

Promoting Innovation through Technology Incubation and Development of Entrepreneurs

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Abstract- Technology Incubation is an institutional mechanism to develop an atmosphere for innovation and entrepreneurship for the active interaction between academia and industry. It is increasingly recognized that entrepreneurial start-ups have an important contribution to technological innovation, economic growth employment generation and social equity. Young entrepreneurs have to be developed in the Institutions of higher learning by setting-up of Technology Incubation Centres at these institutes. Realizing that innovation is the engine for the growth of prosperity and national competitiveness, this paper discusses on the development of young entrepreneurs by supporting institutions of higher learning for the setting up of Technology Incubation Centres. This paper also discusses on the Best Practices for an Incubation to achieve their targets in terms of innovation, entrepreneurial growth, products development, employment generation.

Index Terms- Technology, Incubation, Entrepreneur, Higher Learning, Innovation, Start-up, Best Practices.

I. INTRODUCTION

Technology incubation is an institutional mechanism to develop an atmosphere for innovation and entrepreneurship for the active interaction between academia and industry. It leads to sharing ideas, knowledge, experience and facilities for the development of new technologies through innovation and mentoring. It is increasingly recognized that entrepreneurial start-ups have an important contribution to technological innovation, economic growth, employment generation and social equity. The incubation concept is divided into five stages as depicted in Figure 1.1.



Fig 1.1 Arrangement of Incubation concept

India has made commendable progress in terms of the growth of scientific and technological (S&T) culture. Today, India has a vast pool of S&T infrastructure with over 8000 technical institutions [1] including around 600 universities [2], 400 national laboratories & over 1,300 in-house R&D units in the corporate and other sectors [3]. The estimated annual out-turn of the engineering graduates is around 15 lakhs [4].

Innovation has become a key focus area for the Indian industry as one of the critical levers of competitiveness and growth. During the discussions for the Five Year Plan, the subject of promoting innovation and technology innovation has been recommended at several forums. It was recommended that a) the group to be set up by PMO Task Force to promote the growth of electronics/IT/Hardware manufacturing industry b) The working group on fostering innovation and sustaining competencies c) The study team for R& D for Five Year Plan. Realizing that innovation is the engine for the growth of prosperity and national competitiveness in the 21st century, the then honorable President of India (Smt. Pratibha Devi Singh Patil) in her address to Parliament on 4th June 2009 mentioned that next ten years would be dedicated as a 'Decade of Innovation'. Towards this, Government of India had set up a National Innovation Council (NinC) with the objective(s) to discuss, analyze and help for the implementation of strategies for inclusive innovation in India and prepare a 'Roadmap for Innovation' for the decade 2010-2020. Various departments in Government of India took the initiative and set up different organizations to promote innovation and incubation in varied fields e.g. Technology Incubation for Development of

Entrepreneurs (TIDE) scheme by Department of Electronics and Information Technology (DeitY), Technology Business Incubators (TBI) scheme by Department of Scientific & Industrial Research (DSIR), Bioinformatics centre (BIC) and Biotechnology Industry Research Assistance Council (BIRAC) schemes by Department of Biotechnology (DBT) and Rajiv Gandhi Udyami Mitra Yojana (RGUMY) scheme by Ministry Of Micro, Small And Medium Enterprises (MSME).

II. RESEARCH METHODOLOGY

This study was conducted by collecting data through surveys and interviews. The structured questionnaires were designed for the survey and aligned to specific stakeholder(s) of Technology Incubation. Three separate questionnaires had been designed to focus three different categories of stakeholder of technology incubation: (1) Technology incubation centres, 275 Premiere Institutes across India who have setup their centres through Government scheme; (2) Startups, 1211 who have developed 2860 entrepreneurs and (3) Host institutions where the Technology incubation centres located.

The questions captured the relevant aspects of social, technological and economic impacts. Structured and semi-structured interviews were conducted. Parameters considered to analyse technological impacts are: patent counts, counts of new products and processes, involvement/development of number of students, consultancy provided by faculties, trainings provided by the incubation centre, ICT infrastructure at the centres and commercialization & marketing information support. Parameters taken to analyze economic & fiscal impacts are: revenue generated, employment created, annual salaries & wages, taxes paid and grant/investment raised. Parameters considered for social impacts are: entrepreneurs developed through technology incubation centres, women entrepreneurs through the centre, employment generated, employment generated industry-wise and students/alumni entrepreneurs. The data collected through the survey was studied, analyzed and conclusions were drawn.

III. DATA ANALYSIS AND FINDINGS

In order to understand and integrate various perspectives, to bring Best Practices for an technology incubation to achieve the goal in terms of innovation, entrepreneurial growth, products development, employment generation, an in-depth interview and/or field surveys were conducted. Also, the open-ended questions through semi-structured interviews provided rich information for this study. captured through survey and interview was analysed on multiple dimensions using both quantitative and qualitative methods.

A Qualitative Approach

- (1) Perspective of Technology Incubation Centres: It plays an important role in arranging the resources for the startups; idea generation, transformation of prototype to plan, infrastructure support, entrepreneurial training, IPR facilitation and creation of a framework to nurture technology incubation. Key findings and best practices for a technology incubation through qualitative approach:
 - Nurture Innovation: Centres are able to carry out the activities that facilitate knowledge creation, innovation and entrepreneurship for the promotion and foster the spirit of entrepreneurship. This benefits the students, faculty and young entrepreneurs for the conversion of their innovative idea into a new product.
 - Transparent Selection Process: A transparent processes for the selection of startups which is based on a detailed techno-commercial proposal includes a business plan submitted by prospective entrepreneur. The proposal thus submitted are evaluated on its technical merits and commercial viability by a committee of experts who would recommend the level / duration / and terms of support to the prospective entrepreneur(s). Also, centres are regularly monitoring the progress of the company. Due to the transparent selection process, many new startups who are aspiring and have innovative idea to develop a product are benefited.
 - Infrastructure/incubation support: A separate office space, internet and telephone facilities, departmental resources for the development of their products, common infrastructure facilities like, file server, fax machine, laser printer, photocopier, scanner, teleconferencing facilities, meeting/conference room with projection equipment, library and pantry facilities are available for the Technology Incubation Centre. The infrastructure and incubation support provided by the centres enable the young and budding entrepreneurs to take up the challenges in the competitive environment.
 - Mentoring and IPR Support: Centres are able to facilitate networking with resources including mentors, experts, consultants, graduate firms, alumni and advisors for the startup to convert their innovative idea into a product and find the market for their products. (i) The Mentoring Support with regard to incubation provides advocacy, management, procurement, product development strategy, competitive landscape, possible alliances, equity, and regulatory issues and (ii) the IPR & Legal support includes technical Support, financial Support, legal Advices, fabrication assistance, market information and networking with research laboratories/institutions. Due to these supports, the startups are capable enough to bring up their products as their Intellectual Property by registering patent, software code, tools, copyrights, design and, product development.
- (2) Perspective of Host Institutions: The Host Institutions play an important role not only in the establishment but also in its smooth and efficient functioning of the Technology Incubation centres and nurturing it into a successful venture. Host institutions are expected to provide full support to the centres as to mentoring, testing labs, infrastructure, built-up space and also enable them to access the institutes' expertise and facilities. It also ensures that the funds provided to the Host Institution / Incubation Centres are fully utilized for the specific purpose of developing the entrepreneurs. Key findings and best practices for a Host institution through qualitative approach:

- Host institutes perform as an umbrella for the promotion of entrepreneurship. It facilitates the conversion of research activity into entrepreneurial ventures which translates ideas from the academic research into practical benefits to communities.
- Facilitation to Technology Incubation centres: Host institutions facilitate networking with professional resources, which include mentors, experts, consultants and advisors for the incubate companies at Technology Incubation centres.
- Host Institutes Alumni Association support: Alumni association of Premier Academic Institutes support to raise awareness and promote entrepreneurial activities, apprentice-ship, mentorship and expert guidance to the startup.
- Conducting Innovation Contests to students to develop critical thinking, entrepreneurial skills, get exposure to state of the art technologies, interaction with experts to refine their understanding to take up challenges and make a positive difference in the world around them.

(3) Perspective of Startups at the Technology Incubation centres: Startups are new and young entrepreneurs who aspire and materialize the conceptual ideas into a value added products in the commercial market. These entrepreneurs require value added support and access to critical tools, information, education, contact, resources, networking with venture capitalists and capital in the form of soft loan that are otherwise unaffordable to them. Key findings and best practices for a Startup through qualitative approach:

- Startups are expected to take the advantage of incubating in an academic environment as they get academic mentors who closely engage with them and share their knowledge. This allows the startups to focus on the development of their product/service and market it conveniently.
- The startups should use the business networks helps them to refine business models of their companies.
- In addition to the seed fund, primary services and other facilities are available at a minimal cost which is an essential requirement for them.

B. Quantitative Approach

The findings of the Quantitative Approach are discussed in respect of three aspects: Technological; Economical; and Social. The results of the study indicate that Technology Incubation Centre seem to achieve their targets in terms of innovation, entrepreneurial growth, products development, employment generation, students and professor’s participation as mentors. The infrastructure and mentoring support provided by the centres helped the startups for capacity building which resulted a sustainability rate of 86%. 2288 products had been developed by these startups out of which 1717 are software products and 571 are hardware products. The fund required for the development of hardware product is more than the software products as the average seed fund utilized by each start-up in hardware and software industries are in the ratio 7:5.

Table 1: Category-wise product developed

Type of Industry	No. of Startup Registered	Products Developed
Software	821	1717
Hardware	390	571
Total	1211	2288
S/W : H/W	2:1	3:1

Table 2: Funds invested by Venture Capitalists

Type	Number of Startups	Number of VCs	Funds Invested by VCs (In Rs. Lakhs)
Software	821	290	30847
Hardware	390	141	24405
Total	1211	431	55252

A total number of 151180 jobs had been created throughout 275 Technology Incubation Centre. Annual growth rate of 22.4% in the employment generation has been observed. 90% of the infrastructure facilities and more than 85% of the support services (Legal & Mentoring) provided by most of the TIDE Centre ensures the sustainable development of the ecosystem that are required for

entrepreneurial growth which leads to achieve the objective of ‘strengthening the technology incubation Centre in institutions of higher learning’.

Table 3 Employment generated industry-wise

Type	Number of Startup	Employment Generated	Employment generated per startup
Hardware	390	31330	80
Software	821	119850	146
Total	1211	151180	226
Ratio: S/w Vs H/w	2.1:1	3.8:1	1.8:1

Out of 1211 startups, 699 had successfully graduated and around 95% sustainability rate is achieved by the startups. It leads to the successful attempt of the commercial exploitation of the technologies developed by the startups.

IV. CONCLUSION

It is concluded that building ecosystem for mutual learning among the Technology Incubation centres in the form of seminars, workshops, symposiums, conferences and online discussion forums on regular basis has to be carried out. A separate budget for pre-incubation activities is required for setting up of Technology Incubation centres. Technology Incubation Centres which have been successfully established as per best practices to be used as a nodal centre or as a mentor centre for the next phase for motivating other institutions to setup the Technology Incubation Centres. Mentor Centre can guide & help those new Centres in establishing themselves.

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