

# Asia Pacific Journal of Innovation and Entrepreneurship

Volume 3, No.1 May, 2009

ISSN 2071-1395

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Asia Pacific Journal of  
Innovation and Entrepreneurship  
Volume 3, No.1, 2009  
**ISSN 2071 - 1395**



Asian Association of Business Incubation

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# Techno-Innovation to Techno Entrepreneurship through Technology Business Incubation in India: An Exploratory Study

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## ***Abstract***

*The best solution to solve a problem of unemployment, in country like India, is to have as many Job Creators as possible, so we need Entrepreneurs. Various Government and Non Government agencies are doing lot of work to promote Entrepreneurship. Particularly Government of India is doing great work to promote Techno – Entrepreneurship by providing support through various agencies under the umbrella of Department of Science and Technology (DST). Even it has established National Science and Technology Entrepreneurship Development Board under DST. In this paper we will try to give information and study, mainly exploratory, related to these support activities to convert Techno-innovation to Techno – Entrepreneurship by keeping main focus on Technology Business Incubation approach in India. Here we are trying to give conceptual model to establish relationship between Techno – Innovation and Techno – Entrepreneurship. And this will be substantiated by various Techno – Innovation and Techno – Entrepreneurship illustrations of real life. Here, the major focus is given to Technology Business Incubation approach to support and create Techno – Entrepreneurship from Techno-innovation. This paper will show a research gap, in the context of India, in the area of Techno-entrepreneurship through Technology Business Incubation. This can be further useful for research in broader sense in future in this context. This paper also give ideas about which kind of research is possible in the context India in this area.*

***Key words:*** Techno – Innovation, Techno – Entrepreneurship, Techno Business Incubation

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## 1. Introduction

For any economy entrepreneurship is very crucial. The objectives of achieving sustained industrial development, regional growth and employment generation have always depended on entrepreneurial development. All over the world, researchers have taken lot of interest in studying entrepreneurship. Entrepreneurs are, thus the seeds of industrial development and the fruits of industrial development are greater employment opportunities to unemployed youth, increase in per capita income, higher standard of living and increased individual saving, revenue to the government in the form of income tax, sales tax, export duties, import duties, and balanced regional development (Charantimath P.M., 2006)<sup>15</sup>. In India, entrepreneurship is in its cultural ethos. Entrepreneurship and enterprises are a continuous process and it is growing from centuries to centuries (Desai V., 2001)<sup>14</sup>. In country like India, we are facing a problem of unemployment for so many years now. And one of the best solutions is to have as many Job Creators as possible, so we need Entrepreneurs. Now our economy is growing but in this growth, the contribution of Entrepreneurship can not be neglected. Various Government and Non Government agencies are doing lot of work to promote Entrepreneurship. Particularly Government of India is doing great work to promote Techno – Entrepreneurship by providing support through various agencies under the umbrella of Department of Science and Technology (DST). Even it has established National Science and Technology Entrepreneurship Development Board under DST. The objectives of achieving sustained industrial development, regional growth and employment generation have always depended on entrepreneurial development.

Techno-Entrepreneurship can be defined as the Entrepreneurship in Technology area and the person who undertakes Techno-Entrepreneurship is termed as Techno-Entrepreneur. Techno-Entrepreneur is also termed as Techno-preneur and hence Techno-entrepreneurship can be termed as Techno-preneurship<sup>32</sup>.

## 2. Techno – Innovation to Techno-Entrepreneurship

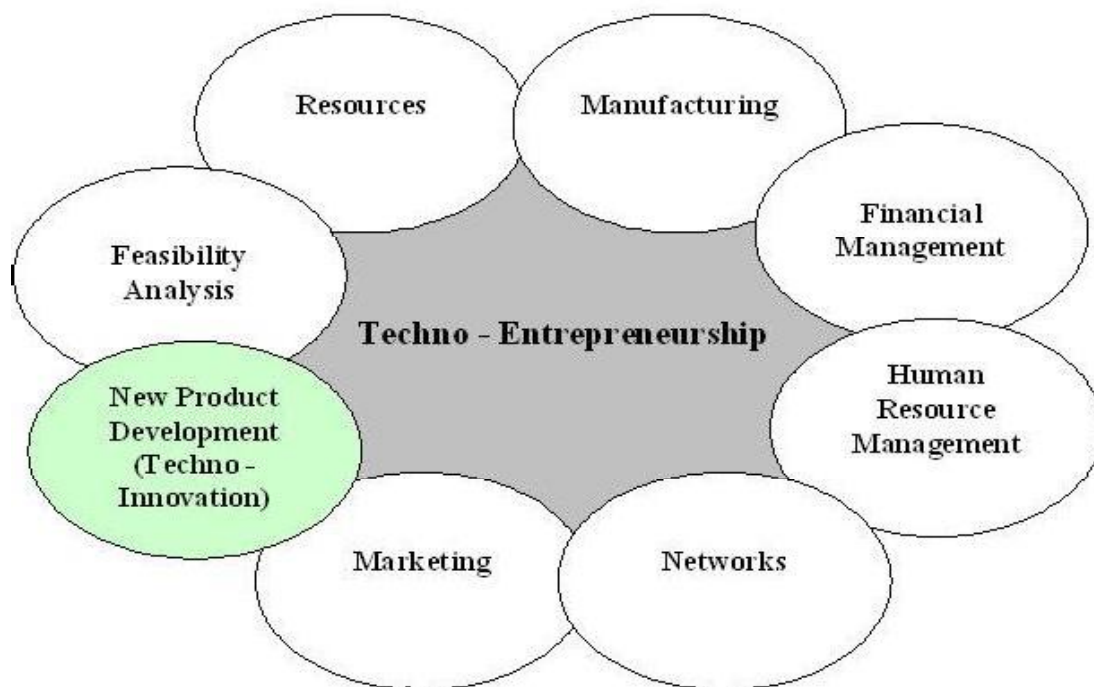
Innovation is the introduction of new ideas, goods, services, and practices which are intended to be useful (though a number of unsuccessful innovations can be found throughout history). The main driver for innovation is often the courage and energy to better the world. An essential element for innovation is its application in a commercially successful way. Innovation has punctuated and changed human history (consider the development of electricity, steam

engines, motor vehicles etc.). But many times innovation dies because of lack of supports. Many engineering students are doing so many innovative things but most of the time they end up as a certificate on a piece of paper as they do not find any support to commercialize their ideas. Not only engineering students but even innovations have come from the grass root people without any technology back ground and National Innovation Foundation (NIF), Honey Bee Network, Sristi etc. have supported them in India An innovator can be a member of Honey Bee Network. It works in knowledge mapping and gathering, knowledge creation and value addition & knowledge application and dissemination (Gupta A, 2006)<sup>3,4</sup>.

Important thing is that: How to convert Techno – Innovation in to Techno – Entrepreneurship? There are many Technology innovations but how many can be converted in to Techno – Entrepreneurship is the real fact. Technology Innovation is important and it is difficult but Entrepreneurship is not just about Technology & innovation. Techno – Entrepreneurship is a broad concept and involves many things and not just Technology Innovation. Technology Entrepreneur is one who organize, manages and assumes the risk of an technology based business enterprise (Nicholas S.P. & Armstrong N.E., 2003)<sup>1</sup>. For Entrepreneurship innovation in term of product development may require but it is not just enough as Entrepreneurship is not just all about innovation but also managing many things in business. Successful entrepreneur has to have managerial skills to utilize resource effectively, should be able to make appropriate feasibility analysis, should have skills related to marketing, human resource management, financial management, manufacturing management and networks.

Following figure 1 will give inside of relationship between Techno – Innovation and Techno – Entrepreneurship:





<Figure 1> Relationship between techno-innovation and management function

Entrepreneurship is ‘the process of looking at things in such a way those possible solutions to problems and perceived needs may evolve in venturing.’ Willingness to take the risks involved in starting and managing a business, particularly in establishing business on Unconventional Innovations is a major issue. As an Entrepreneur one has to think about all other components of business and not just about the Technology Innovation. And because of that only person who has Technology Innovation may require support for other components of business other wise as mentioned earlier even the greatest innovation may die. Techno – Entrepreneur need to have Technical Management skills, Business management skills and motivation, then only he can be a complete successful Techno – Entrepreneur (Oakey R.P., 2003)<sup>11</sup>. Product innovation is not guaranteed by the solution of difficult technological problems. The mindset and company culture adapted to technological innovation may need to adjust its focus in order to give due weight to the issues involved in product innovation (Tomes A., Erol R. & Armstrong P., 2000)<sup>6</sup>. India is cognizant of the fact that current economic liberalization and changing patent scenario, the key factors determining success are to make rapid technological advancements with respect to quality, cost, productivity and velocity of commercialization in line with international standards (Sikka P.,1999)<sup>8</sup>. New, entrepreneurs who have no existing markets and no existing customers, look for any market where their technology offers cost and performance advantages over existing products i.e. replacement of existing products (Walsh S. and Kirchhoff B.,2002)<sup>10</sup>.

***Teaching Entrepreneurship to Engineering Students:*** The field of “Teaching of Entrepreneurship” has been divided as to whether entrepreneurship can be taught or not. Those who favor it as an independent academic discipline see it as a distinctive, if not unique component of the free enterprise system. In this respect, it creates wealth, improves the productivity of a region, adds to employment, and offers a more exciting dimension to society. A second consideration is that entrepreneurship contains specific knowledge, concepts and theories that apply in a reasonable and consistent manner across the discipline. The research of D'Cruz, C.; O'Neal, T.(2003)<sup>13</sup> at University of Central Florida (UCF) has shown that integration of Technology Incubator program with academic entrepreneurship curriculum has brought yielded impressive results thus far. Entrepreneurship programs not only result in start-up companies, they also promote intrapreneurial culture and attitudes in established organizations. Even, Wright M., Hmieleski K.M., Siegel D.S. & Ensley M.D. (2007)<sup>21</sup> has shown in their research – ‘it appears that there may be great benefits in university programs that combine science and technology with business management’.

When we discuss above relationship of Techno-Innovation and Techno-Entrepreneurship, then we need to give emphasis on various contexts also.

***Socio – Economic Context:*** When we think of socio economic context, few important issues are – Globalization, High demand for faster innovations and depletion of natural resources. Globalization has increased competition and diverse needs which has created high demand for innovations due to fast technology obsolescence and demanding customer.

***Technological & Regulatory Context:*** Major issues here are – Intellectual Property Rights (IPR), Information Technology based sophisticated techniques, High Research & Development cost, Uncertainty in return on innovative ideas, Aspects of commercialization etc. Particularly in Indian context, awareness of IPR and time taken to get patent are the main issue. It may take almost 2-3 years to have patent on any innovative ideas where as in China, it is hardly 4- 6 months only. If we compare the figures of patents filed, then in India hardly 36000 patents applications per years have been filed, out of that only 20% from Indian innovators and rest from all over the world. Whereas in US and Japan, the figure is around 5 Lacs patents applications per year as on today as per the presentation given by the Indian Patent officer in 2009<sup>41</sup>. So awareness of the same is very less and that is a challenged for Government of India to foster techno innovation process in India. He said that the less numbers of examiners and support staffs is the major problem in Indian context which has created many clusters of pending cases particularly in



the area of engineering innovations. But if we talk about IT based development, then India is having upper hand.

**Imbalances:** Limited & unequal distribution of resources, effective curriculum, Government policies and slow rate of innovations are the main issues in the context of India.

**Questions for Management:** While discussing the techno – entrepreneurship & innovation, we need to give a thought to following questions:

- How to explore the tacit knowledge?
- What to do to remove obstacles to the creation of teams for innovation?
- How to tackle the issues of geographical diversity in vast country like India?
- How to maintain balance between traditional systems and innovations in country like India where tradition is having lot of value?
- How to design reward systems to foster innovation and conversion of innovation in to Entrepreneurship?
- How to solve the problem of – ‘who will get the credit’?
- How to manage resources for innovations in country like India where still many people live below the poverty line?

All above questions are very important for innovations and conversion of innovations in to Techno – Entrepreneurship. So many times, people do have innovative ideas in a form of tacit knowledge but they may not be ready to share with others. Reasons may be any – they may be shy, they have fear of losing importance or fear of rejection. So it is always difficult to convert tacit knowledge of others in to innovation. All above questions are important but may not require much explanation as they are very explicit in nature. Here, the most important question may be – who will get the credit? Most of the time just because of this innovation may die. Many a times, Technology institute will have many students who come out with innovative ideas but they do not have proper support to convert their ideas in to Entrepreneurship as it has already been shown in the model – figure 1 that Entrepreneurship involves many components and not just Innovation in Product development. Where as Management institute can have support for many components of Entrepreneurship except Technology & Innovation. So if they come together and start institution - institution interaction & networking, then they can give best support to the students who have innovative ideas. But here also, most of the time, the question – ‘who will get the credit?’ will

create trouble and act as a hurdle to Techno – Entrepreneurship & Innovation. When asked, they may give polished answer, but in reality the fact lies over there on credit.

### **3. Techno-entrepreneurship supports in India**

In India, to promote Techno – Entrepreneurship, many Government and non Government agencies are doing great work. Particularly Department of Science and Technology, Government of India has established National Science and Technology Entrepreneurship Development Board (NSTEDB)<sup>27</sup> with full fledged website and even web portal TIME IS – Technology Innovation Management & Entrepreneurship Information Services with web site: <http://www.techno-preneur.net><sup>32</sup> which gives all the information about Techno – Entrepreneurship and how to convert innovation in to Entrepreneurship with the help of various schemes of DST in India. Under the NSTEDB, Department of Science and Technology has major schemes like: Entrepreneurship Development Cell (EDC), Science and Technology Entrepreneurship Development Project (STED), Science and Technology Entrepreneurship Park (STEP) and Technology Business Incubators (TBI). There are more than 30 E D Cells established by DST all across the India. STED projects are located at more than 35 places in India. There are 14 STEPs all over the India. And most importantly there are as many as 24 Technology Business Incubators which are acting as a real booster to convert Technology Innovations in to Techno – Entrepreneurship. Some of the major Technology Business Incubators in India are:

- National Design Business Incubators, National Institute of Design, Ahmedabad
- Centre for Innovation, Incubation and Entrepreneurship (CIIE), IIM Ahmedabad
- Nirma Lab, Nirma University, Ahmedabad
- GIAN, Ahmedabad
- Society for Innovation and Entrepreneurship - SINE, IIT Bombay, Mumbai
- TBI – Vellore Institute of Technology
- TBI – NIT Calicut
- Foundation for Innovation and Technology Transfer (FITT), IIT Delhi
- TBI – Centre for Biotechnology, Anna University, Chennai

Apart from these, Department of Science and Technology has established National Innovation Foundation (NIF) in February 2000. Society for Research and Initiative for Sustainable Technologies and Institution (SRISTI) and Honey bee network are also doing great

work to support innovations to be converted in to entrepreneurship. GIAN – Grassroots Innovations Augmentations Network is an Incubator for grassroots innovations and traditional knowledge. It is established by NIF at Ahmedabad, Gauhati and Jaipur. By looking at above data, one may definitely feel that there is enough support for the Innovations and Innovation based Techno – Entrepreneurship in India but ‘how effective they are?’ is a matter of research.

#### **4. Technology Business Incubation**

Technology Business Incubation involves the commercialization of science and technology through newer community institutional arrangements which can be thought of as technology venturing. It concentrates on alliances as an economic development strategy. Technology venturing is based on creative and innovative ways of linking public sector initiatives and private sector resources within and across regional and national boundaries for promoting economic growth. Technology Business Incubation can foster corporate and community collaborative efforts, while nurturing positive government-academic-business relationships. Technology venturing activities within a community are based on linking four critical factors: (1) talent – people, (2) technology – ideas, (3) capital – resources and (4) know-how – knowledge. Support for each factor includes: Expanding talent pool, Accelerating the transfer of technology, increasing availability of capital and Improving availability of managerial, technical and business know-how. The primary drivers of technology business incubation are entrepreneurs – people who make things happen and technologies or ideas that have potential to be commercialized within a reasonable period of time (Tornatzky L.G., Batts Y., McCrea N.E., Lewis M.S. & Quittman L.M. (1996)<sup>2</sup>. There is growing realization that the community at large also benefits from small business incubators. Not only can incubator increase local employment opportunities, it can also diversify the local economic base and enhance the local image as a center for business activity. But in future incubation centers may tend to be organized ‘for profit’, as public source of funding are stretched to their limits (Gatewood B., Ogden L. and Hoy F.,1985)<sup>7</sup>. The most effective use of the incubator as a tool for economic development will require careful consideration of the process by which those entrepreneurs choose to participate in the program (Spitzer D.M. and Ford R.H.,1989)<sup>9</sup>. Allen D. N. (1985) has shown relationship between business incubators and start ups as an entrepreneurial marriage. To qualify for incubation program one must have: sound technical knowledge , competence in focus area, entrepreneurial traits, good business sense, global thinking, Conviction and strong perseverance and Strong references as per the Nirma Lab<sup>38</sup> – one of the TBI in Ahmedabad. H.K. Mittal, Advisor and Head, National

Science and Technology Entrepreneurship Development Board, DST – Government of India, has shown in his presentation that incubation is required because: Innovative ideas have longer gestation period and skill set of entrepreneurship is not well developed in all innovators<sup>20</sup>.

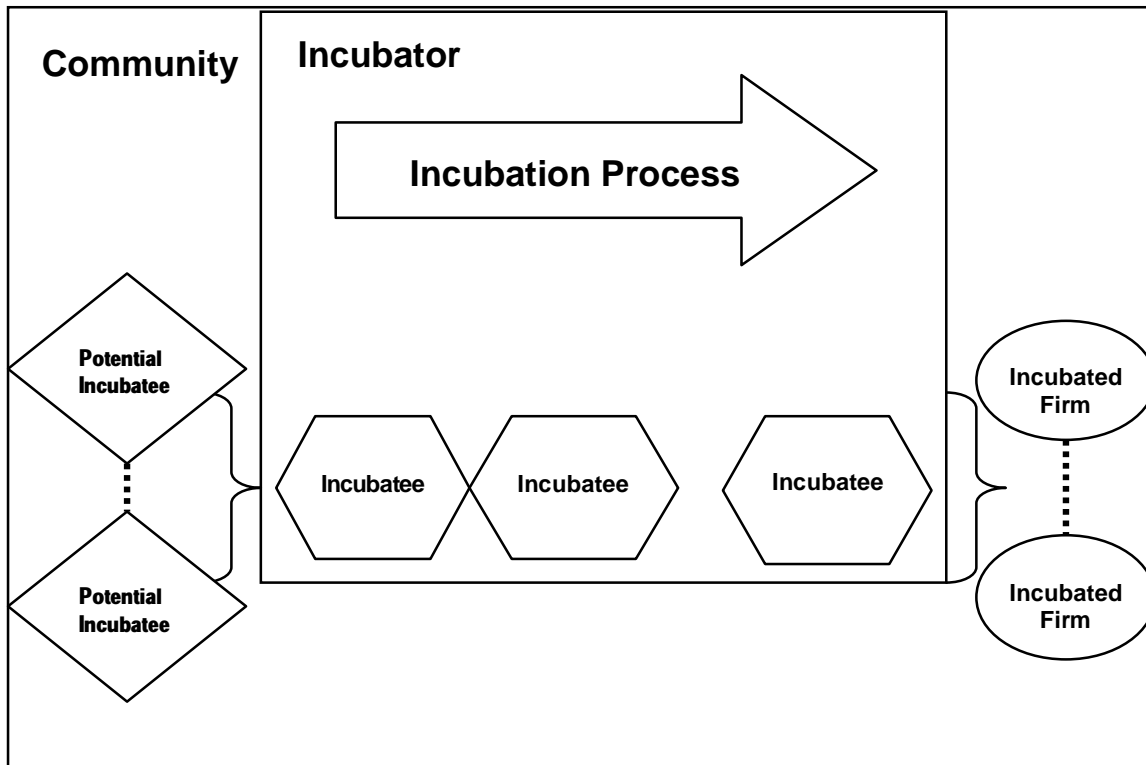
*Business incubators* are programs designed to accelerate the successful development of entrepreneurial companies through an array of business support resources and services, developed and orchestrated by incubator management and offered both in the incubator and through its network of contacts. Incubators vary in the way they deliver their services, in their organizational structure, and in the types of clients they serve (Wikipedia, 2008)<sup>33</sup>. According to Wikipedia<sup>33</sup>, Business incubation has been identified as a means of meeting a variety of economic and socioeconomic policy needs, which may include:

- Creating jobs and wealth
- Fostering a community's entrepreneurial climate
- Technology commercialization
- Diversifying local economies
- Building or accelerating growth of local industry clusters
- Business creation and retention
- Encouraging women or minority entrepreneurship
- Identifying potential spin-in or spin-out business opportunities
- Community revitalization

“An organization designed to accelerate the growth and success of entrepreneurial companies through an array of business support resources and services that could include physical space, capital, coaching, common services, and networking connections.” (www.entrepreneur.com)<sup>40</sup>

“The business incubator seeks to effectively link talent, technology, capital, and know-how in order to leverage entrepreneurial talent and to accelerate the development of new companies.” (Kuratko & LaFollete, 1987)<sup>34</sup>

Networking of Incubators is very important. A common theme that became apparent from the research of McAdam M. & McAdam R. (2006)<sup>22</sup> was the concept of shared values emerging from the networks at all levels, which happened as a result of the owners facing similar challenges, thus creating a supportive environment based on empathy. It also helps in determining the duplication of technology innovation. Network of incubators helps in utilizing regional strength and resources (Scott T., 2002)<sup>26</sup>.



Peter C. Van der Sijde (2002)<sup>23</sup> has given main functions and task of an incubator in his article on *Developing Strategies for Effective Entrepreneurial Incubation*. He has old that the five key support needs for high-tech or knowledge-intensive companies are: Incubation and other facilities, Training and Knowledge, Mentoring – Coaching – Counseling, Money and Networking. He has also given idea about the main tasks of Incubator: Human resources (personnel, technical capability, knowledge of the sector, Social resources (access to networks), Financial resources (4Fs – founders, family, friends and fools, banks, formal and informal investors), Physical resources (such as machinery, trucks, office and laboratory space), Technology resources (access to knowledge and technology, patents, licenses), Organizational resources (for example, advice/ consultancy, mentors).

Lockett A., Vohora A. & Wright M. (2002)<sup>24</sup> argue that Universities should be viewed as incubators without walls as resources flow into and out of the university to enable spin-outs to develop. Thinking of universities in this way may be useful in helping academics, practitioners and policy makers to re-evaluate the role of the university in the outside world. Tübke A. & Empson T. (2002)<sup>25</sup> have suggested six elements of a business incubation policy. These are strategic awareness, a positive attitude towards entrepreneurship, an active policy, the transfer of experience, provision of finance, and objective separation.

## **5. Major Technology Business Incubators in India**

### **5.1 Centre for Innovation, Incubation and Entrepreneurship (CIIE), IIM Ahmedabad – A Technology Business Incubator**

Here it is worth to discuss an example of CIIE<sup>28</sup> which located at Indian Institute of Management, Ahmedabad. CIIE is one of the major Technology Business Incubators established by Department of Science and Technology, Government of India. The Center for Innovation, Incubation, and Entrepreneurship (CIIE) was set up at IIM A to undertake research, training and incubation in innovation based entrepreneurship. CIIE main task is to integrate incubation with research and training, with the help of faculty, current students, alumni, and other partners and stake holders. CIIE conducts nationwide competition for high-tech innovations with mass impact to identify innovations that can be converted in to commercial enterprise. Support provided by CIIE covers the entire chain from Innovations to Enterprise. These live incubation projects will get guidance from IIM A faculty. IIM A is part of the National Entrepreneurship Network being created by the Wadhvani Foundation. This discussion will support the model in figure 1 and give idea about how innovation can be converted in to entrepreneurship with the help of Technology Business Incubator.

Major objectives of CIIE:

- To incubate technology based innovations and help commercialize them through an enterprise
- To conduct research as well as training and develop educational material on topics related to innovations and their evolution into viable enterprises.
- To disseminate research findings and related information on the management of innovation, incubation and entrepreneurship.
- Apart from the support of experts operating through a dynamic networking model, closely involve IIMA faculty and students at various stages in the value chain of converting innovations into products and then enterprises.

Main activities of CIIE:

- Incubation:  
Infrastructure support, Networks for technology, Finance, Mentoring, Consultancy, Databases Information dissemination, IPRs, International networking

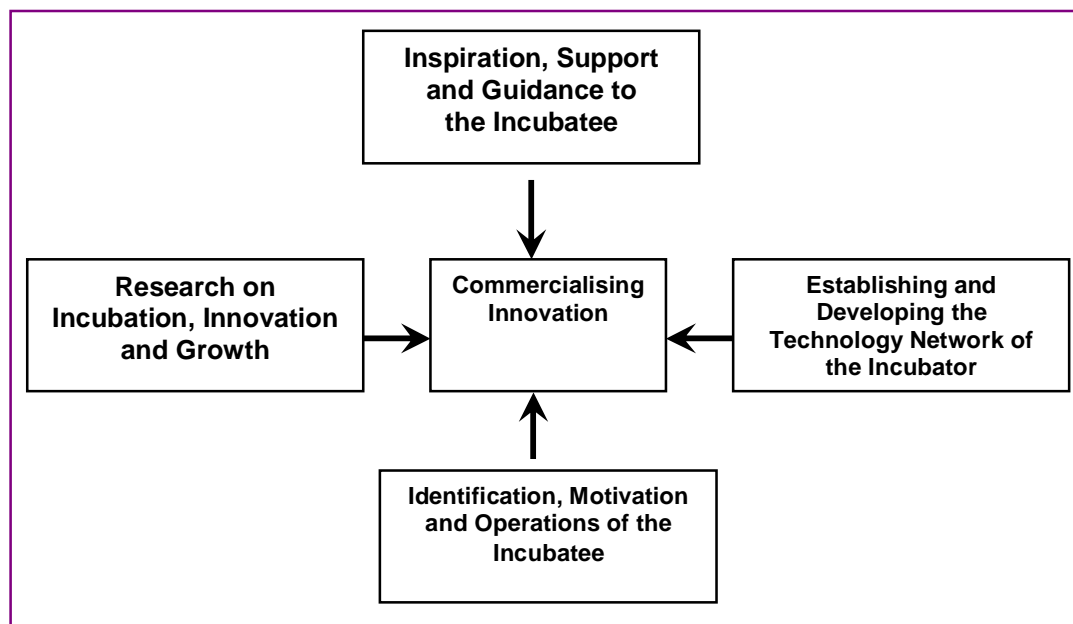
- **Entrepreneurship Development:**

Business plans, Consultancy, Case studies, Dissemination of information, Training Programs

Apart from research, training and consultancy, interactive workshops, seminars, developing course material along with extensive networking operations are conducted to push ahead the CIIE agenda.

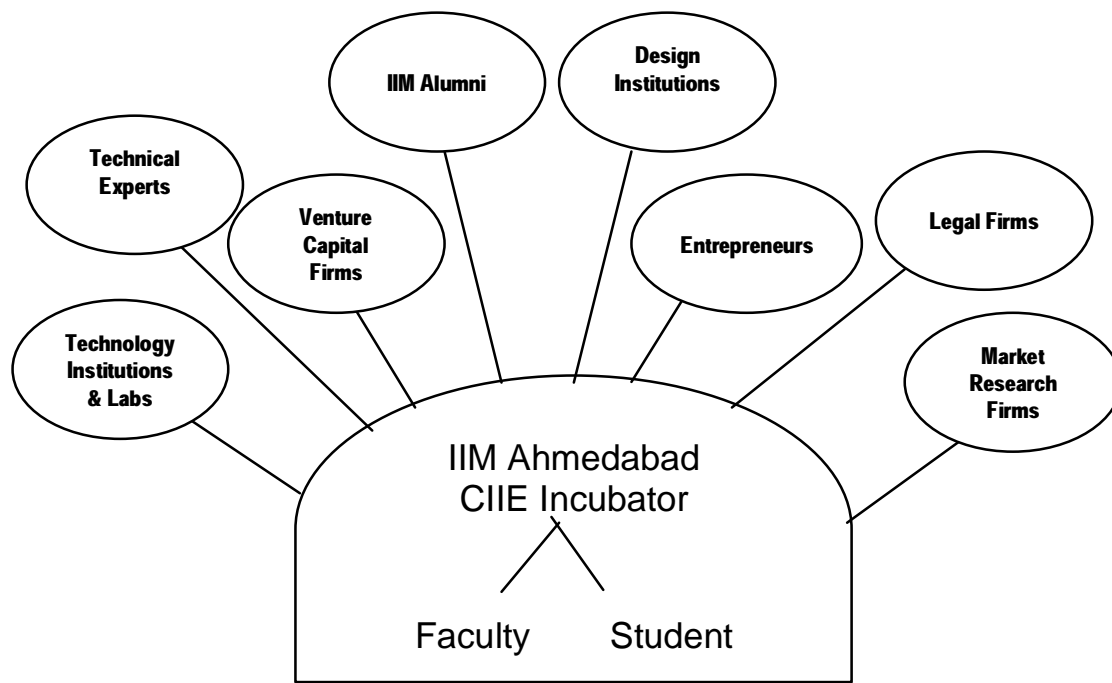
- **Methodology:** involves the following broad steps:

- Scouting for Innovation
- Selection of Innovators, IP evaluation and signing NDA (Non Disclosure Agreements)
- Service and shareholder agreement with incubatees, whatever is applicable
- Infrastructure and services to selected incubatees and initiating mentor program
- Providing access to technology and related networks
- Commercialization Activity - entrepreneurial Venture, business plan, market research, consultancy, legal, finance and other support
- Graduation of the Incubatee



<Figure 3> **CIIE Methodology** (Source: CIIE, Ahmedabad)<sup>28</sup>





<Figure 4> I3E Network (Source: CIIE, Ahmedabad)<sup>28</sup>

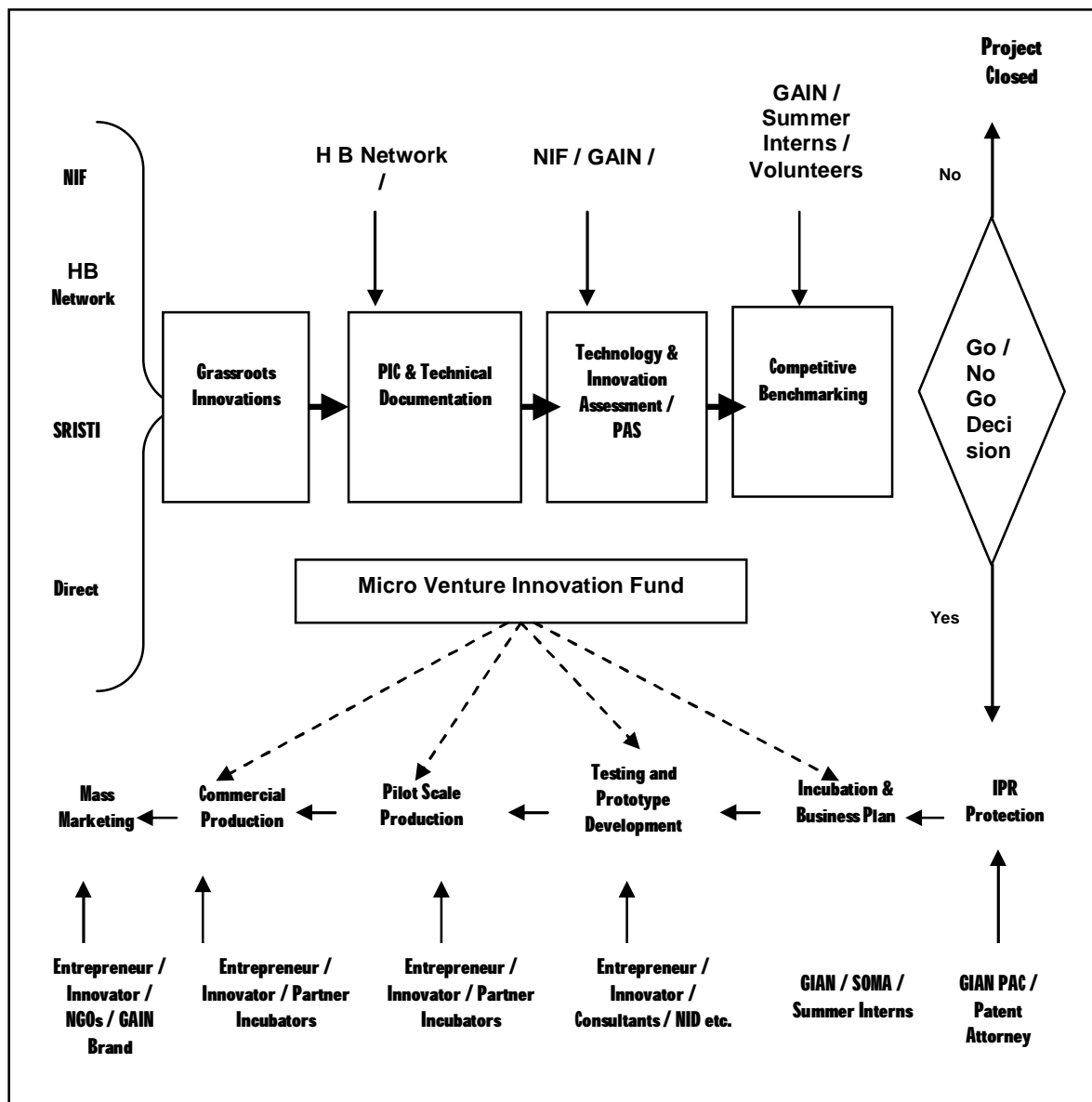
- The Indian Incubator for Innovation Based Enterprises (I3E) is managed by CIIE. I3E help innovators to successfully commercialize their innovation through an enterprise.
- CIIE has incubated around 15 companies till now.

## 5.2 GIAN: (Grassroots Innovations Augmentation Network)

GIAN<sup>29</sup> is India's first technology business incubator focused on incubating and commercializing grassroots innovations. Grassroots innovations are essentially solutions generated by people at the grassroots levels to tide over persistent problems, the solutions to which are either not available or not affordable by a large section of the consumer masses in developing countries like India. These innovations, therefore, capture an unmet need of a large section of the population and building a value chain around these innovations to take them to market holds the potential of wealth creation in a truly sustainable and equitable manner. The objective of GIAN is to build the value chain around these innovations with the end objective of making these available to the masses through the market mechanism or otherwise. GIAN has been setup by NIF (National Innovation Foundation) at Ahmedabad, Guwahati and Jaipur for providing incubation support to Grassroots Innovations and traditional knowledge from the regions of West, North-East and North India respectively. In addition, GIAN cells are also present at Tumkur and Madurai at South India.

GIAN incubates high potential grassroots innovations into market ready products through a well-established incubation process and using its strong and decentralized network. The incubation path followed by GIAN is as shown below:

The problem for GIAN is: How to motivate grass root people to an entrepreneur who come out with great innovations? They lack in soft skills related to business because of their poor educational back ground. Most of the time, they have to go for Technology Transfer rather than making them real entrepreneur.



<Figure 5> GIAN (Source: [www.gian.org](http://www.gian.org))<sup>29</sup>

### 5.3 IITs' experience of Technology Business Incubation

Basant R. & Chandra P. (2007)<sup>19</sup> has thrown some idea about the incubation efforts of Technology Institutes in India in their Research paper. The survey highlighted two issues with respect to the potential for enterprise creation in education institutions in India:

- Only few institutions have high-end links for basic and applied research that can result in technology-based enterprise creation. Most institutions primarily undertake training, testing and prototype development activities, along with student projects.
- Very few institutions are able to raise funding for research and for activities that they do with industry. Lack of funding hinders the creation of links.

Apart from funding, the absence of institutional and policy incentives for researchers and institutions to build links, the lack of research orientation among local firms, and the inappropriateness of research undertaken for industry contributed to the absence of links. But IITs and IISc have some better experience. Now, most of the IITs are having Business Schools which have really helped them foster the entrepreneurship culture. Here, the incubation efforts of three major IITs (Indian Institute of Technology) have been discussed as follows with their achievements and mechanism of supports:

*IIT Bombay:* The IIT Bombay has set up full-fledged Technology Business Incubator to support incubation of technology. The effort was supported by Department of Science and Technology of the Government of India. The TBI named as Society for Innovation and Entrepreneurship (SINE) came into existence in 2004 to manage the business incubation and accelerate the growth of entrepreneurship in IIT Bombay. On behalf of IIT Bombay, SINE holds equity in the incubatee companies, enters into revenue sharing arrangements and licenses technologies developed at IIT Bombay. As of March 2009, 10 companies are successfully incubated but actual figure is more than 20. At present 15 companies are there as the incubatees. The incubator in IIT Bombay is open only to IIT faculty members and students. At a time, they can accommodate 15 – 17 companies as incubatees. They provide facilities like office facilities with furnished rooms with communications facilities, shared resources in terms of servers, software tools, meeting and conference rooms, legal supports, business support with the help of continuous mentoring program, training program, seed funding, showcasing events like exhibitions, training programs, seminars and workshops to support incubatees<sup>42</sup>.

*IIT Kanpur:* In collaboration with the Small Industries Development bank of India (SIDBI), IIT Kanpur has set up the SIDBI Innovation and Incubation Centre (SIIC) to foster innovation, research and entrepreneurial activities in technology based area. Till now, 5 companies have been incubated successfully and at present 8 companies are under incubation process. Emphasis has been given to the commercialization of IIT Kanpur products – techno innovations. They also work more on IPR related issues for techno innovations. They have supported many projects under TePP (Technopreneurs Promotion Program) of Government of India. They provide various facilities like: Seed money, In campus accommodation, mentoring, Business plan development, Business promotion, Incubation space, Office support, Library and documentation, assistance in getting finance, advertising agencies, legal assistance, Electronic and animation cell and all other resources of IIT Kanpur to the incubatees<sup>43</sup>.

*IIT Delhi:* Just like SINE of IIT Bombay, IIT Delhi is having the Foundation for Innovation and Technology Transfer (FITT). It has come in to existence as a part of ICICI Bank and World Bank funded Technology Institutions Program. The incubation center has admitted 12 companies, of which 6 have exited the program, but only 2 successfully incubated. Major focus over here is on IPR and transfer of technology for commercialization. The major mechanism of support here is to provide transfer of technology, research partnership with industry, innovative problem solving consultancy, safeguarding Intellectual Property Rights (IPR), access to resources of IIT Delhi like equipments, library etc., networking with venture capitalists and other sources for funding incubated companies, shared facilities for conferencing and meetings, networking with premier business management schools for mentoring and knowledge support and HRD program to support incubatees<sup>44</sup>.

## **6. Examples of Techno – Innovation to Techno – Entrepreneurship**

### **● Sketching Pen Device:**

- Ms. Pragnya Dilip Bhatt innovates for the visually challenged and fun education of children.
- An innovative teaching aid for visually impaired children
- Provide "drawing stimulus" for creativity.
- Also serves as essential communication link between the sighted and visually impaired persons.

- The developed technology uses readily available materials like polycarbonate plastics, plywood, Acrylic/woolen thread and hook and loop Nylon fabric. CIIE regards this as a simple innovative technology with significant mass impact.
- INFLO - Infusion flow rate monitor:
  - Developed by Sanjeev S. Gokhale and Dr G. Vaze, INFLO
  - It is a microprocessor-controlled device with high levels of accuracy, which can be used to monitor the infusion flow rate.
  - The product senses and displays the infusion flow rate in number of drops per minutes.
  - It has been successfully tested in various hospitals and has received a very positive feedback. This venture is supported by CIIE.
- Process to manufacture fuel oils and related petroleum products from polymeric waste:
  - Products are gaseous/liquid hydrocarbons which could be used as fuel, or chemicals derived from hydrocarbons. When used as fuel the environment is saved from pollutants. The products could be used as fuel and if refined further & blended they could be used as petrol, diesel, kerosene or solvent.
  - Due to excess use of polymeric materials in everyday life lot of waste is generated. This waste being non-biodegradable it is difficult to dispose them. Hence this work was initiated and successful results obtained.
- Aura Herbal:
  - Aura Herbal has been established by Mr. Arun Baid and his wife, Sonal Baid. Arun was in Chemical business for almost 18 years. Then he has realized that he has to do a kind of business which will not harm society just like chemical. They have started their experiment of herbal dyeing in their kitchen and the results were really good. But they have doubt whether the market would accept it or not.
  - They have gone with their innovation of Herbal dyeing to CIIE, IIM Ahmedabad and this project has been considered for incubation. They got patent on this technology and now running their business successfully for last 5 years. Now they are planning to expand their business by vertical integration by means of manufacturing herbal garments from their won herbal dyeing.

Apart from that there are many examples which have been supported by Techno Business Incubators, GIAN, SRISTI, Honey Bee Network and many others:

- Balubhai Vasoya, from Ahmedabad in Gujarat has developed a stove that uses both kerosene and electricity. A six-volt electric coil heats the kerosene, converting it into gas which burns with a blue flame. It saves 70 per cent on fuel compared with conventional stoves running on LPG. One litre of kerosene lasts for eight hours; and in 20 hours, the stove uses one unit of electrical power. So running it for an hour costs one-and-a-half rupees in total. No smell, no smoke and it burns like LPG.
- Mansukhbhai of Gujarat could not afford to buy a tractor, so he created an Enfield diesel motorcycle with a difference: by removing the back wheel and replacing it with a spiked cylinder, his motorcycle now doubles as a tractor.
- Anna Saheb Udgave, a 70-year-old farmer from the Sadalga village in Karnataka's Belgaum district, developed a low-cost drip irrigation system to fight water crisis in his village. He improved upon his innovation and turned it into a mega sprinkler, and called it Chandrababhu Rain Gun. Other impressed farmers of the same village slowly started using Anna Saheb's rain gun in their farms. Now, the farmers of Tamil Nadu, Kerala and Karnataka are also using it successfully.
- Deepasakhti Pooja Oil, a blend of five different oils in a ratio prescribed in the Indian shastras does not produce any soot but gives a bright flame. It lasts longer and the fumes produced repel disease-causing bacteria. It is now being commercially manufactured by KP Castor Oil Works in Coimbatore.
- A manual milking device -- J S Milker -- is another innovation that has found acceptance in the rural areas. J S Milker is manufactured and marketed by J Support Industries headed by Joy John of Pothanickad, Kerala. J S Milker is a simple vacuum driven portable machine, which can be used to milk cows effortlessly. J S Milker is so successful in South India that RIN is planning to market it in Gujarat, where there are several milk co-operatives.
- Arvinbhai Patel of Vanch Village, Ahmedabad has been supported by GIAN for his

innovations like Auto Air Kick Pump, Natural Water Cooler and Auto sprayer. He has got patent for his innovations with the help of GIAN and NIF. He is not even an engineer but just a school passed person. He has been supported for the business of all his innovations in terms of marketing and some financial support. After some time his innovations related to natural Water Cooler has been transfer to one company through Technology Transfer mechanism with the help of GIAN for better business.

## **7. Conclusion & Future Research**

There are Technology innovations but to convert Techno – Innovations in to Techno – Entrepreneurship is a challenge. As discussed in this paper, there are many supports for Techno - Innovations which can be converted in to Techno – Entrepreneurship but how effective they are – is a matter of research. While thinking about Techno – Innovation and Techno – Entrepreneurship, we need to answer many questions from – How to explore tacit knowledge - to - who will get the credit? And answering those questions may not be so easy. From the literature review what we have made, we may say that not much extensive research, particularly in Technology Business Incubation approach, has been done in this area of Techno – entrepreneurship in the context of India; however the literature review suggests that much research has been done in this area in western countries which may guide the research in this area in Indian context. Even western countries, we are finding research in understanding the Technology Business Incubation, but case studies of techno-entrepreneurs through technology business incubation is hard to get. In the context of India, the concept of Technology Business Incubation is comparatively new as started by Department of Science and Technology, Government of India in 2000 only and most of them, out of 24 at present, have been started just 2-3 years back only. So management research in this area in the context of India is not much, however, some exploratory study has been done (Basant R. & Chandra P, 2007)<sup>19</sup>. So scope of some case study research is there in the area of Techno-Entrepreneurship through Technology Business Incubation in the context of India to understand the process.

At this junction of time, we may have to focus on understanding Technology Business Incubation process in the context of India as this concept is comparatively new in India and not much management research done in this area. Even journey of Techno-entrepreneurs through Technology Business Incubation approach in India will be interesting study which may give insight in to the problems and difficulties they might be facing. This may formulate appropriate



conceptual model of Technology Business Incubation in country like India. The case study research approach may be appropriate as the concept is new in the context of India and appropriate sample size may be a problem. Even case study research will help in describing the process of Technology Business Incubation in the context of India. The most appropriate research design may be '*Embedded Multiple – Case Design with Descriptive Case Study*' (Yin R. K., 2003)<sup>17</sup> as here unit of study will be more than one i.e. Organizations and Techno-entrepreneurs both to understand the process. Even multiple case design will be more robust compare to single case study. And descriptive case study design will help in describing Technology Business Incubation in the context of India which can further be useful to define variable and making appropriate hypothesis for future statistical study in this area in the context of India.

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