CHAPTER I

Introduction
Technology Business Incubators

Introduction

Technology business incubators are a powerful economic development tool. They promote the concept of growth through innovation and application of technology, support economic development strategies for small business development, and encourage growth from within local economies, while also providing a mechanism for technology transfer.

Business incubation is the temporary, facilitative support provided to start-up enterprises through the delivery of complex services and special environment with the aim of improving their chance of survival in the early phase of the life span and establishing their later intensive growth.

The term *incubation* refers to the process of support, while *incubator* stands for the organization and infrastructure that are set up for these purposes.

Technology business incubators have emerged from two influences:

1 An increasing interest in fostering indigenous business development, particularly small business entrepreneurship, as an economic development strategy.
2 The desire to develop high-technology businesses in the era of globalisation.

Since business incubation is a very complex area it has been looked at variously, from different angles, by scholars and practitioners alike, who do not yet have consensus on the definition for this important economic development activity. A few relevant definitions are given in succeeding paragraphs to illuminate our understanding.

What does Business Incubation involve?

Business incubation is a business support process that accelerates the successful development of start-up and fledgling companies, also referred to as 'clients' [of the incubator], by providing entrepreneurs with an array of targeted resources and services. These services are usually developed or orchestrated by incubator management and offered both in the business incubator and through its network of contacts.

A business incubator's main goal is to produce successful firms that will leave the program financially viable and freestanding. These incubator graduates have the potential to create jobs, revitalize neighborhoods, commercialize new technologies, and strengthen local and national economies.

Critical to the definition of an incubator is the provision of management guidance, technical assistance and consulting tailored to young growing companies.

Incubators usually also provide clients access to appropriate rental space and flexible leases, shared basic business services and equipment, technology support services and assistance in obtaining the financing necessary for company growth.

The earliest incubation programs focused on a variety of technology companies or on a combination of light industrial, technology and service firms – today referred to as mixed-use incubators. However, in more recent years, new incubators have emerged globally targeting industries such as food processing, medical technologies, space and ceramics technologies, arts and crafts, and software development. Incubator sponsors have also targeted programs to support microenterprise creation, the needs of women and minorities, environmental endeavors and telecommunications.

To summarise, Business Incubation can thus be said to refer to *complex services and special environment provided temporarily for start-up enterprises with the aim of improving their chance of survival in the early phase of the life span and establishing their later intensive growth.*

> *Over the years Vinayakapandi had seen many of his friends and others in the wood processing industry having their fingers cut or hurt due to defective cutters. The conditions of his carpenter friends motivated him to think of a solution.*
>
> ***Mr. Vinayakapandi – Promoter, Biramha Machine Tools from TREC-STEP, Trichy***

Classification of Incubators

Incubators vary in the manner they deliver their services, in their organizational structure and in the types of clients they serve. Highly adaptable, incubators have differing goals, including diversifying regional economies, providing employment for and increasing wealth of their local areas, and transferring technology from universities and major corporations. Incubator clients are at the forefront of developing new and innovative technologies – creating products and services that improve the quality of our lives in communities around the world.

Incubators differ from research and technology parks in their dedication to start-up and early-stage companies. Research and technology parks, on the other hand, tend to be large-scale projects that house everything from corporate, government or university labs to very small companies. Most research and technology parks do not offer business assistance services, which are the hallmark of a business incubation program. However, many research and technology parks house incubation programs.

There are a variety of incubators, which are defined below:

A. Business incubators promote continuous regional and national industrial and economic growth including increasing employment through general business development or stimulating specific economic objectives such as industrial restructuring and wealth generation or utilization of resources.

The incubator combines a variety of small enterprises support elements in one integrated affordable package. It has a special niche, i.e. nurturing early stage, growth-oriented ventures, through focussed assistance within a supportive environment.

A "third generation system" termed as *"International Enterprise Centre"* is reported to be emerging to bring under a single aegis the full range of support services for the development of knowledge-based business, with linkages to universities, research institutes, venture capital and international joint ventures.

B. Technology Incubators (TI) are intended for bolstering the technology development stage. The primary goal of technology incubators is to promote the development of technology-based firms, and assist in completion of the technologies under development. These are located at or near universities, R&D institutes, and Science and Technology parks. They are characterized by institutionalized links to knowledge sources including universities, technology transfer agencies, research centres, national laboratories and skilled R&D personnel. The aim is also to promote technology transfer and diffusion while encouraging entrepreneurship among researchers and academics.

Technology incubators, in practice, are a variant of business incubators, and combine broadly the functions of technology business incubator and innovation centre.

C. Technology Innovation Centres (TIC): The TICs conduct research and development (R&D) and technology innovations required by the industrial field, which aims to jointly invest resources into university campuses or research institutions and achieve commercialization with support from business enterprises or public institutions. As a concept the TIC is similar to that of the Technology Parks, and, at the R&D stage, to the TI.

D. Technology Business Incubators (TBI): The TBI is a venture of universities, public research institutes, local government and private institutions to promote and bolster a new technology intensive enterprise.

TBI refers to the type of incubation where the focus group consists of innovative, mostly technology-oriented, or knowledge-intensive service sector enterprises and interactions with the academic sphere giving a substantive element of the incubation process. The pushing forward of TBI occurred in parallel with the vigorous transformation of today's spatial economic processes, it can be interpreted *as a reply for the challenges of the learning-based economy.*

As TBI intervenes into the spatial processes of the learning-based economy, integrates innovation- and enterprise-policy, and is implemented with the active participation of the academic sphere, it has certain unique characteristics that deserve mention:

- TBI fosters innovative start-up firms, thus *the process of incubation is strongly intertwined with the innovation process* that occurs in the supported enterprises.
- The objective of TBI is the realization of certain *local economic development goals* (ultimately the enhancement of the competitiveness).
- TBI aims at the development of new innovative industries by stimulating the establishment and early growth of start-up firms.

What differentiates technology business incubators from other incubators?

Most general business incubator programs hope to increase the rate of new business formation, expansion, and development, and to increase the chances of survival among client firms — whether they are focused on technology-based businesses or not.

Another difference is that general business incubators tend to focus on client firms that have or are developing proprietary advanced technology with marketable products or services. Such firms usually have a strong R&D component. Technology business incubators offer a slightly different array of services. Incubators associated with universities typically offer access to advanced technology laboratories, equipment, and other research and technical resources such as faculty, staff, students, and libraries. Many of the first incubators in the United States were sponsored by universities, which is also the case in India.

Smilor and Gill found that the advantages of being near a university campus include access to library facilities, access to student labor, a creative environment, and exposure to state-of-the-art technical equipment and expertise. Companies within university-affiliated incubators were perceived to benefit from these advantages. The Smilor and Gill study further explained that incubator companies:

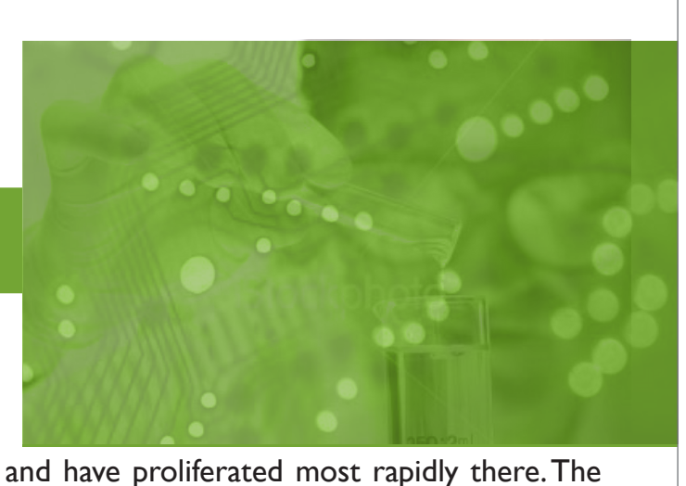
> …may benefit from having the best available talent when they need it without having to carry that high-priced talent on their payroll. And these companies received the stimulations and catalytic effect associated with working alongside exceptional professionals from outside their organization.

A third difference is that technology business incubators linked to universities or other research institutions have, as a major objective, the transfer or commercialization of technology. Technology transfer can be defined generally as the transfer of a technology, technique, or knowledge that has been developed in one organization and then transferred to another where it is adopted and used. Technology transfer is a major component of the innovation process. Mowery captured its importance in this way: "The economic impact of innovation, whether revealed in productivity growth, employment creation and destruction, or changes in wages and profits, is realized only through the adoption of innovations". In other words, technology business incubators have an inherent capacity for economic impact through facilitating technology transfer.

The TBI is different from TI or TIC in that it supports the commercialization of previously developed technology; that is, the start up activities of an enterprise. It differs from general BIs in that it concerns technology-intensive or high tech business.

In many ways, technology business incubators are the epitome of technology-based economic development. They provide a mechanism for technology transfer, the common goal of many technology-based economic development programs. In addition, they support the concept of growth through innovation and application of technology, and economic development strategies that encourage small business development and growth from within a local economy.

> *Dr P.T. Ajith Kumar a Ph.D. from Cochin University of Science and Technology (CUSAT), launched on the entrepreneurial path while still a PhD student when difficulty in receiving quality TV pictures at his home led to his designing and developing of a tuned antenna with high gain for a particular transmission frequency.*
>
> ***Dr P.T. Ajith Kumar, Promoter, Light Logics Holography and Optics Pvt. Ltd from Technopark, Trivandrum***



Historical context

Business incubators originated in the United States of America and have proliferated most rapidly there. The origins of the idea can be traced to 1942, when Student Agencies Inc., in Ithaca, began incubating student companies. In 1946, the first incubator outside the student community was created by American Research Development (ARD), started by several MIT alumni, to supply risk capital to entrepreneurs.

In 1959, Charles Mancuso and his family purchased the Batavia Industrial Center (BIC) in New York State and used this former factory warehouse to create jobs in an economically depressed small town. It was only in the 1960s that incubators began to develop. Growth accelerated in the 1970s and 1980s largely as a result of the need to revitalize regions suffering from job losses in basic industries. The 1990s witnessed further development of incubators throughout the country. Starting in 1996 and gathering momentum in 1998, a new kind of incubator, variously called an "Internet incubator", "accelerator" or "venture catalyst", made its appearance.

As of October 2006, there were more than 1,400 incubators in North America, up from only 12 in 1980. Her Majesty's Treasury identified around 25 incubation environments in the UK in 1997; by 2005, UKBI identified around 270 incubation environments across the country. A study funded by the European Commission in 2002 identified around 900 incubation environments in Western Europe.

In 2005 alone, North American incubation programs assisted more than 27,000 companies that provided employment for more than 100,000 workers and generated annual revenues of $17 billion.

Technology Incubation in India

The National Science & Technology Entrepreneurship Development Board (NSTEDB), established in 1982 by the Government of India under the aegis of Department of Science & Technology, is an institutional mechanism for promoting knowledge-driven and technology-intensive enterprises. The Board, having representations from socio-economic and scientific Ministries/Departments, aims to convert *"job-seekers"* into *"job-generators"* through Science & Technology (S&T) interventions. The objectives of NSTEDB have been defined to be:

- To promote and develop high-end entrepreneurship for S&T manpower as well as self-employment by utilising S&T infrastructure and by using S&T methods.
- To facilitate and conduct various informational services relating to promotion of entrepreneurship.
- To network agencies of the support system, academic institutions and Research & Development (R&D) organisations to foster entrepreneurship and self-employing using S&T with special focus on backward areas as well.
- To act as a policy advisory body with regard to entrepreneurship.

These objectives have been operationalised by NSTEDB through two major interventions. Namely, the scheme for *Science & Technology Entrepreneurs Parks (STEP)*, which was started in the early 1980's, and the *Technology Business Incubators (TBI)* programme launched in early 2000.

Science & Technology Entrepreneurs Park

Science Park initiatives are meant to help in creating an atmosphere for innovation and entrepreneurship; for active interaction between academic institutions and industries for sharing ideas, knowledge, experience and facilities for the development of new technologies and their rapid transfer to the end user.

The Science & Technology Entrepreneurs Park (STEP) programme was initiated by NSTEDB to provide a re-orientation in the approach to innovation and entrepreneurship involving education, training, research, finance, management and the government. A STEP creates the necessary climate for innovation, information exchange, sharing of experience and facilities and opening new avenues for students, teachers, researchers and industrial managers to grow in a trans-disciplinary culture, each understanding and depending on the other's inputs for starting a successful economic venture. STEPs are hardware intensive with emphasis on common facilities, services and relevant equipment.

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 many of whom were otherwise seeking jobs soon after their graduation, and also to:

- Provide R&D support to the small-scale industry mostly through interaction with research institutions.
- Promote innovation based enterprises.

STEPs are autonomous bodies registered as societies under the Societies Registration Act or registered as *not-for-profit companies under the provisions of Section 25 of the Companies Act, 1956.*

NSTEDB has so far catalysed 15 STEPs in different parts of India, which have promoted nearly 788 units generating annual turnover of around Rs. 130 crores and employment for 5000 persons. More than 100 new products and technologies have been developed by the STEPs / STEP promoted entrepreneurs. In addition, over 11,000 persons have been trained through various skill development programmes conducted by STEPs.

Facilities and Services Provided by STEPs

They offer **facilities** like nursery sheds, testing and calibration facilities, precision tool room/central workshop, prototype development, business facilitation, computing, data bank, library and documentation, communication , seminar hall/conference room , common facilities such as phone, telex, fax, photocopying.

They also provide **services** like testing and calibration, consultancy, training, technical support services, business facilitation services, database and documentation services, quality assurance services and common utility services

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Technology Business Incubators (TBI)

The need for instruments such as TBI has been recognised the world over for initiating technology led and knowledge driven enterprises. Studies also show that such mechanisms help not only in the growth of technology based new enterprises but also in improving their survival rate substantially (from 30 per cent to over 70 per cent). TBIs also facilitate speedy commercialisation of research outputs.

Thus, the TBIs besides providing a host of services to new enterprises (and also to existing SMEs in the region) also facilitate an atmosphere congenial for their survival and growth. *The essential feature of this TBI programme is that the tenant companies leave the incubator space within 2-3 years.*

TBIs have been promoted by NSTEDB to achieve the following objectives:

- Creation of technology based new enterprises,
- Creating value added jobs & services,
- Facilitating transfer of technology,
- Fostering the entrepreneurial spirit,
- Speedy commercialisation of R&D output,
- Specialised services to existing SMEs.

These TBI are usually located near a source of technology and knowledge i.e. around R&D Institutions/Academic Institutions or have strong links with such institutions to ensure optimal use of the already existing expertise and facilities thus keeping the cost of the TBI on lower side. Locating TBIs in such location also reduces time lag between technology development and its commercialization. Further, as the success of a TBI largely depends on its location and management besides quality of tenant enterprises, following aspects relating to the host institution (HI) are always kept in view while selecting the location of the TBI:

- R&D track record and subsequent commercialization of R&D output,
- Dedicated team of R&D persons,
- Industrial milieu in the region,
- Proximity to other R&D/academic institutions,
- Infrastructure, facilities and expertise available,
- Strong commitment and willingness of the HI.

> *A promise made to himself in 1995 to be an entrepreneur by 2005 led to Umesh Sisodia founding Circuitsutra ten years later.*
>
> ***Mr. Umesh Sisodia – Promoter, Circuitsutra Pvt. Ltd. from JSSATE-STEP, Noida***

Each TBI promoted by NSTEDB focuses on not more than 2-3 thrust areas. NSTEDB is currently promoting TBIs in the following select thrust areas which have potential for faster growth:

- Information & Communication Technology (ICT)
- Application of bio-technology
- New materials including nano materials
- Instrumentation and maintenance
- Agriculture and allied fields
- Garments and fashion technology
- Services

Facilities

All TBIs promoted by NSTEDB mainly draw upon the existing facilities available in the HI including land and building. Certain essential facilities, which are created in a TBI, are also provided; like:

- Modern work space,
- Communication facilities,
- Computing facilities,
- Vital equipment needed in identified area
- Library & information centre
- Training and conference facilities

TBIs are promoted by the HI and DST jointly. The HI provides the requisite land and building for the TBI. At times other related and interested agencies are also involved as sponsors.

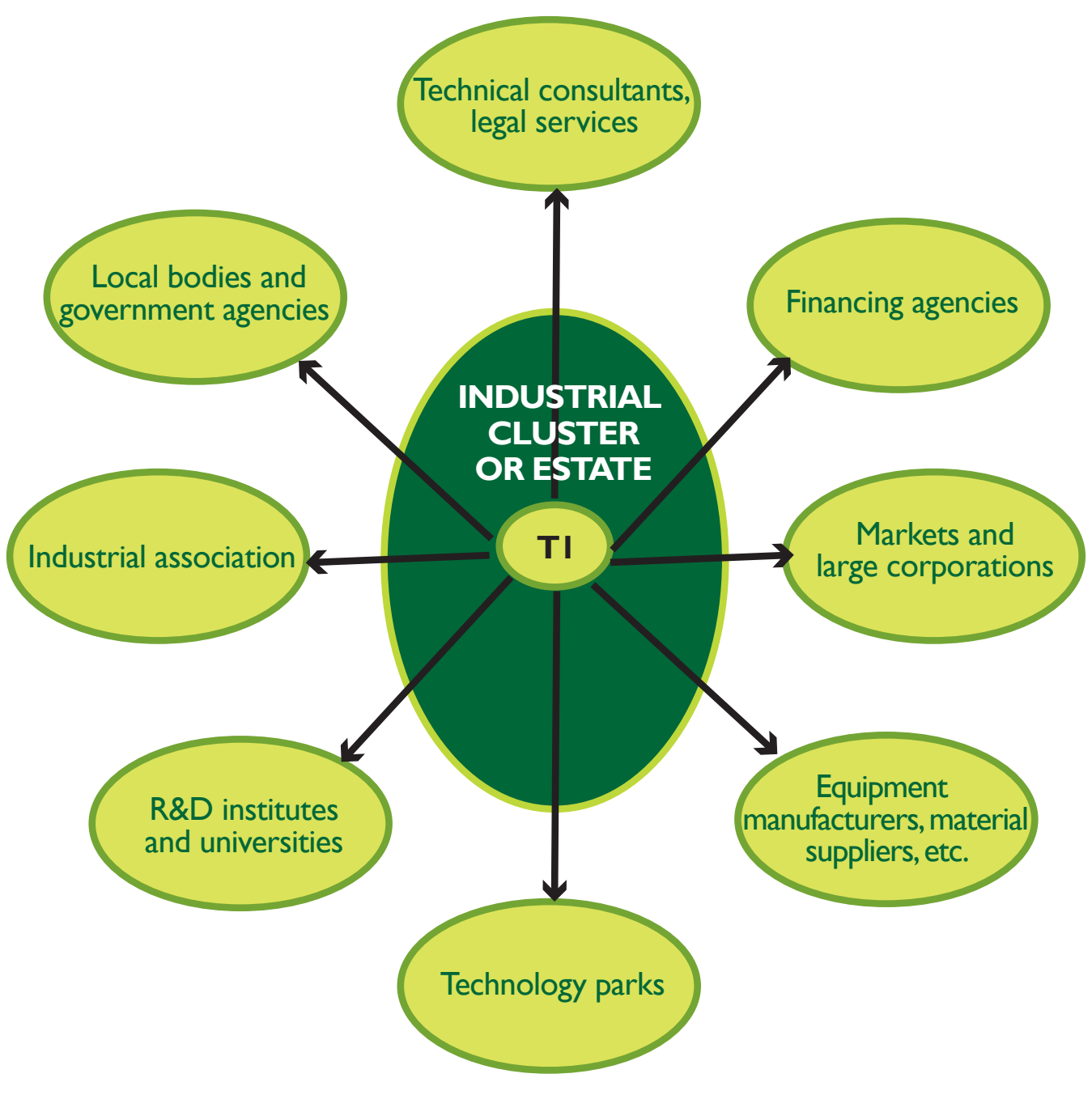
Activities

Each TBI carries out the following set of activities for achieving the objectives of NSTEDB :

- Provide specialized services to existing SMEs in the region,
- Facilitate technology commercialization,
- Consultancy,
- Training including short courses,
- Technology related IPR issues, legal and quality assurance services,
- Marketing,
- Assistance in obtaining clearances,
- Common facilities,
- Assistance in preparation of business plans,
- Technology shows/ technology clinics/ trade fairs.

The linkages required to be established by TBIs for carrying out these activities successfully are given in Figure 1 *[A typical networked technology business incubator]*.

Figure 1: A typical networked technology business incubator



Source: UNESCAP (2001), Strengthening Technology Incubation System for Creating High Technology-Based Enterprises in Asia and the Pacific

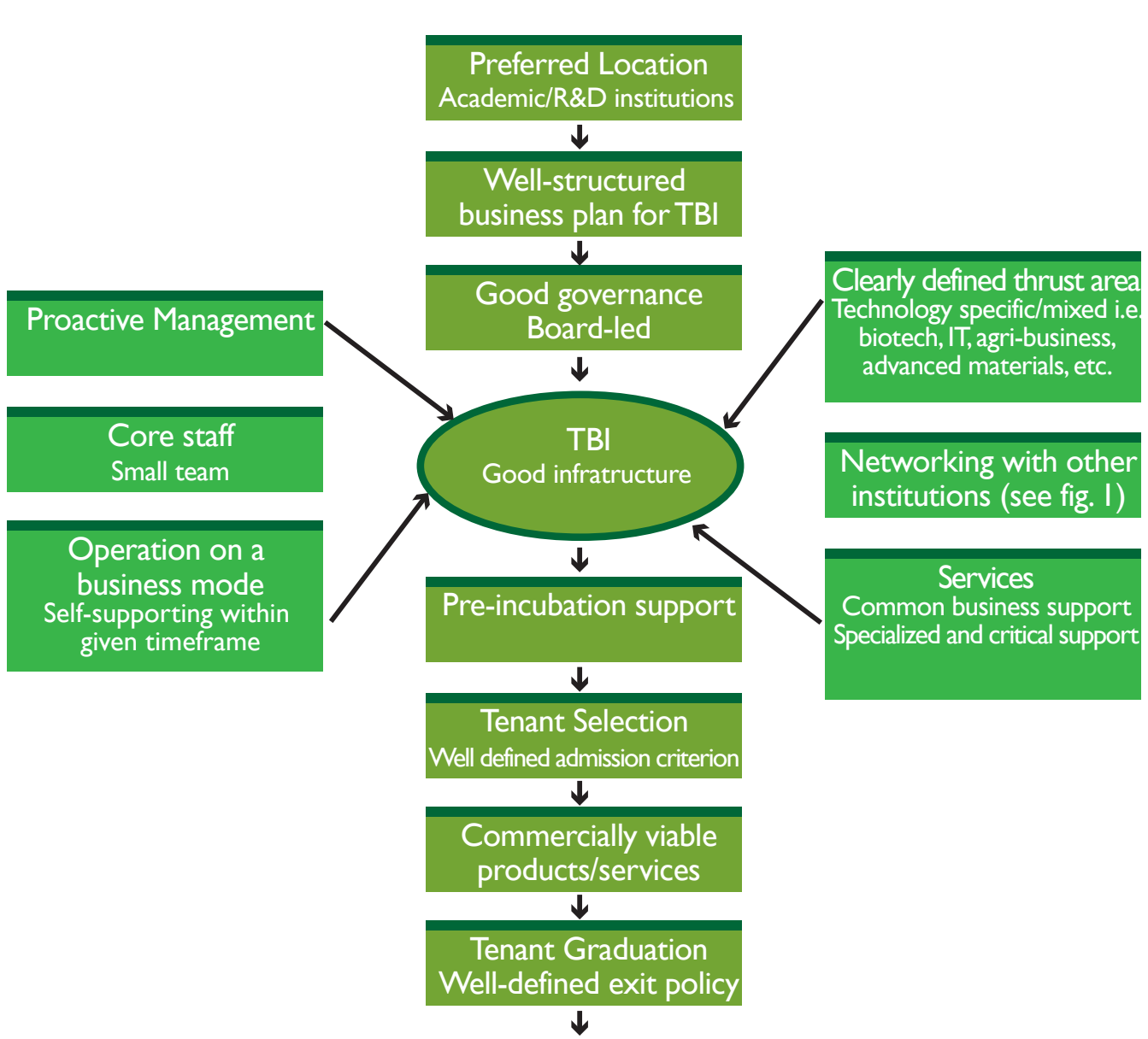
All NSTEDB promoted TBI's are intended to be self-sustaining, operating on for-profit principles. Administratively they are functioning as autonomous bodies, either as a Society registered under Societies Act, 1860 or as a not-for-profit company under the provisions of Section 25 of the Companies Act, 1956.

> *A researcher in bio-organics, and Ph.D in the area of pharmacy, Dr. Bikash Aich , resisted all the opportunities to work abroad for his post–doctoral research because of his keen interest in entrepreneurship.*
>
> ***Dr. Bikash Aich – Promoter, geneOMBIO Tech. Pvt. Ltd. from STP, Pune***

The affairs of these TBI are managed by an Advisory Board. The Board of the TBI helps not only in development of a strategic plan containing quantifiable objectives to achieve the desired results but also in managing the TBI efficiently and effectively. These Board usually have representation from the promoters and reputed professionals. At times they also include representatives of DST, SIDBI, HI, industry, VC companies, Entrepreneurs, student bodies and tenants of the TBI. A committee is also set up for selection of tenant firms.

TBI, as a researcher insightfully observed, is a "trial and error" process, hence it becomes necessary to create mechanisms that provide feedbacks from the effects and that are continuously able to select out the unsuccessful programme elements, while strengthening the successful ones. This aspect has received special attention from NSTEDB and has been incorporated in the incubation process. This process, recommended by NSTEDB for adoption by TBIs, encapsulates all of these activities, principles and governance mechanisms within a well structured design [Figure 2]. While the guidelines for operation, as enumerated by theNational Business Incubator Association, are also suggested for implementation [Exhibit 1].

Figure 2



Source: Annova Consulting, 2009.
Adapted from UNESCAP (2001), Strengthening Technology Incubation Systems for creating High Technology-Based Enterprises in Asia and the Pacific

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Exhibit 1

Principles and Best Practices of Successful Business Incubation

NSTEDB recommends these guidelines for operation and governance of incubators, which were devised in 1996 by NBIA's board of directors to help incubator managers better serve their clients. NBIA research has consistently shown that incubation programs that adhere to the principles and best practices of successful business incubation generally outperform those that do not.

Two principles that characterize effective business incubation:
1. The incubator aspires to have a positive impact on its community's economic health by maximizing the success of emerging companies.
2. The incubator itself is a dynamic model of a sustainable, efficient business operation.

Model business incubation programs are distinguished by a commitment to incorporate industry best practices. Management and boards of such incubators strive to:

- Commit to the two core principles of business incubation
- Obtain consensus on a mission that defines the incubator's role in the community and develop a strategic plan containing quantifiable objectives to achieve the program mission
- Structure for financial sustainability by developing and implementing a realistic business plan
- Recruit and appropriately compensate management capable of achieving the mission of the incubator and having the ability to help companies grow
- Build an effective board of directors committed to the incubator's mission and to maximizing management's role in developing successful companies
- Prioritize management time to place the greatest emphasis on client assistance, including proactive advising and guidance that results in company success and wealth creation
- Develop an incubator facility, resources, methods and tools that contribute to the effective delivery of business assistance to client firms and that address the developmental needs of each company
- Seek to integrate the incubator program and activities into the fabric of the community and its broader economic development goals and strategies
- Develop stakeholder support, including a resource network, that helps the incubation program's client companies and supports the incubator's mission and operations
- Maintain a management information system and collect statistics and other information necessary for ongoing program evaluation, thus improving a program's effectiveness and allowing it to evolve with the needs of the clients

Source: NBIA

> *Rated as one of India's 100 Innovative Startups by Nasscom in 2006. Mob Me was also featured in the annual list of Indian IT Innovators for 2007, the youngest company to be felicitated alongside giants like Infosys, Texas Instruments, HP and Reuters.*
>
> ***MobME Wireless Solutions Pvt. Ltd. from Technopark, Trivandrum***

References

1. *University of Michigan, NBIA, Ohio University and Southern Technology Council,* Business Incubation Works. *Athens, Ohio: National Business Incubation Association, 1997.*
2. *Linda Knopp,* 2006 State of the Business Incubation Industry. *Athens, Ohio: National Business Incubation Association, 2007.*
3. 2006 State of the Business Incubation Industry
4. *Stone, Mary (24 April 2008). "Mancuso, inventor of business incubator, dies".* Rochester Business Journal*. [http://www.rbj.net/fullarticle.cfm?sdid=72679]*
5. *Bajmocy, Z. (2007): The Theory of Technology Business Incubation and Opportunities of Application in the Less Favoured Regions of Hungary. PhD Dissertation.*
6. *Bajmócy Z. (2006): Opportunities of University Business Incubation in Less Favoured Regions of Transition Countries. 46th Congress of European Regional Science Association, Volos, Greece*
7. *Bajmócy Z. (2005): University Business Incubation in Less Favoured Regions: The Case of Szeged. PRIME 2nd PhD Summer School, Budapest,*
8. *National Business Incubation Association, Website.*
9. *RG Phillip (2002), Technology business incubators: how effective as technology transfer mechanisms?, Technology in Society*
10. *Smilor, R., Gill, M.D. Jr (1986), The New Business Incubator: Linking Talent, Technology and Know-How, Lexington Books, Lexington, MA*
11. *UNESCAP (2001), Strengthening Technology Incubation System for Creating High Technology-Based Enterprises in Asia and the Pacific*
12. *Wikipedia (2008), Business Incubation*
13. *U.S. Department of Commerce, Economic Development Administration (2008), Construction Grants Program Impact Assessment Report*