">http://www.nsic.co.in/SCHSERV.ASP</a></p>	<p>It is an ISO 9001:2008 certified government enterprise. It is working with an aim to promote growth of MSMEs. It provides marketing support, credit support, technology support and consultancy services for MSMEs. They have established 106 training cum incubation centres all over India for assisting technology growth of MSMEs.</p>
4.	<p><b>Central Manufacturing Technology Institute (CMTI)</b>  <a href="http://cmti-india.net/">http://cmti-india.net/</a></p>	<p>CMTI is an R&amp;D organization supported by DIPP is focusing its efforts mainly on harnessing know-how in the manufacturing technology sector to practical purposes and assisting technological growth in the country. CMTI has the role of being a Catalyst and a Key Player in manufacturing technology growth in the country.</p>
5.	<p><b>Central Pulp &amp; Paper Research Institute (CPPRI)</b>  <a href="http://www.cppri.org.in/">http://www.cppri.org.in/</a></p>	<p>The institute was established as a autonomous body under administrative control of DIPP, GoI, to promote R&amp;D in the field of pulp &amp; paper.</p>
6.	<p><b>National Council for Cement and Building Materials (NCB)</b>  <a href="http://www.ncbindia.com/">http://www.ncbindia.com/</a></p>	<p>NCB is the premier body under the administrative control of Ministry of Commerce and Industry, Govt. of India, for technology development, transfer, continuing education and industrial services for cement and construction industries.</p>

## B. Industry Oriented Programmes of Funding Agencies

Various funding agencies have initiated number of programmes/schemes to support R&D in industries. Industrial association and GoI has together created a dedicated agency such as GITA (<http://gita.org.in/>), a joint initiative of DST, GoI and CII, for promoting industrial development globally by providing funding support and capacity building for industrial



R&D. Industrial association FICCI and DIPP, GoI created a joint initiative ‘Invest India’ (<http://www.investindia.gov.in/>) for facilitating investments in R&D. Industry and DST also joined hands for starting a unique fellowship programme ‘Prime Minister Fellowship Programme’ for researchers pursuing industrial R&D, where industry and SERB, DST contributes equally for fellowship.

Table 7 lists down the programmes/schemes initiated by government funding agencies for promotion of industrial R&D contributing to the growth of Indian industry.

**Table 7: Industry Oriented Programmes of Government Funding Agencies**

S. No.	Programme/Scheme	Government Funding Agency
1.	Technology Development Board (TDB) <a href="http://tdb.gov.in/">http://tdb.gov.in/</a>	DST
2.	Drugs and Pharmaceutical Research Programme <a href="http://www.dst.gov.in/drugs-pharmaceutical-research">http://www.dst.gov.in/drugs-pharmaceutical-research</a>	DST
3.	Patent Acquisition and Collaborative Research and Technology Development (PACE) <a href="http://www.dsir.gov.in/12plan/pace/pace.htm">http://www.dsir.gov.in/12plan/pace/pace.htm</a>	DSIR
4.	Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) <a href="http://www.dsir.gov.in/12plan/prism/prism.htm">http://www.dsir.gov.in/12plan/prism/prism.htm</a>	DSIR
5.	Access to Knowledge for Technology Development and Dissemination (A2K+) <a href="http://www.dsir.gov.in/12plan/a2k+/a2k+s.htm">http://www.dsir.gov.in/12plan/a2k+/a2k+s.htm</a>	DSIR
6.	Technology Development and Demonstration Program (TDDP) <a href="http://www.dsir.gov.in/tpdup/tddp/tddp.htm">http://www.dsir.gov.in/tpdup/tddp/tddp.htm</a>	DSIR
7.	Technology Management Programme (TMP) <a href="http://www.dsir.gov.in/tpdup/tmp/tmp.htm">http://www.dsir.gov.in/tpdup/tmp/tmp.htm</a>	DSIR
8.	International Technology Transfer Programme (ITTP) <a href="http://www.dsir.gov.in/tpdup/ittp/ittp.htm">http://www.dsir.gov.in/tpdup/ittp/ittp.htm</a>	DSIR
9.	National Agricultural Technology Project (NATP) <a href="http://www.agriinfo.in/default.aspx?page=topic&amp;superid=7&amp;topicid=1472">http://www.agriinfo.in/default.aspx?page=topic&amp;superid=7&amp;topicid=1472</a>	ICAR
10.	The DRDO-FICCI ATAC Programme <a href="http://drdoficciatac.com/">http://drdoficciatac.com/</a>	DRDO
11.	Extramural Research (ER) and Grant-in-aid Schemes <a href="http://drdo.gov.in/drdo/English/index.jsp?pg=grantinaid.jsp">http://drdo.gov.in/drdo/English/index.jsp?pg=grantinaid.jsp</a>	DRDO
12.	Industrial Corridor Projects <a href="http://dipp.nic.in/English/default.aspx">http://dipp.nic.in/English/default.aspx</a>	DIPP
13.	Modified Industrial Infrastructure Upgradation Scheme (MIUS)	DIPP

	<a href="http://dipp.nic.in/English/Schemes/IIUS.aspx">http://dipp.nic.in/English/Schemes/IIUS.aspx</a>	
14.	Antrix Corporation Limited <a href="http://www.antrix.gov.in/">http://www.antrix.gov.in/</a>	ISRO
15.	Biotechnology Industry Partnership Programme (BIPP) <a href="http://www.birac.nic.in/desc_new.php?id=76">http://www.birac.nic.in/desc_new.php?id=76</a>	BIRAC
16.	Technology Upgradation Fund Scheme for the Textile Industries (TUFS) <a href="http://www.sidbi.com/?q=government-subsidy-schemes">http://www.sidbi.com/?q=government-subsidy-schemes</a>	SIDBI
17.	Technology and Quality upgradation Support to Micro, Small & Medium Enterprises (TEQUP) <a href="http://www.sidbi.com/?q=government-subsidy-schemes">http://www.sidbi.com/?q=government-subsidy-schemes</a>	SIDBI
18.	Credit Linked Capital Subsidy Scheme (CLCSS) <a href="http://www.sidbi.com/?q=government-subsidy-schemes">http://www.sidbi.com/?q=government-subsidy-schemes</a>	SIDBI
19.	Integrated Development of Leather Sector Scheme (IDLSS) <a href="http://www.sidbi.com/?q=government-subsidy-schemes">http://www.sidbi.com/?q=government-subsidy-schemes</a>	SIDBI
20.	Scheme for Food Processing Industries <a href="http://www.sidbi.com/?q=government-subsidy-schemes">http://www.sidbi.com/?q=government-subsidy-schemes</a>	SIDBI

### C. Incentivization of Private Sector by DSIR

DSIR, nodal agency under Ministry of Science and Technology, New Delhi which is working with a mandate of promoting industrial research, supporting indigenous technology development and faster commercialization. DSIR has taken an initiative of “***Building Industrial R&D and Common Research Facilities (BIRD-Crf)***”. Under this initiative, DSIR has commenced granting recognition to **In-House R&D Units** established by corporate companies and Scientific and Industrial Research Organizations (SIRO). Recognition of In-House R&D Units (RDI) is the solitary scheme in the entire Government sector for benchmarking R&D pursued by industrial sector. Through this DSIR recognition, industries pursuing research and innovation practices can avail fiscal incentives from the government sector which are categorized as a) Funding for R&D from Government Agencies and b) Tax Rebate and Customs /Excise Duty Waiver on Inputs for R&D.

#### **Incentives provided to private sector by GOI, as on Nov. 2015**

- **Incentives based on direct taxes (Income-tax Act, 1961)**
  - 100% write off of revenue expenditure on R&D; (Section 35(1)(i) of IT Act).

- 100% write off of capital expenditure on R&D in the year the expenditure is incurred; (Section 35(1)(iv) of IT Act).
- Weighted tax deduction @175% (to the sponsor) for payments made to approved national laboratories, universities and IITs or a specified person, with a specific direction that the said sum shall be used for scientific research under a programme. (Section 35(2AA) of the IT Act).
- Weighted tax deduction @200% on expenditure (other than land & buildings) incurred on approved in-house R&D facilities of companies engaged in the business of biotechnology or in any business of manufacture or production of any article or thing, not being an article or thing specified in the list of the Eleventh Schedule. [Expenditure on scientific research in relation to drugs and pharmaceuticals, includes expenditure incurred on clinical drug trials, obtaining approvals from any regulatory authority under any Central, State or Provincial Act and filing an application for a patent under the Patents Act, 1970 (39 of 1970). (Section 35(2AB) of the IT Act.)]
- Accelerated depreciation allowance for investment on plant and machinery, made on the basis of indigenous technology (Rule 5(2) of IT Rules, 1962).

➤ **Incentives based on indirect taxes**

- Customs duty exemption to in-house R&D units established by corporate companies, other than a Hospital for capital equipment and consumables needed for R&D. (Notification No.24/2007-customs, dated 01 March, 2007 as amended from time to time).
- Central excise duty exemption to in-house R&D units established by corporate companies, other than a Hospital for capital equipment and consumables needed for R&D. (Notification No.16/2007-central excise, dated 01 March, 2007 as amended from time to time).
- Central excise duty waiver for 3 years on goods designed and developed by a wholly owned Indian company and patented in any two countries out of: India, USA, Japan and any one country of European Union (Notification No.15/96-CE dated July 23, 1996, amended vide Notification No.13/99-CE dated 28 February, 1999).
- Exemption from customs duty on imports made for R&D projects funded by Government in industry. (Notification No. 50/96-Customs dated 23 July 1996).

- Goods specified in List-28 (comprising of analytical and specialty equipment) for use in pharmaceutical and biotechnology sector allowed to be imported duty free {notification No. 26/2003-Customs dated 1 March 2003 (entry substituted at S. No. 248 of the table in the said notification)} Subject to conditions mentioned in the notifications.

## 2. Academia- Industry Model (AIM)

Academic institutions are the store house of the R&D activities. They possess handsome amount of resources that can lead to generation of novel technologies that can be readily commercialized contributing to economic and societal benefits. Whereas, industrial sector in order to progress and compete globally need to bring innovation in their existing systems. Therefore, it is imperative for academia and industry to come in close collaboration in order to pursue directed research that can be successfully transferred to industries.

In this category, successful industry-academia initiatives are briefed in following sections:

### **A. Industrial Setups (Research Laboratories) in Academic Sector**

Industries are coming forward to collaborate with academic sector to pursue collaborative research. Various industries have set up specialized laboratories/units in academic institutions where industry personals and academicians (faculty and researchers) together carry out industry oriented research activities. Table 8 represents some of the notable industrial sets ups in different academic institutes where academia and industry in partnership are pursuing R&D activities.

**Table 8: Laboratories Set Up by Industry in Academic Sector**

<b>Industrial Set up</b>	<b>Academic Institution</b>
<ul style="list-style-type: none"> <li>• M. K. Rangnekar Memorial Laboratory</li> <li>• Ramesh Banatwala Memorial Industrial Pharmacy Laboratory</li> <li>• E- Merck Laboratory and Chemistry Laboratory</li> <li>• Nihchal Israni Microbiological Laboratory</li> </ul>	BCP Mumbai
<ul style="list-style-type: none"> <li>• Xilinx FPGA Laboratory</li> <li>• The Tata Infotech Laboratory</li> <li>• Intel Microelectronics Laboratory</li> <li>• Laboratory for Intelligent Internet Research</li> <li>• Tata Consultancy Services Laboratory for VLSI Design and Device Characterisation</li> <li>• Texas Instruments Digital Signal Processing (TI-DSP) Laboratory</li> <li>• Wadhvani Electronics Laboratory</li> <li>• Cummins Engine Research Laboratory</li> <li>• Applied Materials Nano manufacturing Laboratory</li> <li>• VLSI Design Consortium</li> </ul>	IIT Bombay

<ul style="list-style-type: none"> <li>• Intel set up a Planet Labs in E&amp;C Dept.</li> <li>• Cisco set up equipment for a Telephony and Security Lab in E&amp;C Dept.</li> </ul>	IIT Roorkee
<ul style="list-style-type: none"> <li>• Bharti School Of Telecommunication Technology And Management</li> </ul>	IIT Delhi
<ul style="list-style-type: none"> <li>• General Motors-IIT Kharagpur Collaborative Research Laboratory on Electronics, Controls and Software</li> </ul>	IIT Kharagpur
(iv) Autodesk, Microsoft and Intel have established Centres of Excellence and sponsored research laboratories in the campus.	IIT Madras
(v) Ricoh Company- Centre for Design and Innovation at the Institute.	IIT Gandhinagar
(vi) Analog Teaching Lab and C2000 Micro Controller Lab Setup by Cranes Software International Limited	

## **B. Scholarships/Fellowships/Industrial Chairs/Scientists Specific**

Industry-Academia has collaborated for pursuing R&D and for this industry has come up with the grant of special fellowships and scholarships for researchers doing industrial research. List of some of the notable fellowships from industry to researchers for pursuing I-A collaborative projects is presented below:

**Table 9: Fellowships/Scholarships Sponsored by Industry**

S. No.	Fellowship/Scholarship
	Prime Minister Fellowship Scheme- Industry and government funding agency to pay equal amount of fellowship to the researcher pursuing industrial research
	<u>Industry oriented fellowships in IITs</u> IIT Kharagpur: <ul style="list-style-type: none"> <li>• Google India Fellowship</li> <li>• Aditya Birla Fellowship</li> <li>• TCS Research Scholarship</li> <li>• Singapore Technologies Engineering Scholarships</li> </ul> IIT Bombay: <ul style="list-style-type: none"> <li>• Infosys fellowship</li> </ul>

	<ul style="list-style-type: none"> <li>• Intel India Fellowship</li> <li>• TCS Research Scholarship</li> </ul> <p>IIT Madras</p> <ul style="list-style-type: none"> <li>• Aditya Birla Fellowship</li> <li>• Nissan Scholarship</li> <li>• TCS Research Scholarship</li> <li>• Singapore Technologies Engineering Scholarships</li> </ul>
	<p><u>ICT Mumbai</u></p> <ul style="list-style-type: none"> <li>• Pidilite Industries Ltd, Visiting fellow in Dyestuff Science &amp; Technology</li> <li>• Marico Industries Visiting Fellowship</li> <li>• ICT - Lupin Visiting Fellowship for Bioprocess Technology</li> <li>• CIPLA Distinguished Visiting Fellowship in Pharmaceutical Sciences</li> </ul>

Various industries are in collaboration with academia in sponsoring industry chair through which they support scientist pursuing industrial research. Table 10 lists some of the notable industrial chairs in HEIs.

**Table 10: Industrial chairs in HEIs in India**

S. No.	Industrial Chair	Academic Institution
1.	TATA Chair	IIT Bombay
2.	Praj Industries Chair	IIT Bombay
3.	Forbes Marshall Chair	IIT Bombay
4.	Bajaj Group Chair	IIT Bombay
5.	USV Chair	IIT Kanpur
6.	ABB Chair	IIT Delhi
7.	Microsoft Chair	IIT Delhi
8.	Henry Ford Chair	IIT Delhi
9.	Bharti Airtel Chair	IIT Delhi
10.	Reliance Chair	IIT Bhubaneswar
11.	Bharat Petroleum Distinguished Professor of Chemical Engineering	ICT Mumbai
12.	V.V. Mariwala Chair in Chemical Engineering	ICT Mumbai
13.	J.G. Kane Chair of Oil Technology	ICT Mumbai
14.	R. A. Mashelkar Chair of Chemical Engineering	ICT Mumbai

On individual basis faculty/scientist of the HEIs also collaborates with industries to carry out collaborative research projects.

### **C. Industry supported I-A cells**

Various industries have supported academic institution for creation of dedicated Industry-Academia cells. One such I-A cell is Pfizer-Foundation for Innovation and Technology Transfer (FITT). Details of FITT as a successful model of academia industry initiative for PPP is given below.

- ***Pfizer-Foundation for Innovation and Technology Transfer (FITT)***  
*<http://fitt-iitd.in/>*

GoI established FITT in 1995 in the campus of Indian Institute of Technology, Delhi (IIT-D), a premier engineering institute of India by GoI as the first I-A interface (FITT Annual Report, 1994-95). The GoI at that time provided an amount of ₹ 16.2 million as an aggregated fund to IIT-D for initiation and build up of FITT. The centre was set up as an autonomous and self governing body, to act as a single window utility to the industrial sector with complete professionalism and function as a marketing arm for the IIT-D developed technologies (Sengupta, 2009).

The broad organizational structure is composed of a) Governing Council and b) Research Council. The governing council consists of representatives from industries; industrial associations and nominee from MHRD, selected nominated members from IIT-D senate and its board of governors. On the other hand, research council is composed of selected faculty members of IIT-D having experience in I-A collaborations. The management is vested with the managing director of the organization, guided by governing council and research council. Details are given in Annexure I



### **3. Government-Academia-Industry Model (GAIM)**

#### ***Triple Helix Model***

In third category of PPP, three sectors government academia and industry together in partnership in a form of triple helix are discussed below in 4 sections.

#### **A. Autonomous academic institutions**

Autonomous academic institutions, such as Bombay College of Pharmacy and Institute of Chemical Technology were created on industry demands by getting support from government and industry. These institutes are working in close collaboration with industries and have significantly contributed to the industrial growth. These institutes are explained in following section.

##### **(i) *Bombay College of Pharmacy, Mumbai***

*www.bcpindia.org*

Bombay College of Pharmacy (BCP) affiliated to University of Mumbai, is one of the premier pharmacy colleges in India, imparting quality pharmacy education and research. It was established in 1957 by the Indian Pharmaceutical Association-Maharashtra State Branch (IPA-MSB) with financial assistance from several pharmaceutical conglomerates and Government of Maharashtra to address the needs of pharma industry. Within few years of its establishment, number of graduate, master and doctorate programmes were started in particular branches of pharmaceutical sciences. Since its inception, BCP has grown in stature, and has generated more than 3500 pharmacists, ~700 M. Pharma and ~100 Ph.D. graduates.

BCP is providing master's and Ph.D. programmes through which research in various domains such as Pharmaceutics, Pharmacology and Toxicology, Pharmaceutical Chemistry, Pharmacognosy and Pharmaceutical Analysis is carried out. BCP has formed the research society which is recognized by DSIR, GoI. It has established world class facilities, state of the art instruments and equipments. Research is highly promoted in the college, faculty members have received number of research grants worth ₹100 million from Government funding agencies (DST, DBT, ICMR, UGC and AICTE) and ~₹10 million from private sector. Number of Industry-Academia (I-A) collaborative projects are undertaken in BCP. Till date, More than 300 industry sponsored projects have been successfully completed by BCP. The college has built up effective interface with the industrial sector in term of industrial trainings, industry sponsored projects, consultancy and faculty exchange.

BCP has been accredited with the “Best Industry-Linked Institution in Pharmacy” according to the national survey carried out by AICTE in collaboration with CII, consecutively from past three years (2013 onwards). Details of BCP are given in Annexure II.

(ii) ***Institute of Chemical Technology, Mumbai***

*www.ictmumbai.edu.in*

The Institute of Chemical Technology (ICT), Mumbai was established in 1933 with active industrial participation, as University Department of Chemical Technology (UDCT) under University of Mumbai, with the noble intention of enhancing India's knowledge base in chemical science and technology. Based on its continuous progress in academics and translational research, UDCT was upgraded to Deemed-to-be-University and renamed as Institute of Chemical Technology in 2008. Recently (2016), ICT-Mumbai has been ranked as number 2 university, under the National Institutional Ranking Framework (NIRF) of MHRD, (GoI). Details of ICT Mumbai is given in Annexure III.

## **B. Creation of dedicated agencies promoting PPP**

Government has created specialized agencies for promoting investments in R&D from both industrial and academic sector in PPP mode. One of such agency is BIRAC which was established by DBT, GoI with a mandate of strengthening Indian Biotech Sector by bringing industry and academia together and enhancing entrepreneurship in biotech field. On the other hand, CSIR supported the creation of CSIR Tech as a commercialization arm for various academic institutions including R&D institutions and universities by collaborating with potential industries.

(i) ***Biotechnology Industry Research Assistance Council (BIRAC),***

*www.birac.nic.in*

BIRAC is a not-for-profit Section-8, schedule B, public sector enterprise registered under Indian Companies Act 1956 and was established in 2012 by Department of Biotechnology, GoI, (DBT; <http://www.dbtindia.nic.in/>). DBT created BIRAC as an I-A interface agency to stimulate emerging biotech enterprises in India by supporting R&D activities addressing the national societal needs to make the biotech sector globally competitive. Various schemes of BIRAC promoting I-A interface are presented in table 11.

**Table 11: Industry-Academia Programmes Offered by BIRAC**

S. No.	Programmes	Brief details
1	<b>Small Business Innovation Research Initiative (SBIRI)</b> <a href="http://www.birac.nic.in/desc_new.php?id=75">http://www.birac.nic.in/desc_new.php?id=75</a>	Scheme was started to boost PPP functioning in the country by facilitating innovations, risk taking ability by small and medium companies and bringing together the industries, public institutions and the government under one roof to promote research in the Indian biotech sector.
2	<b>Biotechnology Industry Partnership Programme (BIPP)</b> <a href="http://www.birac.nic.in/desc_new.php?id=76">http://www.birac.nic.in/desc_new.php?id=76</a>	BIPP promotes government partnership with industrial sector for supporting path-breaking research in futuristic technological areas along with societal importance.
3	<b>Contract Research Scheme (CRS)</b> <a href="http://www.birac.nic.in/desc_new.php?id=104">http://www.birac.nic.in/desc_new.php?id=104</a>	It aims to enable promotion of academia research having commercial potential to engage the Contract Research and Manufacturing Systems (CRAMS) industry for validating a process or a prototype.
4	<b>Biotechnology Ignition Grant Scheme (BIG)</b> <a href="http://www.birac.nic.in/desc_new.php?id=83">http://www.birac.nic.in/desc_new.php?id=83</a>	BIG is made available to scientist entrepreneurs working in research institutes, academia to initiate their own start-ups.
5	<b>BIRAC University Innovation Cluster: (UIC)</b> <a href="http://www.birac.nic.in/desc_new.php?id=95">http://www.birac.nic.in/desc_new.php?id=95</a>	Five universities possess Cluster Innovation. <b>These centres are working to promote entrepreneurial cultures and pursue industry oriented research having commercial importance.</b>
6	<b>BIRAC Regional Innovation Centre (BRIC) at IKP Knowledge Park</b> <a href="http://www.birac.nic.in/desc_new.php?id=94">http://www.birac.nic.in/desc_new.php?id=94</a>	It is working for mapping regional innovation ecosystem for Southern India to bring out technologies of commercial importance.
7	<b>Bio-Incubator Support</b> <a href="http://www.birac.nic.in/desc_new.php?id=92">http://www.birac.nic.in/desc_new.php?id=92</a>	Bio-incubation support is harnessing entrepreneurial potential of start-ups and is providing access to well-developed infrastructure networking platforms. <b>Till now BIRAC has extended support to 15 Bio incubators.</b>
8	<b>BIRAC-SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions)</b> <a href="http://www.birac.nic.in/desc_new.php?id=98">http://www.birac.nic.in/desc_new.php?id=98</a>	This scheme is promoting indigenous and grassroots innovations. For example: <ul style="list-style-type: none"> <li>• Development of <b>Honey Bee Network (HBN)</b>; <a href="http://www.sristi.org/hbnew/index.php">http://www.sristi.org/hbnew/index.php</a> for extracting, protecting and promoting innovative ideas from all over the country.</li> <li>• Creation of <b>Techpedia</b> (<a href="http://techpedia.sristi.org/">http://techpedia.sristi.org/</a>) as a platform to put problems of small and medium enterprises and locate solutions for them. Academicians, industries, researchers, students and entrepreneurs can register and draw services that come under techpedia.</li> </ul>

		<ul style="list-style-type: none"> <li>• Creation of <b>Social Innovation Fund</b> (<a href="http://sif.sristi.org/">http://sif.sristi.org/</a>) for providing mentoring, financial and fabrication support to academicians, industries and budding entrepreneurs to carry forward their innovations.</li> </ul>
9	<b>BIRAC AcE Fund - Accelerating Entrepreneurs</b> <a href="http://www.birac.nic.in/desc_new.php?id=99">http://www.birac.nic.in/desc_new.php?id=99</a>	This scheme provides access to equity based fund for budding entrepreneurs.

Source: [www.birac.nic.in](http://www.birac.nic.in)

(ii) **CSIR-Tech Private limited, Pune**, [www.csirtech.com](http://www.csirtech.com)

CSIR-Tech, a for-profit private limited company established in 2011 by CSIR, is a private sector company dealing in commercialization of Intellectual Property from public funded R&D labs and various academic institutions in India. CSIR-Tech is providing entrepreneurial and flexible organization functioning in a competitive environment to ensure the best outputs from R&D investments. The ownership of CSIR-Tech lies with Entrepreneurial Development Centre (EDC) of CSIR-National Chemical Laboratory (CSIR-NCL), Pune; CSIR-Scientists Welfare Trust (CSIR-SWT) and the State Bank of India (SBI). Its major focus area is to act as catalyst for journey of technology transfer from lab to market and encouraging set up of new technology ventures like spin-offs and start-ups by means of collaboration with R&D labs. CSIR-Tech provides different services as mentioned in table 12.

**Table 12: Major Offerings of CSIR-Tech**

S. No.	Offerings	Focus Area
1	<b>Technology Promotion</b>	Provides assistance to associated industries and CSIR research laboratory for opportunity identification, technology transfer and technology de-risking in different areas of R&D.
2	<b>IPR Management</b>	CSIR-Tech also provides support in IP related issues such as IP filing and IP licensing.
3	<b>Industry Advisory Services</b>	Industry gets mentorship and financial support from CSIR-Tech for technology scouting, R&D partner search, market research and consulting, open innovation, technology/IP evaluation and forming industry clusters.
4	<b>Government Advisory Services</b>	Provides government advisory services to various government bodies for capacity building, research, S&T development especially for strengthening I-A interactions under triple helix model.
5	<b>Incubation Support</b>	Provides incubation support to budding entrepreneurs and start-ups for business planning and raising finances and analysing market penetration

Source: [www.csirtech.com](http://www.csirtech.com)

## C. Programmes and Initiatives of Public and Private Sector

Government funding agencies and various industrial associations have instituted various programmes and schemes for bringing government, industry and academia together. Moreover, funding agencies have taken impactful initiatives such as creation of Centre of Excellence, TBIs and S&T parks for enhancing MSMEs growth and entrepreneurship in India.

**Table 13: Programmes for Stimulating Industry-Academia Linkages**

S. No.	Programme/Scheme/initiative	Government Agency	Funding
1.	Schemes for Funding Industry Relevant R&D (Under SERB) <a href="http://www.serb.gov.in/home.php">http://www.serb.gov.in/home.php</a>	DST	
2.	International S&T Co-operation <a href="http://www.dst.gov.in/international-st-cooperation">http://www.dst.gov.in/international-st-cooperation</a>	GITA	
3.	Advanced Composites Programme <a href="http://tifac.org.in/index.php?option=com">http://tifac.org.in/index.php?option=com</a>	TIFAC	
4.	Collaborated Automobile R&D Core-Group <a href="http://tifac.org.in/index.php?option=com_content&amp;view=article&amp;id=68&amp;Itemid=99">tifac.org.in/index.php?option=com_content&amp;view=article&amp;id=68&amp;Itemid=99</a>	TIFAC	
5.	Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) <a href="http://www.dsir.gov.in/12plan/prism/prism.htm">http://www.dsir.gov.in/12plan/prism/prism.htm</a>	DSIR	
6.	Consultancy Promotion Programme (CPP) <a href="http://www.dsir.gov.in/tpdup/cpp/cpp.htm">http://www.dsir.gov.in/tpdup/cpp/cpp.htm</a>	DSIR	
7.	New Millennium Indian Technology Leadership Initiative' (NMITLI) <a href="http://www.csir.res.in/external/heads/collaborations/nmitli.htm">http://www.csir.res.in/external/heads/collaborations/nmitli.htm</a>	CSIR	
8.	Small Business Innovation Research Initiative (SBIRI) <a href="http://www.birac.nic.in/desc_new.php?id=75">http://www.birac.nic.in/desc_new.php?id=75</a>	BIRAC	
9.	Contract Research Scheme (CRS) <a href="http://www.birac.nic.in/desc_new.php?id=104">http://www.birac.nic.in/desc_new.php?id=104</a>	BIRAC	
10.	BARC Entrepreneur's Corner- Technology Transfer and Consultancy & Scientific Services <a href="http://www.barc.gov.in/">http://www.barc.gov.in/</a>	DAE	
11.	Visvesvaraya Ph.D. Scheme for Electronics and IT <a href="http://deity.gov.in/content/schemes-projects">http://deity.gov.in/content/schemes-projects</a>	MeitY	
12.	Scheme for Financial Assistance to Select States/UTs for Skill Development in Electronics System Design and Manufacturing (ESDM) sector <a href="http://deity.gov.in/content/schemes-projects">http://deity.gov.in/content/schemes-projects</a>	MeitY	
13.	Scheme of Financial Assistance for Setting Up of Electronics and ICT Academies <a href="http://deity.gov.in/content/scheme-financial-assistance-setting-">http://deity.gov.in/content/scheme-financial-assistance-setting-</a>	MeitY	

	electronics-and-ict-academies	
14.	Council for Industry Higher Education Cooperation (CIHEC) <a href="http://mhrd.gov.in/collaboration">http://mhrd.gov.in/collaboration</a>	MHRD
15.	Technical Education Quality Improvement Programme (TEQIP) <a href="http://mhrd.gov.in/technical-education-12">http://mhrd.gov.in/technical-education-12</a>	MHRD
16.	Global Initiative for Academic Network (GIAN) <a href="http://www.sici.org/programmes/details/global-initiative-for-academic-network-gian-programme/">http://www.sici.org/programmes/details/global-initiative-for-academic-network-gian-programme/</a>	MHRD
17.	Kaushal Kendras <a href="http://mhrd.gov.in/sites/upload_files/mhrd/files/lu3667.pdf">http://mhrd.gov.in/sites/upload_files/mhrd/files/lu3667.pdf</a>	MHRD
18.	University-Industry Inter Linkage (UIL) Centres <a href="http://www.ugc.ac.in">www.ugc.ac.in</a>	UGC
19.	Industry Institute Partnership Cell (IIPC) <a href="http://www.aicte-india.org/schiipc.php">http://www.aicte-india.org/schiipc.php</a>	AICTE
20.	AICTE – Indian National Academy of Engineering (INAE) Distinguished Visiting Professorship (DVP) <a href="http://inae.in/aicte-inae-distinguished-visiting-professorship-scheme/">http://inae.in/aicte-inae-distinguished-visiting-professorship-scheme/</a>	AICTE
<b>Industry Association</b>		
21.	National Knowledge Functional Hub <a href="http://ficci-nkfh.com/">http://ficci-nkfh.com/</a>	FICCI
22.	I-A-Research/ Government Interface (IARGI) <a href="http://www.ficcifwi.com/ppts/rnd2.pdf">http://www.ficcifwi.com/ppts/rnd2.pdf</a>	FICCI

#### **D. Initiatives (Centre of Excellence, Technology Business Incubators, S&T Parks and Accelerators)**

In order to promote R&D activities in HEIs, government has undertaken initiatives, such as creation of Centre of Excellence, Technology Business Incubators, S&T Parks and Accelerators where industries, academicians, government and budding entrepreneurs are placed under single roof. Other than these, various specific scholarships/fellowships and industrial chairs were promoted to bring academia and industry close to each other. These initiatives taken for promotion of R&D to bring industry and academia together are briefed below.

##### **➤ Centres of Excellence (CoEs)**

CoEs are the organizational set ups for pursuing high standards of research addressing number of socio-economic objectives. Creation of such CoEs in HEIs and research institutes has contributed to the stimulation of technological innovations in different sector. Government introduced various schemes for established of CoEs. One such CoEs working

under PPP mode is Telecom Centres of Excellence (TCOEs). These are the perfect examples of academia, industry and government working together to achieve excellence in field of R&D. They were created with an objective to promote generation of IPRs, development of new technologies, incubating innovations and entrepreneurship in telecom sector. TCOEs were conceptualized in 2007 and came into existence in 2008. Various telecom industries became sponsors for establishing TCOE in premier institutes in India such as IIT and IISc (Table 14).

**Table 14: Telecom Centres of Excellence in India**

S. No.	TCOE	Research Focus Area
a.	Aircel TCOE at IISc Bangalore	Information security and Disaster Management of Telecom Infrastructure
b.	Bharat Sanchar Nigam Ltd. (BSNL) TCOE at IIT, Kanpur	Multimedia and Telecom, Cognitive Radio and Computational Mathematics
c.	Bharti Airtel TCOE at IIT Delhi	Telecom Technology and Management
d.	Idea Cellular TCOE at IIM Ahmedabad	Telecom Policy, Regulation, Customer care
e.	Reliance Communications TCOE at IIT Madras	Telecom Infrastructure (Active and Passive) and Energ
f.	Tata Teleservices TCOE at IIT Bombay	Rural Telecom Technology
g.	Vodafone Essar TCOE at IIT Kharagpur	Next Generation Networks and Technology
h.	RailTel TCOE at IIT Roorkee	ICT and Broadband Applications

Numbers of CoEs were created by government funding agencies with an objective to develop a dedicated facility in particular research domain to promote innovation and technology development in association with industry. One such centre created by DBT is the Centre for Cellular and Molecular Platforms (C-CAMP). C-CAMP is acting as technology platform for industry interaction/collaboration, innovations and incubations. They provide number of services for research, technology development and entrepreneurship to various stakeholders such as academia, other research institutes and industries. MHRD has also created CoEs under the scheme of ‘Training and Research in Frontier Areas of Science and Technology’ (FAST). These centres possess world class infrastructure and facilities and are pursuing research as per industrial needs. 36 centres of excellence were created by MHRD in different parts of India. MHRD also established 30 CoEs under the scheme ‘Technical Education Quality Improvement Programme’ (TEQIP). Government has also announced setting up of more CoEs, to be run under PPP mode for adoption of industry oriented technologies. For instance, announcement for creation of CoE in lot technology in association with

NASSCOM, MeitY and Education and Research Network (ERNET), which was announced by government in 2016.

There are some of the industrial units who have also established CoEs for technology upgradation. They strive for technological solution from government and academia. Examples of such CoE are 150 IBM Software CoEs, created in 20 different locations in India to create generations of IT innovators.

➤ **Technology Business Incubators (TBIs)**

National Science and Technology Entrepreneurship Development Board (NSTEDB) under the aegis of DST , New Delhi has taken impactful “Institution Mechanisms Building Initiative” by building Technology Business Incubators (TBIs) all over India to incubate indigenous technology for creating technology based new enterprises, facilitating transfer of technologies and entrepreneurship development. NSTEDB has established 66 TBIs (<http://www.nstedb.com/institutional/tbi.htm>) in different parts of India in collaboration with host institute and DST. Each TBI has dedicated thrust areas and are working with mandate to build efficient technologies in their respective domains. Each TBI are acting as a role model for enhancing industrial involvement in academic research, hence leading to PPP R&D. Other than NSTEDB under DST, New Delhi, there are some other agencies which support establishment of Incubators and support technology incubation at various educational institutes and R&D organizations. For instance, BIRAC has initiated a programme of Bio-Incubators with an aim to harnesses technology generation and entrepreneurial potential of start ups by giving access to them for proper infrastructure and mentoring. Till date, BIRAC has strengthened the existing fifteen incubation facilities in the country to develop world class bio-incubation facilities. Under Atal Innovation Mission at NITI Ayog, scheme for creating Atal Incubation Centres (AICs) at different educational institutes in order to promote incubation and entrepreneurship culture has been announced. Ministry of Electronics and Information Technology (MeitY) has also established an incubation centre at Patna and Cochin, Kerala for development of Product and IP creation.

Table 15 lists of notable TBIs in different parts of India working for technology enhancement and simultaneously addressing the gap in PPP.



**Table 15: Technology Business Incubators (TBI) working for PPP**

S. No.	TBI	Brief Details
1.	<b>IKP Knowledge Park-Life Science Incubator</b> www.ikpknowledgepark.com	It was established with an aim to boost technological advancements in field of life science, pharmaceutical and biotech areas and addressing needs of industries in these respective areas.
2.	<b>Technology Business Incubator at Shriram Institute of Industrial Research (SRI-TBI)</b> www.shriraminstitute.org	SRI-TBI is acting as unique networking and technology resource centre which is equipped with latest facilities and is supported by highly skilled knowledge providers.
3.	<b>Society for Innovation and Entrepreneurship (SINE) at IIT Bombay</b> http://sineitb.org/sine/home	Initiated with the support of IIT-Bombay alumni, SINE is a platform for promotion of entrepreneurship and administers business incubator that supports technology based entrepreneurship and industrial growth.
4.	<b>Venture Centre, Pune</b> www.venturecenter.co.in	Dedicated towards technology start-ups and generating products and services by exploiting scientific expertise in the fields of materials, chemicals and biological sciences and engineering. It is a collective initiative of NSTEDB, CSIR and TDB and is a not-for-profit company which is hosted by National Chemical Laboratory (NCL), India, through which support to technological enterprises is provided by leveraging scientific competencies of the institutions in the Pune region.
5.	<b>Kalinga Institute of Industrial Technology Business Incubator (KIITBI), Bhubaneswar</b> www.kiitincubator.in	KIITBI is an initiative of KIIT University with support of NSTEDB and it offers incubation facilities and enables the incubatees to work in a secure, innovative and entrepreneurial environment as they progress through various stages of entrepreneurial development.

➤ **Science, Technology and Innovations Park**

Science, Technology and Entrepreneurship parks (STEP) were instituted by NSTEDB with a mandate of creating an environment for entrepreneurship and innovation. NSTEDB has established 15 such STEP at different locations in India in different HEIs (Table 37). The major objectives of STEP are to forge linkages among academic and R&D institutions on one hand and the industry on the other and also promote innovative enterprise through S&T persons. The department has so far catalysed 15 STEPs in different parts of the country, which have promoted nearly 788 units generating annual turnover of around ₹ 130 crores and employment for 5000 persons. More than 100 new products and technologies have been

developed in by the STEPs/STEP promoted entrepreneurs and industrial collaborators. In addition, over 11000 persons have been trained through various skill development programmes conducted by STEPs.

**Table 16: List of STEPs created by NSTEDB**

S. No.	STEPs	Technology Thrust Area
1.	STEP-Birla Institute of Technology, Ranchi	Mechanical engineering
2.	JSS Technical Institutions Campus, Mysore	Electronics and IT
3.	National Institute of Technology, Surathkal	IT
4.	Science & Technology Entrepreneurs Park (BEC-STEP), Bagalkot	Food processing, textiles and building technology
5.	Science and Technology Park, Pune	IT and innovative technologies
6.	Maulana Azad National Institute of Technology, Bhopal	IT and innovative technologies
7.	Thapar University, Patiala	Agribiotechnology, biofertilizer, food biotechnology, tissue culture
8.	Guru Nanak Dev College of Engineering, Ludhiana	Mechanical and IT
9.	TREC-STEP, NIT Campus, Tiruchirappalli	Mechanical and IT
10.	PSG-STEP, Coimbatore	Mechanical and IT
11.	Harcourt Butler Technological Institute, Kanpur	Paints, chemical and IT
12.	Indian Institute of Technology , Roorkee	Environment, Materials and IT
13.	Indian Institute of Technology Kharagpur	ICT, big data analytics, advanced manufacturing, agriproducts and machinery, healthcare devices , bioprocess and bioproducts
14.	NSIC Technical Services Centre, Rajkot	Energy and pumps
15.	National Small Industries Corporation Limited, New Delhi	Energy and pumps

Apart from NSTEDB, there are other organizations [Ministry of Communications and Information Technology (Software Technology Parks of India), ASSOCHAM (Mega Food Parks); Reliance ADA Group (Dhirubhai Ambani Knowledge City)]that have created number of science and innovation parks. These science, technology and innovation parks via their R&D activities are bridging the gap between industry and academia. Table 38 lists down some of the science, technology and innovations park which are actively involved in PPP.

**Table 16: Science, Technology and Innovation Parks under PPP mode in India**

S. No.	Park	Brief Details
1.	<b>Science and Technology Park, Pune</b> www.scitechpark.org.in	It was established by NSTEDB with an objective to create wealth from innovation and R&D activities. It has various linkages with European union and DST for skill enhancement, USAID-India and UNEP. It has various industry association as its members like Indo-Japan Business Council to promote industry, trade and commerce; Indian Green Building Council.
2.	<b>Science and Technology Entrepreneur's Park (STEP) at IIT Kharagpur</b> http://www.step-iit.org/	STEP was established in IIT Kharagpur with support from Government of West Bengal, DST and financial assistance from IDBI, IFCI, ICICI. It is working in harmony with other incubation programmes of IIT Kharagpur such as technology Business Incubator, Technology Incubation and Entrepreneurship Training Society (TIETS) to facilitate technology transfer to the industrial segment.
3.	<b>Indian Science and Technology Entrepreneurship Parks and Business Incubator Association (ISBA), Noida, UP, India</b> www.isba.in	ISBA is the only pan India network of Business Incubators and has an abundance of expertise and knowledge base in technology business Incubation. A unique feature is its diversity, with member organisations coming from academic institutions / universities of repute such as IIM-A, IIT Bombay, IIT Kanpur, University of Pune, NIT Trichy, NIT Surathkal, NID, VIT University, PSG etc., R&D organisations such as NCL, ICRISAT, NDRI etc. and other technology parks such as ICICI Knowledge Park, technopark etc.
4.	<b>IKP Knowledge Park, Hyderabad</b> www.ikpknowledgepark.com	It is ICICI Knowledge Park and is India's premier science park, facilitating business driven R&D for over a decade now. IKP Knowledge Park has promoted 65 companies so far, and is currently associated with 47 of them. It has also facilitates technology transfer between Indian research organizations and local and global industries. Moreover, it educates local industries, entrepreneurs for IP rights and technology licensing.

## ➤ Accelerators

Accelerators are the entrepreneurship grooming organizations that promote indigenous start-up culture. It is comparatively new concept that India is following. Setting up of accelerators has aided in enhancing start-up culture in India. Some of the accelerators instituted in India are as follows:

**Table 17: Accelerators in India**

S. No.	Accelerator	Brief Details
1.	<b>Times Internet Limited Labs (Tlabs), New Delhi and Bengaluru</b> <a href="http://tlabs.in/about-us/">http://tlabs.in/about-us/</a>	<ul style="list-style-type: none"> <li>• It aims to develop entrepreneur's ideas to their potential and bridge the gap between entrepreneur and investor community.</li> <li>• It provides access to more than 100 experts to mentor entrepreneurial idea. It also provides seed capital fund to develop the idea into reality.</li> <li>• The programmes occurs in phases which start with hypothesis development, deep validation, strategic direction and business planning and financing to make an individual or group of individuals ready to set up a venture</li> </ul>
2.	<b>GSF Global Accelerator, Gurgaon, Bengaluru and Chennai</b> <a href="http://www.gsfindia.com/accelerator/">http://www.gsfindia.com/accelerator/</a>	<ul style="list-style-type: none"> <li>• It composes of 13 weeks programme in order to foster innovation and start up culture in country in area of digital economy. It was designed to support product-oriented start-ups.</li> <li>• This Accelerator invests around \$50k at 7-8% equity into product oriented start-ups which are inducted into the Accelerator program.</li> </ul>
3.	<b>Microsoft Accelerator, Bengaluru</b> <a href="https://www.microsoftaccelerator.com/locations/bangalore">https://www.microsoftaccelerator.com/locations/bangalore</a>	<ul style="list-style-type: none"> <li>• It is 4-6 months programme where Microsoft representatives and associated partners provide tools, resource, connection and knowledge expertise to budding start-up to get converted into successful company.</li> </ul>
4.	<b>Startup Village, Kochi</b> <a href="https://www.sv.co/?redirect_from=startupvillage.in">https://www.sv.co/?redirect_from=startupvillage.in</a>	<ul style="list-style-type: none"> <li>• It is run by Indian government to support start ups in field of agriculture.</li> <li>• It mentors the start-ups till the end when they start earning revenues and provides them start-up village angel fund</li> <li>• It is working impressively with portfolio of launching ~1000 companies in last 10 years</li> </ul>

5.	<b>iAccelerator, Ahmedabad</b> <a href="http://www.ciie.co/">http://www.ciie.co/</a>	<ul style="list-style-type: none"> <li>• It is an initiative of IIM, Ahmedabad for promoting innovation in field of internet and mobile technologies.</li> <li>• Expertise support in areas of technology development, product development and management, marketing and customer acquisition is provided along with seed fund to develop idea into reality.</li> </ul>
----	---	---

These accelerators give good exposure the network of angel investors in India, budding ventures and number of industry services and support mechanisms for emerging R&D start-ups. These accelerators provide hand holding services for formation of company at any critical point of their growth. More of such accelerators should come up which can be run by either government agencies or industry representatives/venture capitalist or under PPP mode. Such accelerators are quite common in Israel where they have contributed to the development of R&D Based MSMEs.

#### 4. Summary

The emergence of India as a major global economic power calls for high levels of technological freedom but unfortunately the growth of technology has remained disunited and unlinked. This is due to the fact that the R&D activities of both the public and the private sector have remained disconnected from each other thereby creating a large gap in technology development and technology deployment. Synergies between academic basic research and industrial applied research have to be established to generate mutual added worth. To achieve this synergy it is imperative to create a PPP framework engaging both the public and the private sectors leading to multivariate use of knowledge, innovations, technologies and value creation of R&D activities.

Present chapter focuses on different PPP models existing in India, under three broad categories as:

1. **Government-Industry Initiatives (GII)**
2. **Industry-Academia Initiatives (IAI)**
3. **Government-Academia-Industry Initiatives (GAI): Triple Helix Model**

Under Government-Industry Initiatives, initiatives taken by government and industry for mutual benefits are presented. Research institutes, such as 'Indian Plywood Industries

Research and Training Institute' (IPIRTI), Bengaluru and 'Automobile Research Association of India' (ARAI), Pune were created collaboratively by industry and government organizations and are working exclusively for enhancing industrial sector in their respective domains. IPIRTI was created by Ministry of Environment, Forests and Climate Change in association with plywood industries. The institute carries out R&D activities, training, testing and standardization services for industries. It has carried out 28 in house projects for collaborated industries, 13 sponsored projects and 3 consultancy projects of industries. It is in fact the only research institute dealing with plywood industries. ARAI was established as co-operative industrial research unit by automobile industry and Ministry of Industries, GoI. It is dealing with R&D activities in field of automobiles. ARAI is advancing in its income profile. In the year 2013-14, ARAI's income was of total worth ₹ 19014 lakhs and major chunk of its income comes from R&D activities carried out for industries. Many government organizations have created dedicated institutes that are working for industrial growth. Examples of such institutes, such as Ministry of Micro, Small and Medium Sized Enterprises (MSMEs) established institutes like 'Mahatma Gandhi institute for Rural Industrialization', 'National Institute for Micro, Small and Medium Enterprises' and 'National Small Industries Corporation' for assisting development of MSMEs in India. On the other hand, Department of Industry Policy and Promotion, GoI, has supported various autonomous institution, such as 'Central Pulp and Paper Research Institute' (CPPRI), 'Central Manufacturing Technology Institute' (CMTI) and 'National Council for Cement and Building Materials' (NCCBM) for assisting industrial research in respective domains. Under government-industry initiatives, number of programmes floated by government agencies for strengthening industrial sector is presented. Few of such schemes are 'Technology Development Board' instituted by Department of Science and Technology, New Delhi; 'Promoting Innovations in Individuals, start-ups and MSMEs' (PRISM) AND Technology Development and Demonstration Programme'(TDDP) initiated by Department of Scientific and Industrial Research (DSIR); 'DRDO-FICCI-ATAC' Programme of Department of Research and Development Organization (DRDO) and many more. Other government-industry initiatives include the incentivization of private sector which are recognized by DSIR to avail government benefits in form of tax rebate and custom/excise duty waiver on R&D inputs of industries. Moreover, government organizations like Department of Atomic Energy (DAE) have also established exclusive industrial units to supply hazardous and radioactive material to industries for R&D. Second category of PPP includes Industry-Academia Initiatives. Under this category, industrial role in academia is reviewed. Industries have set up close collaboration with

academia in terms of R&D activities. For example, industries have set up laboratories and dedicated units in academia, introduced number of scholarships and fellowships and sponsored chairs in academia. These steps undertaken by industries are one of the successful models of Industry-Academia Partnerships. Industry has also supported creation of specific cells in academia for assisting R&D activities and technology development and deployment from the academia to the industry along with enhancing entrepreneurship culture. Amongst Higher education institutes, IITs are leading in above mentioned Industry-Academia Initiatives. On the other hand, academia has also created I-A enablers, such as I-A cells which deal with Sponsored Research And Industrial Consultancy Cells, Entrepreneurship and innovation Cells for stimulating entrepreneurship and Technology Development and Intellectual Property Cells.

Existing PPP models were further studies under category of Government-Academia-Industry Initiatives that comes under Triple Helix Model. Under this section, creation of autonomous academic institutes by government on demands of industry and their support are reviewed. For example, Bombay College of Pharmacy (BCP), Mumbai and Institute of Chemical Technology (ICT), Mumbai was established on demands of industries and central and state government supported the creation of these institutes. Both these institutes are ranked top in Industry-Academia linkages in pharma and chemical sector by survey carried out by AICTE-CII. BCP has established dedicated Industry Institute Interaction Cell that coordinates with industries getting associated with BCP. Industry representatives are part of governing body and curriculum design committee of BCP and have resulted in functioning and course structure of BCP is in accordance with industry needs. BCP has delivered more than 300 industrial R&D projects. In last four years (2012 onwards), BCP has carried out 81 industrial projects worth ₹ 1 Cr. Revenue generated from industrial sponsored and consultancy projects are utilized for faculty salary and institute development. Strong industrial collaborations of BCP have resulted into establishment of various laboratories in BCP by industrial units. On the other hand, ICT-Mumbai is a premier institute of India which has been ranked number 2 under the National Institutional Ranking Framework (NIRF) as declared by MHRD, GoI during April 2016. Since inception it has generated more than 500 entrepreneurs. It has successfully completed around 320 government sponsored projects and 318 industry sponsored projects. The number of Industry consultancies conducted till date is around 269 and many of the scientists actually earn their salaries through the consultation fees paid by the collaborating industry. During the last 10 years, ICT-Mumbai has filed a total of 310

patents and in the year 2014-15, ICT-Mumbai with faculty strength of 82 published 382 international publications. ICT-Mumbai enjoys various industry sponsored faculty positions and industry endowments. Under the Government-Academia-Industry Partnerships, creation of dedicated agencies by government, such as 'Biotechnology Industry Research Assistance Council' BIRAC and CSIR-Tech are also briefed. These organizations are effectively bringing industry and academia together for R&D activities and boosting entrepreneurship culture. BIRAC provides funding support in form of grants to SMEs in order to stimulate R&D activities and promoting innovation amongst SMEs (funds were created involving ₹1300 Cr from BIRAC and ₹750 Cr from Industry). BIRAC has also promoted I-A collaborations to explore innovations in biotech sector to be identified and commercialized for generating affordable products of social relevance [BIRAC through its schemes (SBIRI, BIPP and CRS) has led to 121 collaborative projects, out of which 108 I-A collaborative projects and 13 Industry-Industry collaborative projects]. CSIR-Tech is Pune based private Limited company established in 2011. The major partners of CSIR-Tech are CSIR (a conglomerate of public funded R&D labs), State Bank of India (a public funded financial services company) and Venture Centre (a technology business incubator). CSIR-Tech works for the commercialization of Intellectual Property (IP), know-how and technology emerging from public and private R&D labs as well as academic institutions. CSIR-Tech provides services like, Technology Venturing, India Science Venture Fund, Technology Commercialization, Market Insights and Consultancy. CSIR-Tech is associated with CSIR labs, IITs, DAE, ICAR, Industry Association and universities (public & private) to aid them to encourage academic entrepreneurs who want to get involved in knowledge intensive ventures. Government funding agencies have also commenced various programmes for supporting Industry-Academia collaborative research such as 'New Millennium Indian Technology Leadership Initiative' (NMITLI) sponsored by CSIR, 'Schemes for Funding Industry Relevant R&D' (Under SERB) by DST and 'Advanced Composite Programme' by TIFAC and many more. Moreover, initiatives taken by government and private sector for establishing Technology Business Incubators, Centre of Excellences, S&T Parks and Accelerators have catalysed the Government-Academia-Industry Partnership in promoting R&D activities and technology development.



## Annexure I

### **Pfizer-Foundation for Innovation and Technology Transfer (FITT)**

<http://fitt-iitd.in/>

GoI established FITT in 1995 in the campus of Indian Institute of Technology, Delhi (IIT-D), a premier engineering institute of India by GoI as the first I-A interface (FITT Annual Report, 1994-95). The GoI at that time provided an amount of ₹ 16.2 million as an aggregated fund to IIT-D for initiation and build up of FITT. The centre was set up as an autonomous and self governing body, to act as a single window utility to the industrial sector with complete professionalism and function as a marketing arm for the IIT-D developed technologies (Sengupta, 2009).

The broad organizational structure is composed of a) Governing Council and b) Research Council. The governing council consists of representatives from industries; industrial associations and nominee from MHRD, selected nominated members from IIT-D senate and its board of governors. On the other hand, research council is composed of selected faculty members of IIT-D having experience in I-A collaborations. The management is vested with the managing director of the organization, guided by governing council and research council.

#### **Programs and Services at FITT**

Since the inception of FITT, a large number of programs and initiatives have been introduced in an effort to catapult the I-A linkages to the next level. The programs initiated by FITT can broadly be categorized as the following:

- a) Incubation Centers
- b) Research/Technology Development Projects
- c) Knowledge Augmentation Courses
- d) IPR Management Programmes
- e) Corporate Partnership for the Industrial Sector
- f) Government Schemes
- g) Memorandum of Understandings (MoUs) with Private Sector
- h) FITT Awards and Recognitions

### a) Incubation Centers

In an endeavor to promote entrepreneurship and start-up companies, FITT initiated the task of setting up incubators on the campus of IIT-D. These incubation centers were set up with the aim of providing the entrepreneurs with space for a prototype laboratory and other basic infrastructural and instrumentation facilities, without getting into the hassle of paper work. In addition, FITT also promotes start-ups having credible business plan(s) with focused knowledge. The incubator centre provides facilities such as product innovation, product development, software testing, pilot experimentation, prototype development, industrial training etc. and works in close coordination with the institute. Major activities of incubation centers are Technology Business Incubation Unit (TBIU), Bio-Incubator Facility, Science Parks and the units set up under Bio-Accelerator Programme.

Various incubation facilities provided by FITT are as under:

#### ➤ Technology Business Incubation Unit (TBIU)

TBIU was started in 2000 under the aegis of Technology Institution Program (TIP), as a part of the Industrial Credit and Investment Corporation of India (ICICI)/World Bank Funded TIP at IIT-D (Bhattacharya, 2005).

Under this scheme, the start-ups/technology entrepreneurs are provided with an initial seed money and space for converting new ideas/concepts/service into a business opportunity that is commercially viable. TBIU, permits activities such as innovative product development, software development and testing, simulation and prototyping, pilot scale experimentation and training. FITT not only provides modern infrastructure but also provides for hand-holding, managerial and material support for establishing themselves. In return, minimal space utilisation charges and equity share of the company rests with FITT.

A list of resident companies in TBIU in the year 2014-15 is mentioned in Table 1.

**Table 1: Start-Ups Resident at TBIU during the Financial Year 2014-15**

S. No	Start-Up	Work Area
1.	<b>Novo Informatics Pvt. Ltd.</b> ( <a href="http://novoinformatics.com">http://novoinformatics.com</a> )	Bridging the gap between bio-informatics and experimentation
2.	<b>Wring Nano Systems Pvt. Ltd.</b> ( <a href="http://www.truehb.com/team.php">http://www.truehb.com/team.php</a> )	Advanced bioelectronics technologies (e.g. hemometer)

3.	<b>PLANiN Innovation and Consultancy Services Pvt. Ltd.</b>	Basket of innovative products with proprietary technologies (e.g. vehicool, smart wipes and flexible notice board)
4.	<b>Silver Knight Technologies Pvt. Ltd.</b> ( <a href="http://www.silverknight.info/">http://www.silverknight.info/</a> )	Development of Anti-theft bag with unique features like pilfer proof casing, unique zip and lock mechanism & track and trace system
5.	<b>Carbon Neutral Technologies Pvt. Ltd.</b>	Develop an alternative manufacturing process for isoprene
6.	<b>Kentellus Welding and Manufacturing Pvt. Ltd.</b>	Production of welding electrodes of better quality using green technology
7.	<b>Ekam Eco Solutions Pvt. Ltd.</b> ( <a href="http://www.ekamecosolutions.com">www.ekamecosolutions.com</a> )	Ecological solutions in the field of sanitation, water conservation, nutrient recovery and sustainable habitat
8.	<b>Inkilab Technologies Pvt. Ltd.</b> ( <a href="http://www.inkilabtechnologies.com">http://www.inkilabtechnologies.com</a> )	Diagnostics based technologies to facilitate process design
9.	<b>Credext Technologies Pvt. Ltd.</b> ( <a href="http://www.credexttechnologies.com">http://www.credexttechnologies.com</a> )	Development of falcon virtual PC device that enables a user to access his/ her desktop at remote locations
10.	<b>Creditas Solutions Pvt. Ltd.</b>	Developing online platform for debt negotiation and settlements
11.	<b>Innovator Lab Consultants India Pvt. Ltd.</b> ( <a href="http://www.innovatorlabindia.com">http://www.innovatorlabindia.com</a> )	Development of mechanical heart valve fixation system
12.	<b>VM Trans Innovations Pvt. Ltd.</b>	Development of intelligent online platform for road transport management and exchange system

Source: FITT Annual Report, 2014-15

The above-mentioned list of start-up companies is just a glimpse of what TBIU has done in order to promote entrepreneurship via the I-A interface. In the last two decades, there have been innumerable start-ups and incubatees at TBIU and quite a few of them have graduated and are working independently as successful, self-sufficient, profit generating companies (Table 2).

**Table 2: List of a Few TBIU Start-Ups Graduated into Successful Companies**

S. No.	Name of the Incubating Unit	Technology /Product /Process in incubation	Residency	
			Entry	Exit
1	M/s eCapital Solutions Pvt. Ltd. / Trigyn Technologies (I) Pvt. Ltd.	Telecommunication and internet application	1999	2001

2	<b>Sintex ESCO</b>	R&D on insulated lightweight prefabricated building structures for thermal comfort and energy conservation	2001	2003
3	<b>M/s INRM Consultants Pvt. Ltd.</b> ( <a href="http://inrm.co.in">http://inrm.co.in</a> )	GIS based integrated watershed management	2002	2004
4	<b>M/s KritiKal Solutions Pvt. Ltd.</b> ( <a href="http://www.kritikalsolutions.com">http://www.kritikalsolutions.com</a> )	Computer vision and image processing, wireless adhoc networks	2002	2005
5	<b>M/s Mechartes Researchers Pvt. Ltd.</b> ( <a href="http://www.mechartes.com">http://www.mechartes.com</a> )	Software products for simulation of product development in auto component industry	2005	2008
6	<b>M/s SM OnYoMo Infotech Pvt. Ltd.</b>	Consumer searches over the internet	2005	2009
7	<b>M/s LeadInvent Technologies</b> ( <a href="http://www.leadinvent.com">http://www.leadinvent.com</a> )	Novel drug discovery & computational biology	2007	2010
8	<b>M/s Appin Software Security Pvt. Ltd.</b> ( <a href="http://www.appinonline.com">http://www.appinonline.com</a> )	Software security	2007	2009
9	<b>M/s Care-pro Biotechnologies Pvt. Ltd.</b> ( <a href="http://www.careprobio.com">http://www.careprobio.com</a> )	Fermentation based biomolecules	2007	2010
10	<b>M/s. Sunurja Renewable Energy Pvt. Ltd.</b> ( <a href="http://www.sunurja.com">http://www.sunurja.com</a> )	Design and development of renewable energy solutions	2008	2011
11	<b>M/s. Faros Technologies Pvt. Ltd.</b> ( <a href="http://www.farosindia.com">http://www.farosindia.com</a> )	Development of simulator sub components, simulators and providing simulation services	2008	2013
12	<b>M/s. Innovative Transport Solutions Pvt. Ltd.</b> ( <a href="http://www.itrans.co.in">http://www.itrans.co.in</a> )	Scientific and technical solutions for traffic and transport systems and development of models for sustainable transport for cities	2008	2012
13	<b>Gram Vaani Community Media Pvt. Ltd.</b> ( <a href="http://www.gramvaani.org">http://www.gramvaani.org</a> )	Building innovative models of media delivery for rural areas of india	2009	2013
14	<b>Yonyx Infomedia Pvt. Ltd.</b>	Building teacher replication platform to enable teachers to pack instruction with predicted student interaction	2010	2012
15	<b>Innovative Mechatronix Solutions Pvt. Ltd.</b>	Design, development and manufacture of micromachining system, mass production finishing processes and mechatronic embedded systems	2010	2013
16	<b>Simplyfeye Softwares Pvt. Ltd.</b> ( <a href="http://www.simplyfeye.com">http://www.simplyfeye.com</a> )	User-friendly operating platform for biopharmaceutical manufacturers to capture, share and analyze information from biopharmaceutical processes	2010	2013
17	<b>Genesis Location Services Pvt. Ltd.</b> ( <a href="http://genesis-locationsservices.com">http://genesis-locationsservices.com</a> )	Location based products and services	2011	2014
18	<b>Novo Informatics Pvt. Ltd.</b> ( <a href="http://novoinformatics.com/">http://novoinformatics.com/</a> )	Scientific software application products/tools	2011	2014
19	<b>Wring Nano Systems Pvt. Ltd.</b> ( <a href="http://www.truehb.com/team.php">http://www.truehb.com/team.php</a> )	Advanced blood haemoglobin testing	2012	2014

20	<b>Ekam Eco Solutions Pvt. Ltd.</b> ( <a href="http://www.ekamecosolutions.com">http://www.ekamecosolutions.com</a> )	Ecological solutions in the field of sanitation, water conservation, nutrient recovery and sustainable habitat	2013	2015
21	<b>Inkilab Technologies Pvt. Ltd.</b> ( <a href="http://www.inkilabtechnologies.com">www.inkilabtechnologies.com</a> )	Analytics to the manufacturer on defective parts and processes	2013	2014

Source: <http://www.fitt-iitd.org>

Some of the successful examples of the start-ups graduated from FITT:

- ***Ekam Eco Solutions Pvt. Ltd.***

Ekam Eco Solutions Pvt. Ltd. ([www.ekamecosolutions.com](http://www.ekamecosolutions.com)) was initiated in financial year 2013-14 with the aim of developing and providing solutions in the field of nutrient recovery, water conservation, sanitation and sustainable habitat (FITT Annual Report 2013-14). Ekam has successfully commenced its objectives by addressing the gap in innovation and product development and is in the process of delivering out a number of innovative solutions which could be implemented at rural and urban levels.

- ***Kritikal Solutions India Pvt. Ltd.***

The first faculty-student led business incubation unit, KritiKal Solutions India (Pvt.) Ltd. (<http://www.kritikalsolutions.com>), was founded in 2002. The company started functioning as a full-scale commercial venture by the year 2005 (Annual Report, 2005-06). The main focus of the company is embedded system design and real time computer vision and imaging solutions. As of date, KritiKal can boast of significant presence in India and United States and is also extending to Europe, Africa and other parts of Asia.

- ***Gram Vaani Community Media Pvt. Ltd.***

Another successful spin-off from TBIU is GramVaani (<http://www.gramvaani.org>), based at IIT-D since 2008. The basis of this company is social technology and it provides information and community technology based solutions. This company works in collaboration with the institute and encourages interns/trainees to work on real-life problems and situations. The company is now a 35 employee strong group.

➤ **FITT as a Biotech Ignition Grant (BIG) Partner**

BIG is one of the highly successful I-A interface programmes of Biotechnology Industry Research Assistance Council (BIRAC), an autonomous body of Department of Biotechnology (DBT), GoI, New Delhi. The BIG scheme, which aims to invite proposals for the ignition grant twice a year, supports entrepreneurs from the academia and research

institutes for the commercialization of technologies resulting from research in the area of biotechnology, which has been recognized as an emerging and conspicuous area for growth. BIG has identified a few institutes, including FITT, as official partners. FITT holds the responsibility of screening the applications received; review the projects that have been shortlisted, provide mentoring in issues related to IPR, legal affairs and other business development related issues, facilitate interaction with experts of the field and other academic partners of the institute.

This is a one of a kind scheme, which aims at establishing and validating proof of concept ideas and thereby enabling spin-offs, which is now gaining pace. Some of the key projects under BIG partnerships are:

- Cutting Edge Medical Devices Pvt. Ltd. (<http://www.cemd.in>) developed portable analyzer SCINTILLA for detection of protein levels in urine samples.
- Sakosh Biotech Pvt. Ltd. is working on development of lateral flow immunoassay based rapid diagnostic tests for various infectious diseases.

#### ➤ **Bio-Accelerator Programme**

In 2013, FITT in association with National Institute of Immunology (NII) at New Delhi and BIORx Venture Advisors (<http://www.biorxventureadvisors.com>) started a Bio-accelerator programme, which laid emphasis on “accelerating innovation to marketplace” (FITT Annual Report, 2013-14). It is a joint initiative to strengthen the bio-economy of the nation by composing a ‘Master Class on Bio-entrepreneurship’. This programme is devised for working executives, research scholars and post-doctoral scientists who aspire to work towards a path of commercialization for their discovery.

#### ➤ **Biotech Incubator Facility**

DBT, GoI, has recommended supporting the setting up of a Biotech Incubator Facility at FITT, IIT-D (FITT Newsletter, October 2014). A sanction of ₹ 87 million has been granted for the incubator, for a period of initial three years. This facility, like other incubators, will support start-ups and provide incubation facilities for R&D work at minimal charges so as to promote innovation in the field of biotechnology.

FITT, with funding from BIRAC, has also established a **Biotechnology Business Incubator Facility (BBIF)** in 2014. BBIF provides incubator facilities such as specialized equipments,

experimental facility, IP guidance and market linkages to the budding bio-tech start-ups (FITT Annual Report 2014-15).

➤ **Science and Technology Parks**

The most recent endeavour of FITT is to set up S&T Parks. These parks have been conceptualised in a way such that they will have all facilities for start-ups as well as well established firms. These facilities include legal, banking, R&D, consultancy, networking spaces and so on (IIT-D eNewsletter, April 2013).

**b) Research/Technology Development Projects**

FITT is mainly involved in the transfer of technologies to the industry, initiation of joint research programs, consultancy assignments from the industry. The centre has aided the licensing of technologies developed at the institute (Table 3).

**Table 3: List of Technologies Developed at IIT-D and Licensed Through FITT Since 2002**

S. No.	Year	Technology Licensed
1.	2002-03	Know how transfer of fiber optics educational kit
		Low molecular weight organic compound using liquid carbon dioxide
		Pilling tester based on digital image processing
2.	2003-04	Three phase watt hour meter
		RUSTGARD (Industrial grade & superior grade)
		Microwave Integrated Circuit (MIC) Kit
3.	2004-05	Local FE stress analysis and know how transfer of ASME Div-two reactors for Panipat refinery expansion
		Transfer of technology for <i>Trichoderma</i>
		Drape meter based on digital image processing
4.	2005-06	Technology transfer- VCO and detector
		Technology for manufacture of alluritic acid
5.	2006-07	High pressure bio gas (Gobar Gas) enrichment and bottling system
		Statistical scenario analysis software package
		Vehicle under side scanner
		Design & development of reusable pilfer proof currency carrying FRP cases
6.	2007-08	Computer aided design of components at microwave frequencies
		Design and development of active microwave integrated circuit trainer kit
7.	2008-09	Limiting torque bolt mechanism
		A smart cane for obstacle detection for the physically impaired

		A novel back panel design for efficient heat transfer in solar cells
		Polymer composite sheets with enhanced properties
8.	<b>2009-10</b>	RF magnetron target holder
		Selective and sensitive detection of mercuric ion by novel dansyl-appended Calix[4]arene molecules via fluorescence quenching
		An apparatus and method for packet error correction in networks
		System and method for decorticating hard shell seeds and fruits
9.	<b>2010-11</b>	Development of the iontophoretic kit for a transdermal delivery of methotrexate and insulin and validation of iontophoretic parameters for diclofenac
		Odourless, waterless urinal traps and associated structures
10.	<b>2011-12</b>	An apparatus for measuring fabric hand value
11.	<b>2012-13</b>	Real time based supervisory control of AC drive
		A method for preparation of cross- linked protein coated micro-crystal
12.	<b>2013-14</b>	Knowhow for the technologies on drug discovery and proteomics
		In-plane wicking measurement system
13.	<b>2014-15</b>	A small chaperone
		Thermal NDE: Modelling framework for crack detection
		A process of generating magnetically controlled ball and smart abrasive laden shape for finishing 3D intricate shaped surface
		Odour prevention device
		Concrete vibration sensor technology

*Source: FITT Annual Reports, 2002-15*

One of the most successful projects has been the development of the ‘Smart Cane for the Visually Impaired’, which was developed as an improvement to the white cane and defeats the limitation of white cane by detecting knee above and hanging obstacles (Singh *et al.*, 2010). This unique device was developed in collaboration with Phoenix Medical Systems, Chennai (industrial partner) and Saksham Trust, Delhi (NGO working for the visually impaired). Some other successful technologies that have been developed and commercialised are “FruWash” and “EnNatura”.

FITT devotes itself to problem solving (short term) projects that help in developing better working relations with the industrial sector and confidence amongst the two and is continuously working on transferring technologies outside. During the financial year 2014-15, 96 technology development/ transfer projects of worth ₹ 168 million have been contracted. Out of these projects, 5 intellectual property (IP) licenses were executed in financial year 2014-15 (Table 4).



**Table 4: IP Licenses Executed During 2014-15**

S.No.	Title	Client
1.	A small chaperone	Theramyst Novobiologics Pvt Ltd, Bangalore
2.	Thermal NDE: Modelling framework for crack detection	GE India Technology Centre Pvt Ltd, Bangalore
3.	A process of generating magnetically controlled ball and smart abrasive laden shape for finishing 3D intricate shaped structure	Innovative Mechatronix Systems Pvt. Ltd.
4.	Odour prevention device	Ekam Eco Solutions Pvt. Ltd., New Delhi
5.	Concrete vibration sensor technology	Central Electronics Ltd., Delhi

*Source: FITT Annual Report, 2014-15*

FITT also undertakes selected investigative projects involving foreign contribution that aid in technology development and asset share between national and foreign research partners. Some of the successful foreign collaborated projects of year 2014-15 are listed in table 5.

**Table 5: Select Foreign Collaborative Projects (2014-15)**

S. No.	Title	Client
1	Optimization and growth of pyroelectric thin film stack	Ultrasolar Technologies, Inc, U.S.A
2	Optimization of chromatography process steps for purification of monoclonal antibody based therapeutics	Purolite Limited, U.K
3.	On line Devanagiri handwritten character recognition on a smartphone through touch interface	Qualcomm Inc, U.S.A
4	Polypropylene foaming and recyclability	Borealis AG, Australia
5	Advice for development of long term monitoring	Asada Lab, University of Tokyo, Japan
6	EEG signal based recognition module with low computational load	Safran, France
7	Algorithmic framework for MEMS sensor fusion applications	ST Microelectronics, U.S.A

*Source: FITT Annual Report, 2014-15*

### c) Knowledge Augmentation Courses and Professional Development Programmes

FITT understands that higher education is a continuing process and there is no limit to the enhancement of one's qualifications and in order to facilitate this increasing demand and providing a platform for working professionals, FITT in association with IIT-D, introduced several knowledge augmentation & skill enhancement courses as well as a number of short-term courses devised on emerging technologies.

- One such programme initiated was **Professional Candidate Registration (PCR)**. This course involves registration of the candidate for one semester (as per the course chosen) and is certified at the end of the program. This program is confined to the Delhi region as of now due to accessibility issues although a few selected courses are covered under the on-site delivery program by a two-way audio-video link.
- Another programme that was initiated was **Knowledge Augmentation and Skill Enhancement programme**. Various add-on courses for professionals and students have been commenced with the aim of honing the students to be job ready.

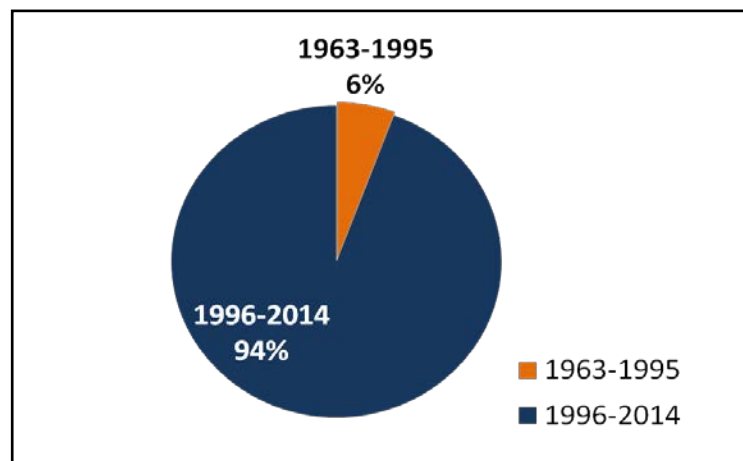
Other programmes conducted by FITT for academicians and industry employees are as follows:

- Frost & Sullivan's Technology Partnership Program: Initiated by IIT-D has access to the Frost & Sullivan's portal thereby getting useful market, technology and econometric information along with the latest updates on technology trends across a broad range of industry sectors (FITT Annual Report; 2014-15).
- Technology Incubation and Development of Entrepreneurs (TIDE) and Entrepreneurial and Managerial Development of SMEs through Incubators (MSME scheme): Adopted by FITT to endow the entrepreneurial environs and efforts to commercialize technology being made at the institute.
- FITT in association with BIRAC and Association of Biotechnology Led Enterprises (ABLE) conducted short courses on Economic and Financing of Renewable Energy Technologies and Nascent Entrepreneurship Development Programme (FITT Annual Report, 2014-15).

#### **d) Intellectual Property Rights (IPR) Management Programmes**

Another responsibility taken up by FITT is the IPR management of the institute's academic community. A number of campaigns were initiated at FITT for promoting IPR filing for novel inventions/technologies/research outputs amongst the academic community. Complete assistance for filing of applications was provided by FITT by way of evaluation of proposals for patents and other IPR applications for the final submission to Indian Patent Office (IPO) and other establishments. The decisions pertaining to the application of technologies are

taken by the IPR standing committee. The licensing policy followed by FITT is pliable and the payment terms are mutually secured. A comprehensive list of the technologies developed and being developed can be accessed from FITT website (<http://www.fitt-iitd.org>). This makes it extremely easy for the industry to search for any technologies of their interest and contact the person in question hence boosting the institute's technology commercialization. Since the inception of IPR body in 1995, FITT has seen enormous growth with respect to IP generation and technology transfer and in the process it has become more than self-sufficient financially. In the past two decades, more than 200 IPR applications have been filed in the form of patents, copyrights and designs as opposed to a mere count of 15 patent applications filed from IIT-D between the years 1963 and 1995 i.e. before the inception of FITT (Fig. 1).



**Figure 1: Patents Filed Before and After the Inception of FITT**

*Source: FITT Annual Report, 1994-95, 2012-15*

#### **e) Corporate Partnership**

FITT has also started a corporate partnership program on the payment of nominal annual fee, for public and private sector industries, ministries and organizations and industry associations and financial institutes, and offers the advantage of concessional services to its members. The corporate members are regularly updated with the information of various programs at the institute and other opportunities of collaboration. The corporate members receive, among other benefits, advance notifications of all patent applications/technologies available and marketed by FITT, customized research presentations and seminars, industrial trainings and workshops, newsletters and select information. Most significant, however, is the advantageous working relation that the member develops with FITT thereby allowing them to

gain access to research performed at IIT-D, as well as a variety of local businesses and services.

As of date, more than 250 companies worldwide have benefited from the programs of FITT (<http://www.fitt-iitd.org>). This number speaks volumes not only about the success of the organization but also about the way in which the industry is ready to collaborate with the academia. Some corporate members that are a part of this are: Pfizer India Pvt. Ltd., L'Oreal India Pvt. Ltd., LG Electronics India, Fresenius Kabi Oncology Ltd., Samsung Research Institute, Delhi, Dabur Research Foundation, Cube Software Pvt. Ltd., Reliance Industries Ltd., National Thermal Power Corporation, Bharat Heavy Electricals Ltd, Munjal Showa Ltd., JCB India, Canon India, Danfoss Industries, Carborundum Universal, Tata Chemicals, Jubilant Organosys Ltd., National Research and Development Corporation and Indian Grameen Services.

Recently, FITT has collaborated with one of the leading pharmaceutical company Pfizer for promoting healthcare innovations in country by commencing IP programme for young entrepreneurs (Laha, 2015) to provide training and short courses in IP related issues and also to support development of technologies in healthcare sector. Under this corporate collaboration individual support system for healthcare innovations are provided. This programme needs direct involvement of BBIF of FITT which was set up only a year ago to meet growing demands among biotechnology/ healthcare sector. The collaboration has resulted into “the Pfizer IIT Delhi Innovation and IP Programme (PIDIIP)” which will provide funding support of upto ₹ 4.8 million, mainly into two sectors one is from idea to IP and other is IP support. Gamut of advantages can be availed by health science innovators in this facility where technical manpower from different fields such as engineering, life sciences and healthcare are engaged towards finding solutions for demanding assignments and to develop innovative healthcare products which will cater to some of the critical issues that our country faces in the healthcare sector (Laha, 2015).

#### **f) Government Schemes**

FITT is also actively involved in the facilitation of all technology based government schemes. It provides for background checks on government technology development projects. Some of the prominent government schemes that are facilitated by FITT are listed below

- *N-WISE*: The National Information System for Science and Technology [NISSAT– Department of Scientific and Industrial Research (DSIR)] Window to Information Services to Entrepreneurs was initiated in 2001-02.
- *Technopreneur Promotion Program (TePP)* by DSIR and Technology Information, Forecasting and Assessment Council (TIFAC) of the DST: FITT has taken up various modules to enhance the environment of entrepreneurship and technology transfer at the institute, one of them being TePP. FITT is a partner in the program initiated by DSIR & TIFAC and also one of the TePP Outreach Centres (TUCs), wherein a financial support of up to ₹ 1.5-4.5 million is provided by DSIR and all the technical support & mentoring for development of an idea/prototype of the project is provided by FITT.
- *Entrepreneurial and Managerial Development of Small and Medium scale Enterprises (SMEs) through Incubators*: This scheme was started for the promotion of knowledge/technology based innovative ventures, in all fields of science and technology, to improve the competitiveness of SMEs, through a financial support of up to ₹ 40.1 million.
- *PRISM (Promoting Innovation in Individuals, Start-ups and MSMEs)*: This program initiated under the aegis of DSIR, aims to support one of the most crucial agenda of the XII<sup>th</sup> Five Year Plan (2012-17) i.e. inclusive growth and development. This program, which is offered in two phases, promotes the development of technologies needed in the market and the transfer of IP of such developed technologies, which is where a major gap lies, mainly due to the lack of funds by start-up firms. FITT as a confederate, through this scheme helps in promotion of the development of such technologies, which could otherwise be shelved only due to lack of resources.
- *Department of Information Technology-Technology Incubation and Development Entrepreneurs (DIT-TIDE)*: Department of Information Technology (DIT) has introduced Technology Incubation and Development of Entrepreneurs (TIDE) for providing seed support in the area of IT. FITT has partnered for promoting this scheme, which provides incubators during early stages of the development of various IT and ITES enabled firms.

### **g) Memorandum of Understanding (MoU)**

Formal agreement between FITT and other institutes/industrial partners has been set up to promote innovation and technology transfer. Some of the advantageous MoUs (2014-15) are mentioned below

- MoU with the **American Society for Quality (ASQ) India Pvt. Ltd.**: An MoU was signed with ASQ India Pvt. Ltd., with a central agenda of achieving forwardness in knowledge/adeptness and its implementation for the benefit of IIT-D community in fields of engineering and management sciences
- MoU with **Security Printing and Minting Corporation of India Ltd. (SPMCIL)**, New Delhi for focusing on research collaborations in the domain of common interest. Vide this memorandum, the training and exchange of expertise shall also be undertaken amongst the two stakeholders.
- MoU with **Wallonia Foreign Trade and Investment Agency (AWEX)**, Belgium. The main aim of this MoU was to evolve strong and globally competitive companies from path breaking start-ups with Wallonia as a hub for their expansion in Europe for obtaining market access in the European Union.

### **h) FITT Awards and Recognitions**

FITT, in order to promote the spirit of innovation and entrepreneurship has launched various appreciation ceremonies in the form of awards and rewards. These activities are generally carried out in collaboration with various corporate players and are as follows.

- **Launch of Industrial Credit and Investment Corporation of India (ICICI)-Trinity program**: The program launched by ICICI for budding entrepreneurs is an initiative of the bank to reward innovation and entrepreneurship amongst the youth community in India. The ICICI Trinity programme comprises of three stages – idea generation, prototype and be an entrepreneur. This program has been launched in several top institutes across the country, with IIT-D being one of them.
- **POSOCO power system award (PPSA)-2015**: The Power System Operation Corporation (POSOCO), a wholly owned subsidiary of Power Grid Corporation of India Ltd., launched these awards, in the form of cash prizes, to recognise the outstanding contribution made in the field of power systems and its related fields. The collaboration with FITT encompasses the IITs and National Institute of Technologies

(NITs). This award aims to bring about cutting edge research in the field of power systems by cultivating and nurturing the individuals for the same.

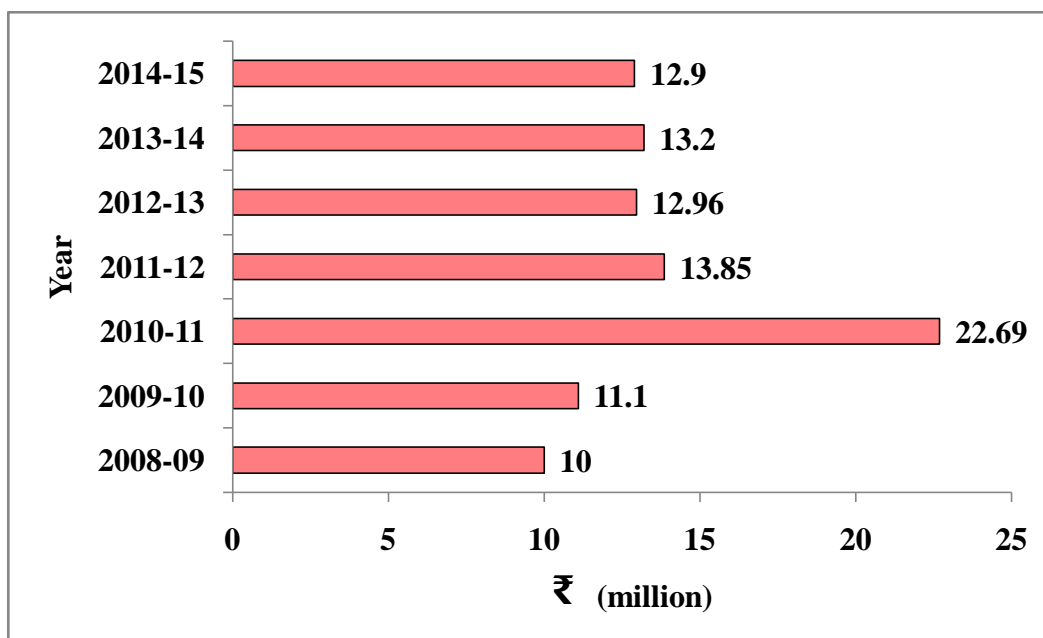
FITT has instituted awards for Ph.D and M.Tech/ M.S projects. The best industry relevant projects(in both the programmes) are provided financial and marketing assistance to incubate their project.

### **Financial Synopsis**

FITT has not only promoted the intellectual and infrastructural facilities of IIT-D but also added industrial relevance and commercial value to the academic knowledge/ research being performed at IIT-D. Among the many functions and objectives of FITT, marketing and business development is one of the most important aspects of FITT. It is the only way of advertising the expertise available at IIT-D that led to enormous asset generation for FITT and IIT-D.

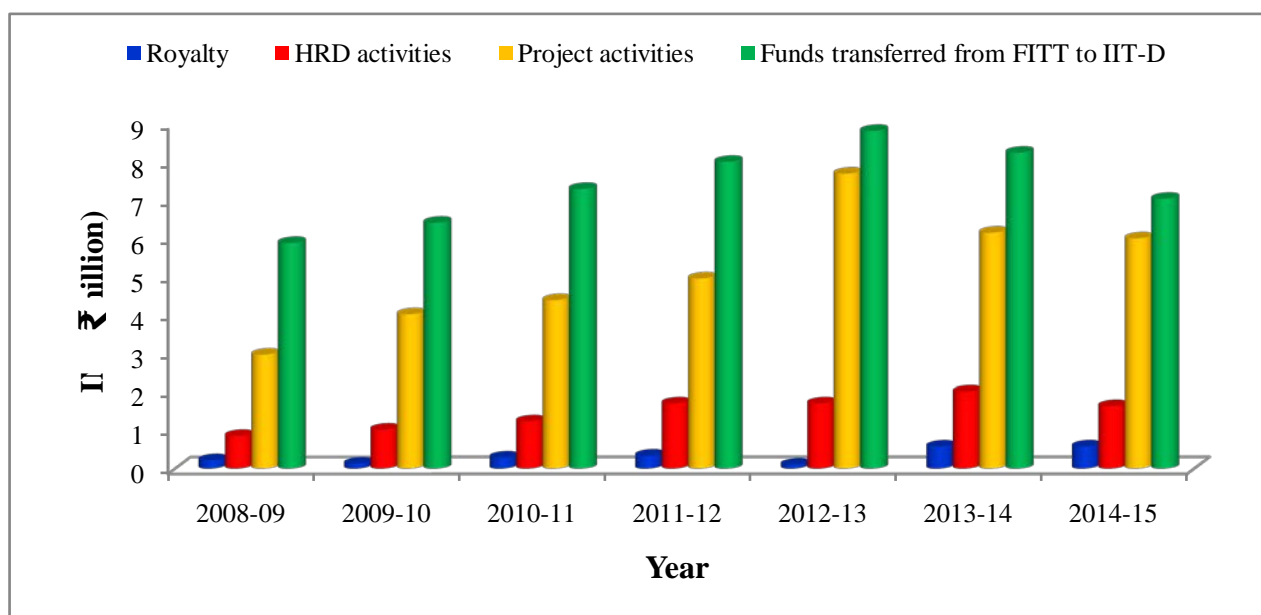
FITT has bank deposits and bonds worth ₹ 356 million in financial year 2014-15. Major earnings of FITT came from interests (₹ 33 million), project activities (₹ 6.6 million) and corporate membership fees (₹ 0.1 million) for the year 2014-15. On the other hand, total expenditure of FITT cost around ₹ 13 million. Thereby, leading to an operational growth worth ₹ 177 million from projects and other activities performed in financial year 2014-15.

Financial assets generated by FITT were achieved by conducting I-A summits, active participation in industry exhibitions at national and international level, publication of a quarterly bulletin, regular propagation of knowledge about IIT-D and FITT through means of articles and write ups in newspapers/magazines and occasional promotional advertisements, initiating corporate membership scheme for the industry, establishment of relationships with associations like Federation of Indian Chambers of Commerce and Industry (FICCI), Associated Chambers of Commerce & Industry of India (ASSOCHAM), Confederation of Indian Industry (CII) and so on. Figures 5.5 and 5.6 depicts the asset and resource generation for IIT-D by FITT since 2002.



**Figure 2: Asset Generation (Infrastructure, Equipments and Transfer of Funds) from FITT for IIT-D**

Source: FITT Annual Report, 2008-15



**Figure 3: Resource Generation for FITT and IIT-D**

Source: FITT Annual Report, 2008-15

## D. I-A Enablers

HEIs possess various R&D enablers for enhancing industry collaborated research in academic institution. These enablers are listed below



1. Industrial Research Cell (Sponsored and Consultancy)
2. Intellectual Property Cells
3. Technology Development Cell
4. Entrepreneurship and Innovation Cells

Notable examples of each in academic institutions are given in table below.

**Table 6: R&D Enablers in Higher Education Institutes (HEIs)**

S. No.	HEIs	I-A Cell / Centre
1.	IIT Kharagpur	Sponsored Research & Industrial Consultancy (SRIC) Cell
2.	IIT Bombay	Industrial Research & Consultancy Centre (IRCC)
3.	IIT Madras	Industrial Consultancy and Sponsored Research (IC&SR) Centre
4.	IIT Kanpur	SIDBI Innovation and Incubation Centre (SIIC)
5.	IIT Patna	Sponsored Research and Industrial Relations Unit (SRIRU)
6.	IISc Bangalore	<ul style="list-style-type: none"> <li>• Centre for Scientific and Industrial Consultancy (CSIC)</li> <li>• Society for Innovation and Development (SID)</li> <li>• Intellectual Property (IP) Cell</li> </ul>
7.	Panjab University, Chandigarh	Centre for Industry Institute Partnership Programme (CIPP)
8.	Amity University, Noida	Industry Interaction Cell
9.	Anna University, Chennai	Centre for Intellectual Property Rights (IPR)
10.	Punjab Agriculture University, Ludhiana	Technology Marketing and IPR Cell
11.	Jadavpur University, Kolkata	Industry Institute Partnership Cell
12.	University of Agricultural Science, Bangalore	University Consultancy Cell

## Annexure II

### **Bombay College of Pharmacy, Mumbai**

www.bcpindia.org

Bombay College of Pharmacy (BCP) affiliated to University of Mumbai, is one of the premier pharmacy colleges in India, imparting quality pharmacy education and research. It was established in 1957 by the Indian Pharmaceutical Association-Maharashtra State Branch (IPA-MSB) with financial assistance from several pharmaceutical conglomerates and Government of Maharashtra to address the needs of pharma industry. Within few years of its establishment, number of graduate, master and doctorate programmes were started in particular branches of pharmaceutical sciences. Since its inception, BCP has grown in stature, and has generated more than 3500 pharmacists, ~700 M. Pharma and ~100 Ph.D. graduates.

BCP is providing master's and Ph.D. programmes through which research in various domains such as Pharmaceutics, Pharmacology and Toxicology, Pharmaceutical Chemistry, Pharmacognosy and Pharmaceutical Analysis is carried out. BCP has formed the research society which is recognized by DSIR, GoI. It has established world class facilities, state of the art instruments and equipments. Research is highly promoted in the college, faculty members have received number of research grants worth ₹100 million from Government funding agencies (DST, DBT, ICMR, UGC and AICTE) and ~₹10 million from private sector. Number of Industry-Academia (I-A) collaborative projects are undertaken in BCP. Till date, More than 300 industry sponsored projects have been successfully completed by BCP. The college has built up effective interface with the industrial sector in term of industrial trainings, industry sponsored projects, consultancy and faculty exchange.

BCP has been accredited with the “Best Industry-Linked Institution in Pharmacy” according to the national survey carried out by AICTE in collaboration with CII, consecutively from past three years (2013 onwards).

#### **Industry-Academia Interface**

BCP has developed strong industrial linkages and is documented as one of the successful I-A linked institute of the country. BCP was constituted on the demand of industry which led to the full fledged functioning of BCP and it is providing continuous support to Indian pharma industry. In return, faculty receives incentives from their industrial collaborations. 20% of

total project cost for research projects and 67% of total consultancy cost for individual consultancy is paid to the faculty, who is carrying out the research project consultancy.

### **Dedicated Industrial Cell**

BCP has dedicated Industry Institute Interaction Cell (IIC) whose main objective is to act as a liaison between industries and the college. Following are the major activities of the IIC:

- Maintenance, coordination and promotion of consultancy services
- Distribution of funds that are obtained from industrial consultancy services for strengthening college’s infrastructure and resources.
- Encouraging industry to start “Industry Study Tour Programme (ISTP) internship programme” and enhancing student’s placement.
- Assist industries in obtaining tax incentives from Government by collaborating with them for R&D activities.
- Training of industry personnel.
- Exchange of personnel between the industries and BCP (such as industry personnel in delivering lectures on the latest technological development; development of curricula as per industrial needs and evaluation of projects).

BCP has also constituted ‘*Research Society*’ in association with Indian Pharmaceutical Association which is recognized by DSIR. This society manages and co-ordinates various industrial research collaborations for related industries.

### **Industrial Linkages**

#### ➤ **Governing Body and Executive Curriculum Committee**

BCP has developed close linkages with industries, through which industries have become an important component of the Executive Curriculum Committee and play essential role in curriculum and course structure designing. Eighteen industrialists from notable pharma industries are presently part of BCP’s Governing Body.

#### ➤ **Industrial Representatives as Faculty Members**

In BCP, there are notable industry representatives as faculty of BCP. They share their valuable knowledge, experiences and industry challenges with the students. They also make the students aware of the industry needs. A few of the eminent industrialists in the faculty of BCP are listed in table 1.

**Table 1: Industrial Representatives as Faculty Members of BCP**

S. No	Faculty Member	Present Designation in the Industry
-------	----------------	-------------------------------------

1.	Dr. Rao VSVV	Vice President, Nektar Therapeutics India Pvt. Ltd.
2.	Dr. Arun Bhatt	President, ClinInvent Research Pvt. Ltd.
3.	Dr. C.N. Potkar	Director, Clinical Research and Regulatory Affairs, Pfizer India Ltd.
4.	Dr. Chitra Lele	Executive Vice President, Sciformix Technologies, India
5.	Dr. Shekhar S Dawkar	Clinical Operations Manager, Amgen Technology Pvt. Ltd.
6.	Dr. Viraj Rajadhyaksha	Senior Medical Advisor, Pfizer India Ltd.
7.	Dr. Aakash Ganju	Director Clinical Operations, Johnson and Johnson, India
8.	Ms. Aditi Andrade	GCQA Specialist, Asia Pacific Global Clinical Quality Assurance, Johnson & Johnson Pharma Res.
9.	Dr. Anupama Ramkumar	Director, Arkus Clinical Trial Support Solutions, Ahmedabad
10.	Dr. Arun Nanivadekar	Medical Research Consultant, Mumbai

Moreover, numbers of guest lectures are arranged from the industry side as well. Students pursuing their final year of B. Pharma course are readily taken up by industries for internship programme where they get associated with industrial requirements and in return industry gets access to the manpower.

➤ **Industry Participation in R&D**

- **R&D Collaborative Projects:** Many R&D projects at the college are funded by pharma industry. BCP has successfully completed over 300 industrial projects. Each department of BCP has collaborations with the industry (Table 2).

**Table 2: Industrial Collaborations in Each Department of BCP**

Department	Industrial Collaborators	Details
<b>Pharmacology and Toxicology</b>	Shreya Lifesciences; Yasham P2D; Marico Ltd; ACTREC; Haffkin Institute; PCP (BDVU)	Faculty Member: 2; Patents: 3 Consultancy Services ( <i>In Last 5 Years</i> ): ~7
<b>Pharmaceutics</b>	Unichem Labs. Bayer (I) Ltd; Bombay Drug House; Novartis; Bristol Mayer Squibb; SPDS Lab India; USV Ltd; Abott India Ltd; Hanschen Probiotics; Famy Care; Glenmark Ltd; Getz Pharma; Cipla Ltd.	Faculty Member: 6; Patents: 15 Consultancy Services ( <i>In Last 5 Years</i> ): ~8
<b>Pharmaceutical Chemistry</b>	Astrazeneca Research Foundation; Bristol Mayer Squib; Biocon Ltd; Alchemy Research Centre; Ciba Speciality Chemicals Ltd; Unichem Labs.	Faculty Member: 4; Patents: 6 Consultancy Services ( <i>In Last 5 Years</i> ): ~2
<b>Pharmacognosy</b>	Omniactiv; Anazeal; Marico Ltd.	Faculty Member: 2; Patents: 1 Consultancy Services ( <i>In Last 5 Years</i> ): ~3
<b>Pharmaceutical Analysis</b>	Marico Ltd; Spring Bank Pharmaceuticals Inc.	Faculty Member: 3; Patents: 3 Consultancy Services ( <i>In Last 5 Years</i> ): ~2

- **Industry Initiated Laboratories:** BCP in association with pharma industries has set up number of laboratories and dedicated research centres such as Drug Testing Centre, Bio-

Availability Centre and Clinical Excellence Academy (Table 3). Industries have also promoted Research Fellowships e.g., Amrut Mody Research Fund (AMRF) was created at BCP out of donation from Unichem Laboratories Ltd. The main objective of this fund is to recognize and encourage research carried out in the field of pharmaceutical and allied science in the BCP and some other pharmaceutical institution in India.

**Table 3: Research Laboratories Created in BCP in Association with Industry**

<b>Research Laboratory</b>	<b>Inaugurated year</b>
The Vividhlaxi Audyogik Samshodhan Vikas Kendra (VASVIK) Research Wing	1987
M. K. Rangnekar Memorial Laboratory	1988
Bioavailability Centre	1990
Ramesh Banatwala Memorial Industrial Pharmacy Laboratory	1995
E- Merck Laboratory and Chemistry Laboratory	1996
Academy for Clinical Excellence (ACE) in Collaboration with Pfizer Global Research	2002
Nihchal Israni Microbiological Laboratory	2005

In addition, AMRF has also supported BCP for payment of faculty salary (Table 4).

**Table 4: Contribution of AMRF to Payment of Salaries to Faculty**

<b>S. No.</b>	<b>Amount of Salary (₹)</b>	<b>Year</b>
1.	9,78,215	2012-13
2.	12,55,571	2013-14
3.	11,63,716	2014-15
4.	13,04,798	2015-16
<b>Total Amount 47,02,300/-</b>		

- **Industrial Partners:** BCP has signed MoUs with many industries for providing education, training, consultancy and research projects. Table 5 represents the name of industrial collaborators of BCP in last four years.

**Table 5: Industrial Collaborators of BCP, 2012 Onwards**

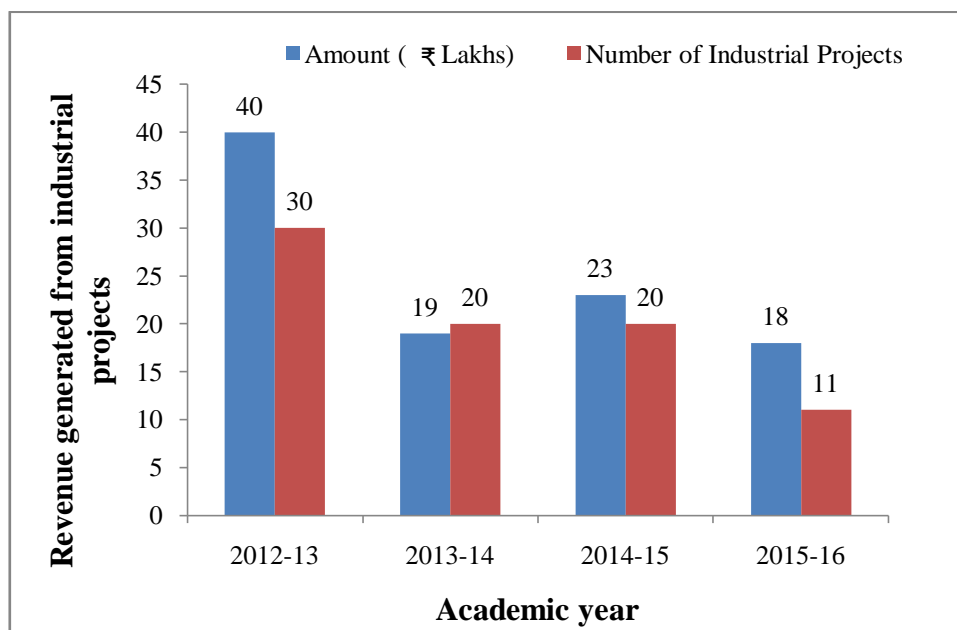
<b>S. No.</b>	<b>Industrial Collaborator</b>	<b>Year</b>
1.	Anazeal Analytical Pvt. Ltd., Omni Active Health Technologies Ltd., Marico Ltd., Shreya Life Sciences Pvt. Ltd., IPCA Laboratories Ltd., Omniactives Health Technologies Pune, Enem Nostrum Remedies Pvt. Ltd., Zytex Biotech Pvt. Ltd., Bristol Myers Squibb, Ambernath Organics Pvt. Ltd., Glenmark	2012-13

	Pharmaceuticals Ltd., Evonik Degussa India Pvt. Ltd., Piramal Life Science Ltd., Gattefosse India Pvt. Ltd., Panacea Biotech Ltd., USV Ltd., Franco-Indian Pharmaceutical Pvt. Ltd., Cymbiotics Biopharma Pvt. Ltd., Bharat Serums and Vaccines Ltd., Abbott India Pvt. Ltd., Getz Pharma Research Pvt. Ltd., Glenmark Ltd., Famy Care Ltd., Getz Pharma Ltd. <b>(25)</b>	
2.	Marico Ltd., Getz Pharma Research Pvt. Ltd., Cipla Ltd., Bajaj Healthcare Ltd., Evonik Degussa India Pvt. Ltd., Neon Labs, Piramal Life Science Ltd., Enem Nostrum Remedies Pvt. Ltd., Ankum Drugs and Pharmaceuticals Ltd., Bharat Serums and Vaccines Ltd., Piramal Enterprises Ltd., Ipca Laboratories Ltd., Ambernath Organics Pvt. Ltd., BASF SE, Germany. <b>(17)</b>	2013-14
3.	Getz Pharma Research Pvt. Ltd., J M B Pharmaceuticals, Piramal Healthcare Ltd., Gattefosse India Pvt. Ltd., Enem Nostrum Remedies Pvt. Ltd., Panacea Biotech Ltd., Marico Ltd., Bharat Serum Vaccines Pvt. Ltd., Vinayak Ingredient India Pvt. Ltd., Naprod Life Science Pvt. Ltd., Anazeal Analytical & Research Pvt. Ltd., Vaidya Patankar Pharmacy Pvt. Ltd., Sandu Pharmaceutical Ltd., Ambernath Organics Pvt. Ltd., BASF SE, Germany <b>(15)</b>	2014-15
4.	Gattefosse India Pvt. Ltd., Fusion Scientific Laboratories Pvt. Ltd., Pioma Chemicals, Naprod life Sciences Pvt. Ltd., Vinayak Ingradient India Pvt. Ltd., Bharat Serums Vaccines Pvt. Ltd., Marico Ltd., Fusion Scientific Laboratories Pvt. Ltd., Gutam Exports, Anazeal Analytical & Research Pvt. Ltd., Sandu Pharmaceutical Ltd., Ambernath Organics, Spring Bank Pharmaceuticals, BASF SE, Germany <b>(14)</b>	2015-16

Several industries as mentioned below are partner with BCP for curriculum design and academic teaching along with pursuing collaborative research:

Pfizer Ltd., Mumbai; Bhavan's SPARC, Mumbai; ClinInvent Research, Mumbai; Fulford India Ltd., Mumbai; Dr. Reddy's Laboratories Ltd., Hyderabad; Goldsheild Services, Mumbai; Lambda Therapeutic Research Pvt. Ltd., Mumbai; Neeman Medical International Asia Ltd., Delhi; Novartis India Ltd., Mumbai; Quintiles Spectral India Ltd., Mumbai; Ranbaxy Research Laboratories, Gurgaon; Sanofi-Aventis Pharma Ltd., Mumbai; Spectra Clinical Research Center, Hyderabad; SIRO Clinpharm Pvt. Ltd., Mumbai; SRL Ranbaxy, Mumbai; Wockhardt Ltd., Mumbai; Wyeth Lederle Ltd., Mumbai and Zydus Byk Healthcare Ltd., Mumbai.

- **Role of Industry in Institute Development and Revenue Generation:** Industry is actively contributing to the growth of BCP by providing finances for faculty salary, institute development and revenue generation. Figure 1 represents the amount of revenue generated from industries, 2012 onwards and table 6 lists the revenue generated from individual project and its corresponding collaborator. Department wise distribution of institutional share from industrial projects is presented in table 7.



**Figure 1: Revenue Generated from Industrial Projects in BCP since 2012.**

**Table 6: Revenue Generation from Industrial Collaborations ( $\geq$  ₹ 1 Lakh)**

S. No.	Project Title	Industry	Amount Received (₹)
<b>Academic year (2012-13)</b>			
1.	Comparison of Dry Powder Inhalation Devices	Glenmark Pharmaceuticals Ltd	4,10,000
2.	Fellowship/Manpower towards project entitled " Novel formulation strategies for New Chemical Entities	Piramal Life Science Ltd	2,80,000
3.	"Extension of SR Project "	Gattefosse India Pvt Ltd	1,00,000
4.	BAE Project of Gelucires Part I		2,65,000
5.	Particle size and Zeta Potential Analysis of formulations	Panacea Biotech Ltd	1,00,000
6.	BMS-Fellowship	Bristol Myers Squibb	4,59,000
7.	Evaluation of Gardcef-1500 Injection for Anaphylactic Reaction Potential	IPCA Laboratories Ltd	1,02,600
8.	Pharmacological evaluation of drugs using carrageenan induced paw edema and croton	Enem Nostrum Remedies Pvt Ltd	1,65,000

	oil/Oxazolone induced ear edema method		
9.	Preclinical studies of Nattokinase	Zytex Biotech Pvt Ltd	1,81,500
10.	Use of SOTAX USP type IV- Apparatus (Single cell unit) for Dexamethasone and Tobramycin Ophthalmic suspension.	Getz Pharma Research Pvt. Ltd	3,70,000
11.	Three way, three period, cross over bioequivalence study of single oral dose of three brands of 300 mg phenytoin sodium tablets marketed in India, on healthy volunteers.	Abbott India Ltd	5,04,250
12.	Use of SOTAX USP type IV- Apparatus (Tablets)	Glenmark Ltd	2,00,000
13.	Dissolution studies using SOTAX USP Type IV apparatus	Famy Care Ltd	3,00,000
14.	Use of USP type IV- Flow through Cell Dissolution Apparatus 2nd Extension Feb 2012 to April 2012	USV Ltd	1,00,000
<b>Academic Year (2013-14)</b>			
15.	In-silico Resistance Estimation - Assessment and development of computational methods for predicting which amino acids in a target protein binding-site are most likely to mutate in order to generate resistance against specific crop protection agents	BASF SE, GERMANY	6,07,925
16.	Effect of some NCEs on Aspirin induced ulcers in rats	Ipca Laboratories Ltd.	4,06,000
17.	Particle size and zeta potential analysis	Bharat Serum and Vaccines Ltd.	1,37,000
18.	Use of SOTAX USP type IV- Apparatus (Single cell unit) for Betoxolol hydrochloride Ophthalmic suspension.	Getz Pharma Research Pvt. Ltd.	3,03,000
<b>Academic Year (2014-15)</b>			
19.	In-silico Resistance Estimation - Assessment and development of computational methods for predicting which amino acids in a target protein binding-site are most likely to mutate in order to generate resistance against specific crop protection agents	BASF SE, GERMANY	6,07,925
20.	In vitro studies of Bilagyl, Berbenterone tablets and Berbenterone paediatric suspension for antiamebic, antibacterial and antifungal activity for proof of concept in infectious diarrhoea therapy	Sandu Pharmaceuticals Ltd	1,53,302
21.	Bioanalysis of Disulfiram and its metabolites by HPLC	Nerlikar Hospital	2,00,000
22.	Stability studies of Doctor Mom Herbal Cough	Anazeal Analytical Pvt	2,00,000



	Lozenges	Ltd	
23.	BAE Project of Gelucires Part I	Gattefosse India Pvt Ltd	1,00,000
24.	Design of liposomal formulations	Panacea Biotech Ltd	2,21,000
25.	Particle size and zeta potential analysis	Bharat Serum and Vaccines Ltd	1,40,500
		Marico Ltd	1,38,000
26.	Particle size and Zeta Potential Analysis of formulations	Panacea Biotech Ltd	1,00,000
27.	Use of SOTAX USP type IV- Apparatus (Single cell unit) for Dexamethasone and Tobramycin Ophthalmic suspension.	Getz Pharma Research Pvt. Ltd	2,30,000
<b>Academic Year (2015-16)</b>			
28.	In-silico Resistance Estimation - Assessment and development of computational methods for predicting which amino acids in a target protein binding-site are most likely to mutate in order to generate resistance against specific crop protection agents	BASF SE, GERMANY	6,08,925
29.	Expression, Purification and X-ray structure determination of plasmid RIG-1	Spring Bank Pharmaceuticals, Inc., MA 07157, USA	6,37,800
30.	Bioanalysis of Disulfiram and its metabolites by HPLC	Nerlikar Hospital	2,28,000
31.	BAE Project of Gelucires Part I	Gattefosse India Pvt Ltd	2,65,000

**Table 7: Institutional Share from Industrial Projects**

S. No.	Name of the Department	Amount (₹)				
		2012-13	2013-14	2014-15	2015-16	Total
1	Pharmaceutics Department	6,25,270	2,52,726	3,34,277	1,54,850	13, 67,123
2	Pharmaceutical Chemistry	-	83,000	83,000	-	1,66,000
3	Pharmacognocoy	18,000	7,850	18,875	21,550	66,275
4	Pharmacology	1,10,320	81,200	24,244	65,738	2,81,502
5	Pharmaceutical Analysis	12,000	22,100	58,200	58,500	1,50,800
<b>Total Amount (₹)</b>		<b>7,65,590</b>	<b>4,46,876</b>	<b>5,18,596</b>	<b>3,00,638</b>	<b>20,31,700</b>

It is clearly highlighted that BCP is having close collaboration with pharma industries for collaborative research projects and consultancy, which has largely contributed to institution growth for example revenue generated from industries are utilized for providing salary component of the faculty, instrumentation purchase and institute infrastructure development. Hence, collaborated pharma industries have led to the overall growth of BCP as the pioneer institute in field of pharmacy.

## Annexure III

### Institute of Chemical Technology, Mumbai

www.ictmumbai.edu.in

The Institute of Chemical Technology (ICT), Mumbai was established in 1933 with active industrial participation, as University Department of Chemical Technology (UDCT) under University of Mumbai, with the noble intention of enhancing India's knowledge base in chemical science and technology. Based on its continuous progress in academics and translational research, UDCT was upgraded to Deemed-to-be-University and renamed as Institute of Chemical Technology in 2008. Recently (2016), ICT-Mumbai has been ranked as number 2 university, under the National Institutional Ranking Framework (NIRF) of MHRD, (GoI).

**Table 1: Brief Profile of ICT-Mumbai**

Attributes	Details
Status of University	Deemed University (University under Section 3 of UGC)
Source of funding	State government
Date of establishment of university	12 <sup>th</sup> September, 2008
Elite status by Government of Maharashtra	12 <sup>th</sup> April 2012
University departments:	
Undergraduate	7 (983*)
Postgraduate (including Ph.D.)	11 (1015*)
Research centres on the campus (PG)	2 (72*)
Academic programmes	
UG courses	9
PG courses	20
Ph.D. courses	29
Integrated Ph.D.	29
Faculty Strength	82
Faculty involved with industrial consultancy	80%
Patents (in last 10 years)	
Filed	310
Research paper in international journal (2011-15)	2806
Average papers per faculty	4.5
Industrial collaborators (MoUs signed)	~56
Government sponsored projects (Completed)	~320
Industry sponsored projects (Completed)	~318
Industrial consultancy	~269
Entrepreneurs generated (till date)	>500

\*number of students

Source: www.ictmumbai.edu.in

## Centres of Excellence

Three Centres of Excellence related to R&D have been established in ICT- Mumbai to promote quality education and research through the support of central agencies. These are:

### 1. DBT-ICT-Centre for Energy Biosciences:

The Centre's main focus is on developing biofuels from renewable resources to reduce India's rising dependence on petroleum fuels. The team of faculty working under this Centre comprises of Professor (1), Assistant Professors (2), Research Scientists (6) and Research Associates (8). Currently the Centre has more than 50 research scholars. The total grants received by this Centre from various sources amounts to ₹ 49 crores (approx). This Centre also has a dedicated unit for IP management and commercialization.

**Table 2: List of Select Research Projects Sponsored by Public and Private Sectors**

S. No.	Title	Funding Agency	Amount (₹) in Lacs	Duration
<b>Public Funded Projects</b>				
1	Green enzymatic fat splitting technology for production of fatty acids and acyl glycerols	DST, India	847.53	2014-2016
2	Improved production of Biogas and Bio-CNG from lignocellulosic biomas	MNRE, India	515.61	2013-2015
3	Centre for energy biosciences: New and extension proposals	DBT, India	1800.00	2013-2018
4	Transnational approaches to resolving biological bottlenecks in macroalgal biofuel production	DBT-BBSRC (Joint Indo-UK Scheme)	471.02	2013-2016
5	Integrated technologies for economically sustainable bio- based Energy	AISRF Indo-Australia Grand Challenge Program, DST, India	444.00	2013-2016
<b>Private Funded Projects</b>				
6	Microbial biotransformation for aromatic chemicals	Nagar Haveli Perfumes & Aromatics, Mumbai	15.00	2014-2015

7	Generation of purified phytoene from yeast cell mass	Wacker Chemie AG, Mumbai	14.49	2014-2015
8	Mass cultivation of algae for aqua feed	Godrej Agrovet Ltd, Mumbai	115.00	2014-2016

**Table 3: Inter Institutional Collaborative Projects**

S. No.	Title	Collaboration	Grant (₹) in Lacs
<b>International</b>			
1	Design of selective nanoporous membrane bioreactor for efficient production of biobutanol from lignocellulosic sugars	• Fraunhofer Institute for Ceramic Technologies & Systems, Hermsdorf, Germany	115.40
2	Transnational approaches to resolving biological bottlenecks in macroalgal biofuel production	• Durham Energy Institute, Durham University, UK • Centre for Advanced Research in International Agricultural Development (CARIAD), Bangor University, UK • Institute of Biological, Environmental and Rural Sciences, Aberystwyth University, UK	471.02
3	Engineering enzymes, bacteria and bioconversion processes for advanced biofuels from waste grain straw	• Clostridia Research Group/ Life Sciences, University of Nottingham, UK • Centre for Novel Agricultural Products, Department of Biology, University of York, UK • Institute for Cell and Molecular Bioscience, Newcastle University, UK • Faculty Health & life Sciences, Oxford Brookes University, UK	272.08
4	Integrated technologies for economically sustainable bio-based Energy	• Centre for Tropical Crops and Biocommodities, Queensland University of Technology, Australia • The Centre for Energy, The University of Western Australia, Australia • Department of Chemical Engineering, Curtin University, Australia	444.00
<b>National</b>			
5	Green enzymatic fat splitting	Acme Synthetic Chemicals,	362.66

	technology for production of fatty acids and acyl glycerols	Mumbai	(Industry Contribution) 850.60 (DST Contribution)
6	Pilot scale translational facility for value added chemicals from biomass	Privi Biotechnologies (P) Ltd, Mumbai	395.00 (Industry Contribution), 390.00 (BIRAC, DBT Contribution to company as loan), 50.00 (BIRAC, DBT Contribution to ICT as grant)
7	Lignocellulosic ethanol pilot plant to integrated continuous pilot plant	• India Glycols Limited, Noida, UP	862.50 (Industry Contribution), 862.50 (BIRAC, DBT contribution to company as loan)

**Table 4: Some Prominent Patents from the Centre for Energy Biosciences**

S. No.	Title	Patent No.	Status
1	Enzymatic process for fat and oil hydrolysis	SG11201404463P	Patent granted; Pilot plant being constructed for demonstration with DST support Total project cost (₹) = 850.60 L+362.50L = 1213.10L
2	Method for production of fermentable sugars from biomass	<ul style="list-style-type: none"> <li>•US8709763 (USDIV-I); 2009</li> <li>• US8338139; 2009</li> <li>•US8673596 (USDIV-II); 2009</li> <li>• BD1005172; 2009</li> <li>• PK141809; 2009</li> <li>•ZA2011/09250; 2012</li> <li>•AU2010252547; 2015</li> </ul>	Patent granted; Pilot plant being constructed for demonstration with BIRAC, DBT support Total project cost (₹) = 862.50L+862.50L = 1725.00L

3	Process for fractionation of biomass	•JP2013-513816;2015 •ZA2013/00133; 2010	Patent granted; Pilot plant being constructed for demonstration with BIRAC, DBT support Total project cost (₹) = 862.50L+862.50L = 1725.00L
4	Enzymatic production Of monoacylglycerol from oil	1583/MUM/ 2014	Patent filed; Pilot plant being constructed for demonstration with DST support Total project cost (₹) = 850.60 L+362.50L = 1213.10L
5	A process for fractionation of oligosaccharides from cereal Bran	155/MUM/ 2014; PCT/IB2015/ 000030	Patent filed; Pilot plant being constructed for demonstration with BIRAC, DBT support (₹) 395.00 (Industry Contribution), (₹) 390.00 (BIRAC, DBT contribution to company as loan) (₹) 50.00

**Table 5: Industry Consultancy and Income Generated in the year 2014-2015**

S. No.	Name of the Company	Period	Amount (₹) in Lakhs
1	M/s. Warden International (Agencies) Pvt. Ltd, Mumbai	3 months	9.00
2	M/s. Kanoria Chemicals & Industries Ltd, Kolkata	1 year	25.00
3	M/s. Catapro Technologies, Nasik	7 months	8.00

## 2. ICT-DAE Centre for Chemical Engineering Education and Research:

This Centre was established as a joint effort of ICT-Mumbai and the Department of Atomic Energy (DAE) for conducting Ph.D. programmes in Chemical Engineering to carry out R&D projects. This Centre is working in close association with the DAE research institutions such as BARC, Mumbai and IGCAR, Kalpakkam, Tamil Nadu. The research objective is focused on generation of nuclear power production, use of radioisotopes in industry, health and agriculture.

**Table 6: List of Important Sponsored Projects Related to the Centre for Chemical Engineering Education and Research**

S. No.	Project title	Amount (₹) in Lakhs	Sponsoring agency
1	Design of solvent and extractant by molecular modelling for heavy metals	84.40	DAE
2	Experimental determination of H <sub>2</sub> -I <sub>2</sub> - HI-H <sub>2</sub> SO <sub>4</sub> vapor-liquid equilibria	48.40	DAE

3	Studies on steam pyrolysis of a CHON amide as a waste solvent management method	24.70	IGCAR
4	Polysaccharide based nanocarriers for improved therapy of systemic fungal infections	16.90	DAE
5	Passive decay heat removal system of AHWR	221.00	DAE
6	Thermal hydraulic studies related to coolants for new generation reactors	80.00	DAE
7	Characterization of cavitation phenomena and its applications in solid liquid mass transfer operations	88.90	DAE
8	Design of sodium cold-trap	23.80	IGCAR
9	Preparation of mono disperse MOX	23.80	IGCAR
10	Role of cavitation and its prevention in sodium pump	24.80	IGCAR
11	Scale up of MOX precipitation	21.50	IGCAR
12	Characterization of the regeneration process for liquid sodium cold trap in secondary system	38.00	IGCAR
13	Transport of actinides and fission products across hollow fibre supported liquid membranes	72.40	DAE
14	Thermal mixer design	24.20	IGCAR
15	Flow distribution in inlet plenum of steam generators	24.90	IGCAR
16	Removal of dissolved TBP for aqueous stream	24.50	IGCAR
17	Self assembly of tethered nanoparticles :Macromolecule' for tailored nanomaterials	95.00	DAE
18	Knowledge based engineering : Improvements in reactor design, heavy water production efficiency, nuclear waste management and development of novel	150.00	DAE
19	Chemical engineering, education and research	7500.00	DAE

### 3. Centre for Green Technology:

Synthetic chemicals are routinely used to make virtually every man-made product. However, when the production and use of chemicals are not managed responsibly it can also have enormous impact on human health and the environment. Alternative means of chemical production which have benign or reduced adverse impact are required and new robust technologies in this direction need to be developed. In recognition of this urgent need, Centre for Green Technology was established in order to promote research in green chemistry with ₹ 30 crores sanctioned by UGC. The Centre is jointly owned by ICT-Mumbai and University of Mumbai.

## **National and International Accolades**

- The Melinda and Bill Gates Foundation, USA, has awarded four grants to ICT-Mumbai recently which speak volumes of ICT's standing internationally.
- During 2014-15, ICT-Mumbai with faculty strength of 82, published 382 research papers in international journals which is a record in India.
- There are around 340 UG scholarships which have been created through funds generated from endowments, philanthropists, donations, trusts etc.
- Many of the scientists actually earn their salaries through the consultation fees paid by the collaborating industry.

## **Technology Enhancement in ICT-Mumbai**

ICT-Mumbai has established various dedicated units that promote technology development and commercialization. A couple of these units are as follows:

1. An entrepreneurship cell (E-Cell) was launched in April 2013 with the primary goal of accelerating the entrepreneurial culture of ICT-Mumbai.
2. The Technological Association (TA) is the student body of ICT-Mumbai that conducts various extra-curricular and co-curricular activities throughout each academic year. The in-house technical journal, Bombay Technologist is also run by the TA and actively promotes scientific writing among students.

The following Centres of Excellence are included in the future expansion plans of ICT-Mumbai:

1. Centre for Infectious Disease Control and Prevention
2. Centre for Process Intensification and Innovation
3. Centre for Product Engineering
4. Centre for Undergraduate Research In Engineering (CURIE)
5. Creation of Visiting Professorships endowments
6. Entrepreneurship resource centre
7. Group consultations: Adoption of sick industries.
8. Increasing international collaborations (Joint projects with leading institutes and Joint degrees , UG exchange, PG exchange)
9. Interactive student services portal
10. Technology Incubation Centre



## 11. Technology Transfer Cell

### **Promotion of Research**

- The culture of research among faculty and students is actively being promoted by facilitating participation in research projects and by providing resources and other facilities. Even UG students are engaged in active research in ICT-Mumbai. The institution facilitates its faculty by providing research funds as seed money. There are funds organized under Golden Jubilee Endowment through which seed money is provided to young faculty.
- ICT-Mumbai utilizes dedicated funds from agencies (BIRAC, RGSTC etc) for Tech Transfers.
- Teaching work load remission is provided to the faculty members in order to devote time to Research activities and for attending conferences etc. A 2 hour concession is given to Heads, Deans and other senior administrators (Controller of examination, Registrar, TEQIP Coordinator, and Course Coordinators).
- Faculties who did not have a Ph.D were encouraged to do Ph.D. Three faculty members took up the chance offered to them and completed their Ph. D during 2014-15. They have now started supervising Ph.D students.
- Sabbatical leave for higher research within the country and abroad can be availed and a good percentage of faculties have utilized this facility.
- New research areas such as computational chemistry, nanotechnology, material science, process control among many others has been initiated by young faculty, and is bound to bring laurels in future. All facilities and provisions such as duty leave and training expenses were made available for the same.
- Many endowment chairs have been created to invite eminent person from academic and industry. All efforts are made to appoint distinguished scientists and faculty through industry endowments. List of some industry endowments is given below:
  1. R.T. Mody Professor of Chemical Technology
  2. Sir Dorabji Tata Reader in Pharmaceutical Chemistry
  3. Darbari Seth Professor of Inorganic Chemical Technology
  4. Bharat Petroleum Distinguished Professor of Chemical Engineering
  5. V.V. Mariwala Chair in Chemical Engineering
  6. J.G. Kane Chair of Oil Technology

7. M. M. Sharma Distinguished Professor of Chemical Engineering
8. R. A. Mashelkar Chair of Chemical Engineering
9. Gunavati Kapoor Chair in Pharmaceutical Technology
10. Dr. B. P. Godrej Distinguished Professor of Green Chemistry and Sustainability Engineering
11. Pidilite Industries Ltd, Visiting fellow in Dyestuff Science & Technology
12. Marico Industries Visiting Fellowship
13. ICT - Lupin Visiting Fellowship for Bioprocess Technology
14. CIPLA Distinguished Visiting Fellowship in Pharmaceutical Sciences

*For details please see NAAC Self Study Report, ICT-Mumbai, 2015  
([http://www.ictmumbai.edu.in/uploaded\\_files/NAAC-Self\\_Study\\_Report\\_2016.pdf](http://www.ictmumbai.edu.in/uploaded_files/NAAC-Self_Study_Report_2016.pdf))*

- The institute receives only salary grants from the state government and the government does not provide any other type of block grant to the institute. As such, institute does not earmark any budget head as a separate research fund in its annual budget. However, institute is supported by central government institutes such as UGC through its Career Advancement Scheme (CAS) programme, DST, CSIR, AICTE and Government and Industrial projects for the research work carried out in the institute.
- The instruments/equipments of ICT-Mumbai are available to research scholars 24X7, for performing their research work.

**Mode of Publicizing the Consultancy Expertise of the University:**

- The consultancy expertise available is publicized by the Institution through the Annual Reports and prospectus and through several conferences and workshops showcasing the capability of individual faculty member.
- Details of all faculty, their expertise and current consultancies, the projects under supervision as well other relevant details are published in the annual reports which are circulated to industries and also uploaded on the website. Industries approach the faculty directly or through the officials in the VC's office for appointing faculty as consultants.
- As long as the terms and conditions of consultancy are in line with the institute's policy, all faculty members are permitted to take consultancy without compromising on their academic work.

**Areas of Consultancy:** The areas of consultancy provided by ICT-Mumbai may be broadly classified into Pharmaceuticals (drug formulation, purification, delivery

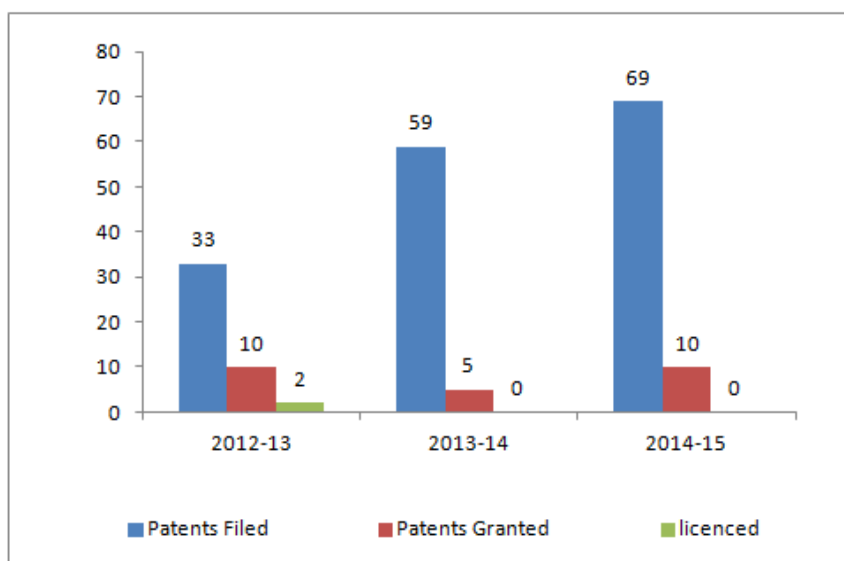
systems etc) Food industry (process, additives, formulation etc) Cosmeceuticals, Nutraceuticals, Microbial biotransformation and Bio-based chemicals, Organic chemical synthesis and Natural product purification.

### Outcomes of Research in ICT-Mumbai

1. **Publications:** Details of the publications by the faculty from 2011-15 are provided below:

- Number of papers (national / international) published in peer reviewed journals - 2806
- Chapters in Books – 29
- Books with ISBN with details of publishers - 8
- Books edited - 25
- Monographs - 6
- Number of publications listed in International Database (For e.g. Web of Science, Scopus, Humanities International Complete and EBSCO host) - 2037
- Citation Index – 26,498
- H-index – 63

2. **Patenting and Licensing:** ICT-Mumbai has filed/acquired 310 patents in last 10 years of which 189 are during the last 5 years. Two patents have been licensed during the year 2012-13. Trend in patenting in ICT-Mumbai in last 3 years is illustrated in figure 1.



**Figure 1: Patents Filed, Granted and Licensed in ICT-Mumbai from 2012 Onwards**

*Source: NAAC A Self Study Report, ICT-Mumbai, 2015*

3. **Industry Sponsored Projects:** Around 232 industry/corporate houses sponsored projects are undertaken by ICT-Mumbai worth ₹ 84.7 crores. The list of industrial projects along with the funds involved is given below.

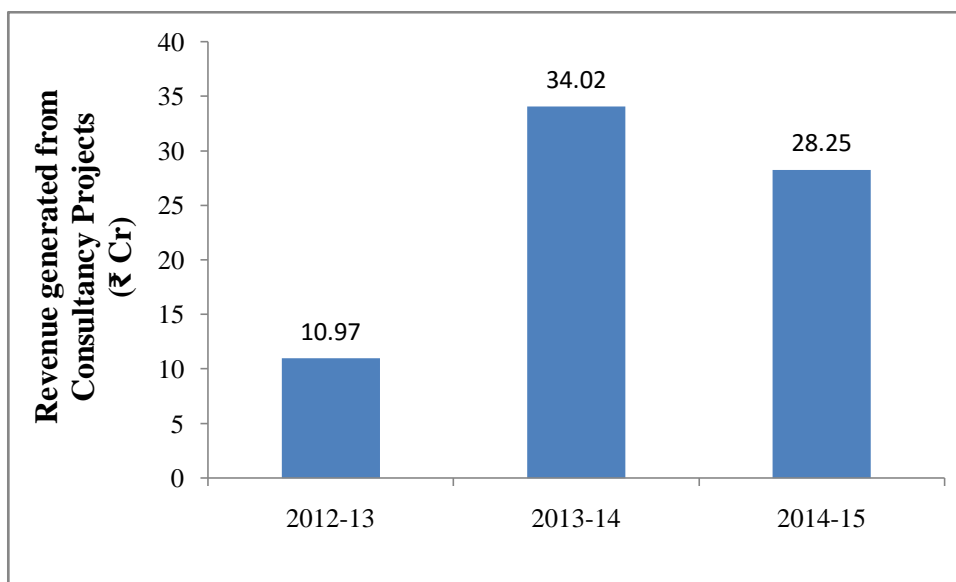
**Table 7: Prominent Industry/Corporate Houses Sponsoring Research Projects at ICT-Mumbai**

Industry/Corporate Houses	Principle Investigator	Amount (₹)
Abbott Healthcare Pvt. Ltd	Prof. P.V. Devrajan	603800.00
Asian Paints Ltd	Prof. R.N. Jagtap	*
BASF Ltd	Prof. R.V. Adivarekar	*
Bill Gates Foundation.	Prof. B.N. Thorat	*
Bio-Rad Lab	Prof. A.M. Lali	198987.00
BIRAC	Dr P.R. Namade	54656.00
Cadbury India	Prof. Rekha S. Singhal	*
DSM India	P.R Gogate/V.K. Rathod	34500.00
General Mills-III	Prof. A.M. Lali	*
Glenmark Pharma Ltd	Dr. S.S. Sathaye	*
Godrej Agrovet Ltd	Prof. A.M. Lali	8595540.00
Himedia Laboratories Pvt Ltd	Prof. U.S. Annapure	*
Hindustan Unilever Ltd	Prof. P.A. Mahanwar	301962.00
India Glycols Ltd	Prof. A.M. Lali	*
IPCA Lab Pvt Ltd	Prof. S.S. Bhagwat	*
Nicholas Piramal	Prof. K.G. Akamanchi	*
Pepsico	Prof. A.M. Lali	*
Pidilite	Prof. R.N. Jagtap	50000.00
Reliance Industries	Prof. G.D. Yadav	*
Tata Chemicals Ltd	Prof. U.S. Annapure	126405.00
Unilever India Pvt Ltd	Prof. A.W. Patwardhan	161270.00

\* Project amount not available

*Source: NAAC Self Study Report, ICT-Mumbai, 2015*

4. **Mutual Benefits Accrued due to Consultancy:** The faculties of the institute get an understanding of the industry requirements and an opportunity to solve real life problems. Financial remuneration is another added advantage. Institutional resources in the form of equipments, endowments etc are generated through consultancy. Industry gets expert advice in the shortest possible time which saves their resources (time, energy, money). Figure 2 presents the worth of industrial consultancy carried out in ICT-Mumbai



**Figure 2: Revenue Generated from Industrial Consultancy Projects**

*Source: NAAC Self Study Report, ICT- Mumbai, 2015*

5. **Industrial Collaborations:** ICT-Mumbai has close working relations with both foreign and Indian institutes and industries. In order to facilitate faculty and student exchange, research programmes and joint projects and symposia a large number of MoUs has been signed. We have listed some important MoUs in the following table.

**Table 8: Important MoUs of ICT-Mumbai with National and International Industries**

S. No.	National Industry/ Corporate Houses	Year of Collaboration
1	Bharat Petroleum Corp. Ltd (BPCL)	2000, 2015
2	Reliance Industries Ltd	2007
3	Hindustan Petroleum Corporation Ltd.	2010
4	General Mills Operations LLC	2010
5	Tata Chemicals Limited	2010
6	Biotech Consortium India Limited	2010
7	Bayer Crop Science Ltd	2011
8	Bio-Rad Laboratories India Pvt. Ltd	2012
9	GlaxoSmithKline Consumer HealthCare Ltd	2012
10	India Glycols Ltd	2012
11	Unilever Industries Pvt. Ltd	2013
12	Tata Chemical Ltd	2013
13	Kirloskar Integrated Technologies Ltd	2013
14	L'oreal India Pvt. Ltd	2013
15	Glenmark Research Centre (Non Disclosure Agreement)	2014
16	Reliance Technology Group (Non Disclosure Agreement)	2014

17	Agilent Technologies	2014
18	Indian Oil Corporation Ltd	2015
19	Asian Paints Ltd	2015
20	Godrej industries Ltd	2015
21	Siemens Ltd	2015
<b>International Industry/ corporate houses</b>		
22	Microsoft Corporation	2010
23	Coca Cola Ltd	2012, 2014
24	Essilor International	2014

*Source: NAACA Self Study Report 2015*

**6. Generation of Entrepreneurs:** The industry-institute-government relationship fostered by ICT-Mumbai has been exemplary and has been cited as a role model for other institutes. There are several first generation entrepreneurs (numbering over 500) who have done pioneering work in chemical and allied industries in and around Mumbai and other parts of India who are the alumni of the institute. Some distinguished Alumni of ICT-Mumbai who became successful entrepreneurs are mentioned below.

***List of notable entrepreneurs generated:***

1. Shri. Mukesh D. Ambani (CMD, Reliance industries Ltd)
2. Dr. Dinesh Patel (Chairman, Themis Pharmaceuticals)
3. Dr. K. Anji Reddy (Chairman, Dr Reddy's Laboratory Ltd)
4. Shri. Ashwin S. Dani (Vice Chairman and MD, Asian Paints Ltd)
5. Shri. C. J. Bhumkar (Chairman, Soujanya Chemicals)
6. Shri. Chandrakant V. Gogri (Chairman, Aarti Industries and Aarti Group of Companies)
7. Shri. D.M. Trivedi (Famous Textile Technologist I)
8. Shri. J.R. Vyas (CMD, Dishman Pharmaceuticals and Chemicals)
9. Shri. J.R.Shah (Former President, Plastindia Foundation; Chairman, Jayvee Organics and Polymers)
10. Shri. S.M. Mokashi (Managing Director, Xytel India)
11. Shri. U. Shekhar and Shri SudhirPatil (Galaxy Surfactants Ltd)
12. Shri. V.G. Rajadhyaksha (Chairman, Hindustan Lever Ltd)
13. Shri. Narendra Parekh (Chairman, Pidilite Industries)
14. Shri. NarotamSekhsaria (Founder & Managing Director, Gujarat Ambuja Cement Ltd; Sekhsaria Chemicals)
15. Shri. Nikhil R. Meswani (Tech. Director, Reliance Industries Ltd)

## **Some important points for promotion of Intellectual Property Rights (IPR) of ICT-Mumbai**

Research carried out at ICT-Mumbai caters to both academic need as well as industrial applications. Rules and regulation for carrying out consultancy research work with industry/corporate houses in terms of consultancy and sponsored projects and subsequently filing of intellectual property can be accessed from the document “NAAC Self Study Report, ICT-Mumbai, 2015” ([http://www.ictmumbai.edu.in/uploaded\\_files/NAAC-Self\\_Study\\_Report\\_2016.pdf](http://www.ictmumbai.edu.in/uploaded_files/NAAC-Self_Study_Report_2016.pdf))

Some of the salient features adopted by ICT-Mumbai for promotion of IP are as follows:

1. In the case of patent filled by the faculty members, if there is no third party involved, the license fee should be shared between the institute and the faculty members in the proportion of 30% to the institute and 70% to the faculty members.
2. In the case of patent filled by the faculty members, if there is no third party involved, the Royalty shall be shared in the ratio of 1:4 i.e. 20% to the institute and 80% to the faculty member and the other inventors.
3. The institute shall not pay any annual renewal fee for the patent granted. It shall be the responsibility of the authors.