

BUSINESS FACILITATION THROUGH TECHNOLOGY INCUBATORS IN INDIA, PAKISTAN, AND SRI LANKA: A COMPARATIVE PERSPECTIVE

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1. INTRODUCTION

Small and medium enterprises (SMEs) have several handicaps including low technological capabilities. SMEs generate higher rate of employment, reduce regional disparities of development, contribute in economic growth and positively affects social indicators. SMEs also contribute in increasing the competitive intensity of the market and reduce the monopolistic position of large corporations (Todd and Javalgi 2007). Development of SMEs is, therefore, an essential component of national economic policies. Both, the developed and the developing economies recognise these issues. Khanna (2000) is of the opinion that SME sector cannot be eliminated in view of its important role in the economy. Business facilitation of SMEs has a prominent place in the national agenda of economic and social development. Technology Business Incubators (TBI) provides a sheltered and supportive environment to entrepreneur. This environment helps entrepreneurs in acquiring and developing technology, perfecting applications before launching of the products commercially. The study focuses on:

- Why do SMEs need business incubation?
- An overview of different models of business incubation.
- An overview of initiatives on technology incubation in the three countries.

- What are the determinants of success of technology incubators?

The paper first examines the changing profile of business environment for SMEs and the need of technological capabilities for a long-term success. In the sections that follows, it discusses various types of incubators and their characteristics. In the concluding sections, the paper evaluates the operations of various incubators and identifies determinants of success.

This paper is confined to incubators in three south Asian countries, India, Pakistan, and Sri Lanka and limits its scope to discuss technology business incubation.

2. THE SMES AND THE GLOBAL BUSINESS ENVIRONMENT

The small scale sector has suffers from several weaknesses and handicaps for example lack resources, technology, management expertise, access to market, and access to sources of supplies (Sardana 2004). It is in the disadvantageous position because of lack of economies of scales. It cannot compete with large-scale organizations in procurement or marketing operations. The three countries, in question, over decades have extended support to SME in the form of product reservation, market

reservation, restrictions on imports through high rate of custom duty, price preferences, and priority sector lending, fiscal exemptions, concession permits for scarce raw materials, licences for imports, protective taxation, subsidies and preferential purchases. These policies have dominated the economic scene for the last four decades. However, the process of liberalized trade and globalized economy has brought radical change in the business environment (Rakesh 2001). Almost all the protective policies have been withdrawn. As a result, the small scale sector has to compete on its own to find a place for itself in the domestic as well as international market (Tannan 2002). Bhavani (2006) mentions that while protective measures led to the proliferation of the small units, a considerable gap exists between the levels of technologies of the larger and the smaller units. The small sector operates with obsolete technologies with low productivity and hence lacks in competitive strength. Commercial viability and competitiveness are primarily dependent on technology. It is in this context that the role of technology incubation requires scrutiny and examination.

3. SMEs AND TECHNOLOGICAL CAPABILITIES

Technology has been defined differently by different authors. Broadly expressed, technology represents the know-how to transform inputs into value added outputs. Thus, it encompasses the knowledge, the product and the process designs, organisational modes and the skills to deliver outputs. Technological change resulting from the application of any aspect of technology is referred to as an innovation. SMEs in the region have generally relied upon acquiring technology from developed countries, through approaches as outright purchase, franchisee arrangements, obtaining licence, or by copying the design with minor modifications after expiration of patent. This arrangement worked as long as the units operate in the state protected and regulated environment. But, SMEs were not able to develop their competencies in indigenous product designs. Globalisation and revolution in IT has brought both the information and availability of products within the easy reach of customers. Technological change has created redundancy and obsolescence at a very faster pace. It has not only created competitive advantage for an enterprise, but has also improved the productivity through measures such as cost reduction, faster delivery and flexibility. It is imperative, that SMEs creates a strong focus on management of technology. Narayanan (2001)

refers to it as incorporating development of technological capabilities and deployment of the same in various markets. Dahlman et al. (1987) points out that technological capability includes identification, acquisition, assimilation, use, change or creation of technology. Bhavani (2006) quotes Dahlman and Lal to describe four types of technological capabilities: (a) Production capabilities refer to skills to operate, maintain, monitor and control the processes. (b) Linkage capabilities are the skills to transmit information and knowledge. (c) Investment capabilities relates to identification of technology, its usefulness, its sources of availability and the process of acquisition. (d) Innovation capabilities deal with technological change for economic gains. SMEs are generally found to be weak in all these components. It is hindered by lack of resources, manpower and infrastructure. Low market power of SMEs increases its risk of failures. SMEs, therefore, cannot risk investments on commercialisation till it has perfected the product. It, therefore, requires technology experts for development and launching of the product on a commercial scale. Business incubators provide such environment.

4. BUSINESS INCUBATION

Business incubation in the three countries is comparatively of recent origin. Business incubators came to be reported in SME literature in 1960s (Dasanayaka 2007). Incubators are meant to nurture nascent ventures by providing focused counselling and facilitation services together with smart workspace and shared office facilities (Lalkaka 2001). Business incubators are defined as a location in which entrepreneurs can receive value added support and access to critical tools, information, education, contacts, resources and capital that may otherwise be unaffordable (Bayhan 2008). Business incubation at the basic elementary levels provides networking support and infrastructure services to run the enterprise at start up phase, advises on project planning, assists to obtain regulatory clearances and renders guidance to get finance. At the second level of incubation, an entrepreneur gets access to technology capabilities. Technological competence is an important determinant of small manufacturers' ability to hold their own in the context of liberalization (Romijn 2001). Central to the concept of business incubation is the support for new businesses in the early stages of development and to graduate them when they reach a certain stage of level of maturity (infDev 2006). Incubators provide an effective means of developing SMEs (Jaywardhana 2007). Johnsrud (2003) stresses that both profit and economic development result from proper incubation.

Dasanayaka (2007) mentions some of the services and functions performed in the process of incubation:

- To provide an entrepreneurial and learning environment.
- To provide infrastructural support in the form of physical space for business operations, common business facilities and utilities as discussion rooms, conference halls, power, water, communication network, offices, fax machines, photo copiers.
- To provide easy access to experts in the focused areas, mentors, guidance to formulate project proposals and seek approvals, to identify markets, to locate sources of materials, plant and equipment.
- To assist new businesses in developing cutting edge technologies through prototype development, product testing, tool room, workshops.
- To assist in seeking seed/VC funds.
- To facilitate and to achieve community based economic development goals especially in under-developed rural areas.

4.1 INDIAN INITIATIVES

The National Science & Technology Entrepreneurship Development Board (NSTEDB) under the Department of Science & Technology of the Government of India was established in 1982 to provide a nodal institutional mechanism with broad objectives of promoting self-employment amongst the science, technology and management graduates. Reason for opening such an institution was that the innovative ideas have a longer gestation period, the skill set of the entrepreneurs is generally not fully developed and the young entrepreneur needs mentoring to establish a unit. Apart from structured training programmes, NSTEDB is responsible for setting up of institutional network for promoting knowledge based innovative enterprises. Over the years, NSTEDB has initiated four distinct programmes:

4.1.1 ENTREPRENEURSHIP DEVELOPMENT CELL (EDC)

EDC was established with the objectives of creating entrepreneurship culture in science and technology in academic institutions, to assist in dissemination of

knowledge and to respond effectively to emerging challenges related to SME's. EDC has been organizing seminars and arranging training classes to nurture the entrepreneurship culture.

4.1.2 SCIENCE AND TECHNOLOGY ENTREPRENEURSHIP DEVELOPMENT (STED)

This institutional scheme was launched with prime objectives of identifying existing and new projects that needs improvement in operations. STED is working on socio-economic development of the regional area by nurturing the science and technology.

4.1.3 SCIENCE AND TECHNOLOGY ENTREPRENEURSHIP PARKS (STEP)

STEDs are hardware intensive entities that provide common business facilities, services and other required equipments. This entity has helped a lot in the development of entrepreneurs. STEP's major emphasis is to provide entrepreneurs with common business facilities for achieving cost efficiency and faster commercialization.

4.1.4 TECHNOLOGY BUSINESS INCUBATORS (TBI)

Initiated in the year 2000, after 15 years of the start of STEP programme, TBI programme is built around accepted concepts of technology incubators the world over with primary target on academic and R&D institutions.

A TBI is differentiated from a STEP in its clear thrust on nurturing the development of technology-based and knowledge-driven companies. TBI is to focus on not more than 2-3 thrust areas. These are jointly sponsored by Host Institute (HI) and the Department of Science and Technology (DST) of the Government of India, with the latter contributing a share of 50-70% of set up cost. The Host Institute must possess a strong R&D base, a dedicated team of academics, a technology infrastructure, and should be able to provide the requisite land and building to the TBI. The TBI in turn has to create work space, communication facilities, utilities and computing facilities.

A typical TBI incubator costs around 1 million US dollars, has an average of 6 tenants with an average tenancy of two years, and aims to generate four successful entrepreneurs every year. A TBI is supposed to reach self-sustainability within 5-6 years. A total of 24 TBIs have been established; of these fifteen are operational. These are listed in Table-

I. Some of the highly exciting TBI initiatives are briefly surveyed as under (National Science and Technology Entrepreneurship Development Board, 2002):

- The Agri-Business Incubator, at Patancheru, focuses to creating competencies of agri-business enterprises. The clients have access to laboratories on biotechnology, tissue culture, production facilities of bio-pesticide, bio-fertilizer, and agricultural lands with precision irrigation and green houses. TBI assists in transfer of agriculture know-how from International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).
- National Design Business Incubator (NDBI) sponsored by National Institute of Design (NID), Ahmedabad, offers assistance in diagnosis of design related problems by NID consultants. It organises regular design clinics for its clients at their premises and workshops in leading institutions. TBI enrolls incubates in two categories: Physical incubates have access to physical facilities such as prototyping lab, visualization lab, and studios. Virtual incubates, on the other hand, have a reach on effective business support framework.
- Nirma Labs set up by Nirma's Education and Research Foundation at Nirma University Campus, Ahmadabad, focuses to enhance ecosystem to maximally leverage entrepreneurially inclined individuals to create hi-tech knowledge based wealth generation ventures. It focuses on ICT sector and emerging areas like biotechnology and life sciences.
- Centre for Innovation, Incubation and Entrepreneurship (CIIE) was established in 2001 with the support of Government of Gujarat Innovation Foundation and Indian Institute of Management, Ahmedabad. It has a focus to assist in commercialization of hi-tech and high impact innovations.
- Composite Technology Park (CTP) managed and operated by Society for Development of Composites has a focus on design, analysis and characterisation of polymers, reinforcement fibres, sandwich core materials, and adhesives with special emphasis on natural fibres such as bamboo, coir, jute, banana, etc.
- Technopark Business Innovation Centre (T-BIC), Trivandrum is the first and so far the largest IT Park in India and has been assessed at LMM1 Level 4. Spread over 3.2 million sq. ft. of workspace, it has over 15000 professionals employed in over 100 companies. The presence of who is who in IT sector as Infosys, TCS, Tata Elxsi, McKensey and others provides a perfect setting to incubates to graduation. The incubator offers ready to move in, plug and operate through its facilities of 4, 8, 16, and 20 seat modules. It has focus on IT and software solutions, medical and healthcare solutions, and bio-informatics.
- Business Incubator at IIT, Bombay, operated by Society for Innovation and Entrepreneurship (SINE) is an initiative to promote innovation and entrepreneurship. The focus is on knowledge based start ups with social and strategic bearings, technology- based products and solutions.
- TBI at Birla Institute of Technology and Science, Pilani focuses on mixed signal design, design modelling, embedded systems and VLSI architecture. It has been able to attract a number of industries to extend support of infrastructure and technical help. Some of the notables include, Motorola, Tensilica, Logic Vision, Open Silicon, ST Microelectronics, and Broadcom.
- TBI at KEC at Kongu Engineering College, Erode, has thrust areas in cutting edge technology areas of embedded systems, digital signal processing, and electronic card design, wireless embedded systems and multimedia technology.
- Vellore Institute of Technology based Technology Business Incubator (VIT-TBI), has a focus to create hi-tech ventures in bio-technology based industries, products for leather industries, and automotive/mechanical engineering sector related products, and IT products and solutions.
- Rural Technology and Business Indicator (RTBI) at the Indian Institute of Technology, Madras, focuses on ICT as an enabling tool for entrepreneurial socially motivated business with thrust on building rural inclusive business ventures. RTBI provides incubation assistance to village-based, ICT-enabled kiosks, with an aim to develop each kiosk as a self-sustaining business venture with the kiosk operator acting as an independent franchisee.

4.1.5 OTHER TBI INITIATIVES

Indian TBI's have been beneficiary of technical and financial assistance from a number of sources other than NSTEDB and the state agencies. With the support of Government of Japan, *infoDev* launched the Incubator Initiative in 2002. It supports a global network of over 60 incubators located across developing nations (*info Dev*. 2006). These are aimed to foster ICT-enabled entrepreneurship. Some of the more prominent of the TBI's outside the route of NSTEDB are noted as under:

- TBI at Indian Institute of Technology (IIT), Delhi, managed by the Foundation for Innovation and Technology Transfer started its operations in 2000 with focus to leverage IIT-technology.
- India Co iCenter operates a series of incubating clusters in Mumbai-Pune sector and has established a strong network of close operations with some of the well known research institutes, universities, and technology companies to get access to the technologies that are developed within their laboratories and are available for commercialization. Following an equity model, it thus arranges technical, financial and business assistance and offers an array of services that include intellectual property management, technology commercialization, and assistance for joint ventures, business development and help in raising capital. It has a large capacity matrix of over 40,000 Sq.ft of commercial space, and currently works with 100 companies worldwide.
- NS Raghavan Centre for Entrepreneurial Learning (NSRCEL), set up in Indian Institute of Management, Bangalore, in 2002, focuses to help entrepreneurs launch their business plans into commercially viable products and services. It can house ten teams of 4-6 members each.
- SIDBI Innovation & Incubation Center (SIIC) set-up by Indian Institute of Technology (IIT), Kanpur, in collaboration with Small Industries Development Bank of India, is to foster innovation, research and entrepreneurial activities in technology based areas in SME sector. Besides office space, the host offers mentoring from IIT faculty, legal experts, business development support, soft loans at a reasonable rate of interest as seed money, and networking with the alumni network.

4.2 BUSINESS FACILITATION IN PAKISTAN

Small and Medium Enterprises Development Authority (SMEDA), the main policy-formulation body for the SMEs, is assisting SMEs with technical up-gradation. It is attached to the Ministry of Industry and Production (MoIP). SMEDA's e-Market initiative is the most comprehensive business and export opportunity virtual exchange in Pakistan providing over 50,000 business leads giving access to 202 countries and territories. Very recently SMEDA has set-up technology centers to upgrade surgical instruments, sports goods, and fruits processing sectors.

Apart from policy formulation and sector development strategies SMEDA aims for facilitation of Business Development Service (BDS) provider for the SMEs. Business development services are demand driven and include a large variety of services including business planning, production management, product design, quality standards and control, productivity studies, marketing, information systems, and training. Government's efforts under this approach are directed towards creating conducive business environment, facilitating SMEs access to markets, enhancing information flow, promoting entrepreneurial culture, facilitating development of services for creation of new enterprise, education and technology development.

Resource Monitoring and Development Group (RMDG) is engaged in helping the Government of Pakistan to develop a more competitive and sustainable agribusiness sub-sector. Project activities focus in particular on improving access of agribusiness enterprises to BDS, strengthening BDS providers to enhance skills throughout the agribusiness sub-sector, expanding access to agribusiness finance, and developing institutional capacity.

The Mennonite Economic Development Agency (MEDA) and the Entrepreneurship Career Development Institute (ECDI) develop a strong understanding of local gender systems as well as local garment markets and distribution systems in order to design a program to reach rural, home-bound women. MEDA and ECDI have assessed BDS markets for low-income women in Pakistan. They focus on three promising sectors: garments, handicrafts and ICT.

Pakistan Council of Scientific and Industrial Research (PCSIR), Pakistan Industrial Technical Assistance Centre

(PITAC), Ministry of Science and Technology (MOST) established to facilitate industrial growth still need to adopt an active approach to provide their services to SME in an effective manner. Export Promotion Bureau (EPB) provides online export leads to the potential exporters.

At the local front, actions are being planned to deliver incremental, regular and continuous up-gradation of competitiveness through provision of focussed short duration training modules. These are to be delivered to groups of similar industries/processes and users through appropriate Common Facility Centres (CFC) for key industrial clusters.

The state has also initiated Industrial Linkage Programs (ILP). There are two main parties involved in enhancing the SME-ILPs: PCSIR and the SMEDA. During the years, the PCSIR scientists have focused mostly in developing low cost technologies to attract the attention of SMEs. The number of technical processes developed for such SMEs is well over a thousand. A survey carried out in the 1990s indicated that out of 484 technical processes developed until 1990, 367 were leased out to SMEs.

PCSIR has established a specialised technology at Karachi for the development and testing of rubber and allied products. PCSIR proposes to set up technological centres in different disciplines in various parts of the country and creation of effective linkages between SME industry and PCSIR. Minerals and Metallurgy Research Centre is proposed to be upgraded as Technology Institute of Pakistan on minerals and material.

SMEDA was also expected to take a key role in the Industry Linkage Program. The formulated working committees will address core issues on Business Environment, Access to Finance, Access to Resources & Services, and SME Definition, Feedback, Monitoring & Evaluation Mechanism.

4.2.1 NGO SUPPORT IN BUSINESS FACILITATION

Aga Khan Rural Support Program (AKRSP) has sought to encourage the development of markets for BDS in the remote areas of northern Pakistan. AKRSP set-up by the Aga Khan Foundation helps in improving the quality of life of the villagers of the Northern Areas and Chitral in Pakistan. While striving to support and assist other agencies in promoting social sector programs, it has also been

involved in agriculture, livestock, forestry, credit and saving, training, mountain infrastructure and engineering, and enterprise development. AKRSP started the “Shubinak” project in the Chitral district, one of the poorest rural areas of Pakistan, to improve the economic base and livelihoods of the rural population – particularly women – by reviving the “shu” industry. Shu is an indigenous, handmade wool fabric, which women in Chitral have been making for centuries. The original concept for the project was to enhance the production of high quality shu by improving the technology and the technical and entrepreneurial skills of the women for shu production and selling.

Taraqee Foundation was incorporated in Pakistan limited by guarantee and without share capital. It works to alleviate poverty in Balochistan through gender sensitive, people centered approaches by providing social and economic services. Balochistan Rural Support Program, another NGO is working on training and credit programs in the state.

Kashf Foundation provides microfinance to poor women in rural Punjab to run small units. Lachi Poverty Reduction Project helps sustainable rural livelihoods through promotion of village based self help groups, which provide income generation activities through physical infrastructure projects, savings and credit programs and enterprise development. Akhuwat, provides access to the poor to financial services to help improve the quality of the life of the poor. National Rural Support Program (NRSP) works with the government in NWFP on community development, community contribution and cost recovery. Sarhad Rural Development Corporation is working with provincial government on training, saving and credit programs,

4.3 BUSINESSES INCUBATORS IN PAKISTAN

As a policy, the Pakistan Government selects product areas where employment to investment ratio is higher. These include assembly and manufacturing of electronics products and systems, software development and improvement of some conventional industries. Apart from the above-mentioned industries, incubation has become a novel concept in the context of human development. It is expected to bridge the implementation gap between strategy and delivery by introducing best practices from the business world into

social programs by establishing a nationwide network of Human Development Support Units (HDSU). Acting as incubators, the HDSUs will build the capacity and competencies of government line departments, and NGOs working in the social sectors at the district level by imparting skills to promote communication, coordination and knowledge sharing. In order to achieve the objective of building up a new, improved, technology sound SME sector based on latest technological developments, it has decided to establish Academia-SME partnership building facilities called Technology Incubation Centers (TIC). These centers can act as a gateway between the SME sector and academic institutes or organizations where research & development activities are carried out. TICs are planned to establish at each of these regional levels where SMEs exists so that the fruit of the scientific and technological development is made available at the grass root level. Following initiatives have been taken at different level in this regard.

4.3.1 SOFTWARE TECHNOLOGY PARK, ISLAMABAD

The Software Technology Park, another initiative provides conducive conditions for software stop shops. It provides a large bandwidth communication with reliable power supplies, high flexibility buildings, minimized regulatory overheads and maximum flexibility in the choice and use of space.

4.3.2 HIGH-TECHNOLOGY TOWNSHIP (TECH TOWN)

The scheme envisages the development of a whole town into a closely associated industrial community. This is an expanded and fused version of a technology park and a cluster. The township is meant to provide space to investors for setting up high tech industries based on electronic technologies. The township will provide centralized infrastructure facilities and also an incubation centre for new entrepreneurs.

4.3.3 ELECTRONICS INDUSTRIES PROMOTION CENTRE

The National Institute of Electronics (NIE), situated in Islamabad, is involved in research and development of electronics systems and components. It has established an incubation centre for the development of its own lab prototypes into pilot production lines.

4.3.4 INDUS INFORMATION TECHNOLOGY PARK

The park would be declared an export free zone to encourage foreign investments and export of software. This would be the first completed IT Park in Pakistan providing all necessary facilities to the start-up companies and entrepreneurs of IT business.

4.3.5 TECHNOLOGY INCUBATION CENTRE (TIC)

An initiative of the National University of Sciences and Technology (NUST), Pakistan is the first technology incubator of Pakistan being established in academia. The buildings and infrastructural facilities are expected to be made available by 2009. TIC is being established with objectives of helping the potential entrepreneurs, students, faculty and general public to enable incubation of their technology-based companies and to liaison with other agencies and funding sources to provide business facilitation. TIC has been set up with a three pronged strategy of incubating start-up technology based companies, collaborative research with industrial partners and providing assistance of engineering services for industry and SME's. When fully operational, it will provide space to more than 70 hi-tech start-up companies (Dasanayaka 2007). TIC has some of the most prestigious and well-known names as its partners. Foremost, it has all the constituent institutes and colleges, (technology and engineering) of NUST to rely on their resources and expert advice. Moreover, there is a full support from the trade and industry, as a number of chambers of commerce are the partners. TIC is supported by International Beijing Incubator. Presently, TIC is hosting nine physical incubates in engineering, ICT and service sectors and further four as virtual incubates.

4.4 BUSINESS INCUBATORS IN SRI LANKA

The concept of business incubation originated in Sri Lanka in 1993 after consultative meeting between Sri Lankan Industry Ministry and Japan International Corporation Agency (JICA). As a follow-up measure, JICA prepared a Master Plan in 1990 and it recommended setting up Small and Medium Scale Enterprise Development Corporation to develop SMEs in Sri Lanka. The government setup Nawabima Business Incubator very close to Moratuwa University. In 2001, UNIDO provided assistance to setup another business incubator in Ruhuna. Dasanayaka (2007) provides details as under:

4.4.1 NAWABIMA BUSINESS INCUBATOR (NBI)

NBI established in the year 2001 has the objectives of facilitating development of local entrepreneurship. NBI has the characteristics of a conventional business incubator.

During the planning stage of the NBI, its founders formulated a panel of consultants to address the various functional areas, and access to partner network. Incubates of NBI were allowed to be members of the data base of industries maintained by the Industrial Development Board of Sri Lanka (IDB), and contact other innovative enterprises.

Nawabima Business Incubator got temporarily stopped due to conflicts related to the governing authority of the Incubator. Absence of a proper operational mechanism became the primary cause of failure. NBI was originally launched by the Ministry of Enterprise Development and Constitutional Affairs. Thereafter, there was a change in the Government. The regulating ministry changed. No specific ownership could be defined.

4.4.2 CONCEPT NURSERY, SRI LANKA TECHNICAL INCUBATOR (PVT) LTD

Concept Nursery, Sri Lanka's first technology incubator in the private sector has been set up in the year 2000 to incubate technology centric innovative ideas (www.idisc.net). This is an initiative backed and financed by four principle investors synonymous with IT and financial industry in Sri Lanka: Sri Lanka Institute of Information Technology, People's Venture Investment Company (Pvt) Ltd, Media Solutions (Pvt) Ltd and Prudential Holdings (Pvt) Ltd. Resident clients at Concept Nursery receive a fully furnished office space equipped with dedicated high speed data connectivity, assistance in technology, mentoring, networking, exposure to venture capital and institutional capital, and lab facilities. Some of the special provisions of this incubator model are:

Virtual Incubator model

The client operates from any part of the country and gets access to all monitoring support provided by the incubator. Regional incubation programs and other interesting events are listed in the calendar. This model is in the experimental level at the Concept Nursery.

The Entrepreneur News Portal

The portal allows Concept Nursery to aggregate and

disseminate news relating to entrepreneurship and emerging technologies. The entrepreneur portal cuts the cluster on the internet and allows visitors to access news and information related to the incubator's areas of interest. The entrepreneur portal is an outreach activity of Concept Nursery, primarily intended to attract potential tenants and partners.

The Tenant Portal

This portal is dedicated to Concept Nursery tenants, both resident and virtual. The tenants can manage their own 'showroom' on the net. The portal has integrated Personal Information Management (PIM) and a web based project-monitoring tool. New applicants apply online. The virtual residents use the online resource request system to access and reserve various resources available from Concept Nursery. Around 20 companies have graduated so far. Many of these have made a name as leading companies in Sri Lankan IT market.

4.4.3 SRI LANKA TECHNOLOGY PVT LTD

Is an ICT technology incubator. This non-profit organization operates under the Concept Nursery Expansion Programme to stimulate the adoption of ICT.

4.4.4 RUHUNA BUSINESS INCUBATOR (RBI)

Ruhuna Business Incubator is the third Business Incubator established in Sri Lanka. It was initiated in July 2002 and the first batch was hosted in February 2003. Ruhuna Business Incubator was located in Matara district in Kamburupitiya, a high potential area for entrepreneurship in the country. Abandoned buildings of the Kamburupitiya Village Reawakening (Gam Uda) programme provided the basic infrastructure. Thus isolated office/business space for each incubate became possible. Two business incubators came to operate under one roof. The programme was funded by the United Nations Development Organization (UNIDO) in collaboration with Matara District Chamber of Commerce, Japan Lanka Development Corporation (JLDC), Sarvodaya Enterprise and Economic Development Service (SEEDS). An advisory board monitored the progress of the Incubator. Ruhuna Business Incubator adopted a simple model compared to Nawabima and Concept Nursery. However, the programme became another failure. Lack of awareness of the incubator amongst potential entrepreneurs, vagueness in procedures of incubation and distant location from business cities added to the difficulties.

4.4.5 CONSTRUCTION SOLUTION CENTRE (PVT) LTD

Construction Solution Centre (CSC) is a recently launched construction service exchange, which is equipped with several features. The main objective of this centre is to assign emerging subcontractors to undertake turnkey construction projects whilst supporting them to strategically develop their capacities, to provide entire range of construction solutions under one roof, and to provide infrastructure to facilitate the transfer of technology related to construction industry. To nurture emerging construction companies, main services planned to be catered by the centre for incubates include, solutions in purchasing land for property development, land surveys, getting buildings designed by architects, carrying out construction estimates, structural engineering solutions, ground and foundation engineering solutions and other construction activities calling for technology solutions.

5.0 AN EVALUATION

Business facilitation, mostly sponsored by the state and government funded bodies has been practiced by the three countries for last four decades. If the failure rate of the SME sector is an indicator, the success of these approaches is questionable. Johnsrud (2003) points out that technology-based economic development has already superseded more traditional approaches to economic development in the US, Europe and other developed economies. However, technology-based incubation in these South Asian countries is of recent origin. Setting up of incubation facilities is less of a pro-active measure and more of a reactive initiative.

Of the four Sri Lankan TBIs discussed, Nawabima and Ruhuna were sponsored, funded and controlled by government/international bodies. Nawabima has faced serious administrative problems leading to closure. Ruhuna incubator has faced problems in attracting potential incubates. The bureaucratic systems introduced could not identify proper measures for motivating the incubator and the incubate. Concept Nursery, on the other hand, has a participation of the industry and is in the business to make returns, and has registered some success. Construction Solution is industry specific and has a clear focus. It aims earning while developing the incubates.

The NSTEDB-TBI model in India represents the incubator as a sustainable business operation, generating revenue as

well as profits. It can operate as a non-profit registered society or even as a part of the Host Incubator but with independent financial and administrative status. The focus areas have been identified as ICT, applications in biotechnology, IT, electronics, systems, instrumentation, agribusiness, environment engineering, new materials, garments and fashion technology and services.

NSTEDB has supported and approved setting up of 25 TBI's in the last eight years. Of these, ten incubators are 'new' having been set up/being set-up in the last two years (Refer Table I) and have yet to take a concrete shape to reach capacity operations. Another four, Ritunand Balved, Agri business- Patancheru, Krishna Institute-Ghaziabad, and JJSATE have not as yet reported a significant success. Composite Technology Park, Bangalore, Technology Business Innovation Center, Trivendrum, VIT-TBI, Vellore, and Rural Technology and Business Incubator, Madras are in top league each contributing more than 20 incubates. Overall, more than 200 incubates have either graduated or are under the process of incubation. No TBI has been closed or reported failure.

The top league incubators are located in Bangalore, Trivendrum, Vellore. These are focused on IT and so are the locational sites, which have created a name in IT world wide. The guidance, expertise, knowledge and exposure in IT are thus easily available. The non-performers, as cited, also happen to be based at institutes which are not known as institutes of excellence. Conversely, institutes reputed for their infrastructure and educational contribution as Indian Institutes of Technology (IITs), Indian Institutes of Management (IIMs), Kongu Engineering College have contributed significantly to incubation. IndiaCoiCentre, and the ConceptNursery have generated exceptional performance. Both the incubators have extensive links with private sector to share experiences.

Pakistan reports a great success of the process of incubation. According to studies on the impact of incubated investments carried by National Business Incubation Association (NBIA), about 87% of incubated businesses were rated as success. A key factor behind the success of SMEs in Pakistan has been the role played by NGOs in the process of developing and fostering SMEs. The presence of Regional Incubators is another key factor behind the success. Incubators presence at the grass root level ensures the maximization of technology and process

affordability to the SME. While regional Incubators are maintained at district level as well as provincial level, National Innovation Centers are formed to help form an inter alliance among the regional level incubators thereby forming a national system with a cluster effect.

The three south Asian countries record a poor performance when compared with other nations, which have adopted technology incubation as a route to development. Chauhan (2007) provides revealing figures. USA leads with 850 incubators. China with 465, Korea with 350, Germany with 300 and Japan with 203 follow suit. China and Korea are reported to have set-up all the incubators in the last ten years. Qian (2005) making a presentation of business incubation in Shanghai provides a more exciting contrast. By the end of 2005, City of Shanghai had 35 incubators with 2095 tenant companies employing 26,700 persons and 396 graduated enterprises. India, Pakistan and Sri Lanka have miles to go.

6.0 DETERMINANTS OF SUCCESS OF A TBI:

A number of factors contribute to the success. These depend on the local needs, the state of development in the region, the basic skills, the resources available and the expertise with the HI. Taking into account the experiences of the three countries, which possess similar attributes with some degree of variation, the following emerge as determinants of success for a TBI:

- Technology incubation is for hi-tech knowledge oriented products needing development, extensive testing, and simulated trials, before these are commercially exploited. These are to be produced in small batches and often have to be customised, as against the products of mass production. All the three countries have, therefore, shown interest in IT, ICT, embedded systems and other knowledge technologies.
- The incubators should be located nearest to the potential incubates. The recommended locations are the clusters of SMEs (Bangalore, Trivendrum, Kochi in India are success and Ruhuna in Srilanka proved a failure), the institutes of technology (in case the fresh graduating students are the targets).
- Small regional incubators are to be preferred. These allow easy access to the facilities, maximum utilization of the local resources of the region, easy management

of operations, and new job opportunities for local population. Pakistan TBI success is based on this premise.

- Not every institute of technology or academic institute can launch a successful TBI. It should be an established institute of excellence, equipped with technological infrastructure (not necessarily needed for academics) and contribute or at research on the subject. India has several such well-equipped institutes, which decided to host incubation.
- Successful incubation requires active interface with industry. All the technical know-how may not be available in the university or the academics. The business knowledge, the market assessment shall be better available with captains of industry. Technopark, Trivendrum-India is in high demand and has reported noteworthy success on this ground. Private sector affiliated ventures would be fruitful (Concept Nursery, India Coi Center).
- Non-existence of a formal and structured performance evaluation system of an incubator is yet another area where all the three nations sadly lack. As a result, the non-performing incubators continue to draw heavy monetary assistance from the government bodies. As the ultimate aim of an incubator is to commercialize the technology based products in the shortest possible period, the period of incubation and the returns may be good indicators of performance.
- Incubation also requires identification of potential suitable incubates. Practices adopted by Nirma Labs, and IIT-Delhi is worth emulating.

7. CONCLUSIONS:

Knowledge-based industries will achieve increased prominence in the coming years. Biotechnologies, genetic engineering, ICT, pharmaceuticals and health care segments would be the organizations of the future demanding focus on technology, human resource development, innovations and product development. These areas need business facilitation to foster entrepreneurship with emphasis on technology transfers, speedy commercialization of technology, innovations and new products developed.

According to Jayawardhana (2007) India has comparatively, a mature IT sector and incubation industry. It is, therefore,

not surprising that major incubation is related to IT sector. For similar reasons, there is, now, a thrust on encouraging biotechnology and herbal medicines. Leather, Footwear and Ceramics are recognised as the areas of growth in Sri Lanka and Pakistan, and require infusion of productivity and competitiveness through technology incubation (Jayawardhana-2007).

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Table I
Technology Business Incubators in India

| Sr. No | Technology Business Incubator | Year of Start | Focus Areas | No. of Incubates |
|--------|---|---------------|--|---------------------|
| 1. | Life Science Incubator ICICI Knowledge Park, Hyderabad | New | Pharmaceutical and biotechnology | 2 |
| 2. | Agri- Business Incubator, ICRISAT, Patancheru | 2003 | Biotechnology | 3 |
| 3. | Biotechnology Incubation Centre, Hyderabad | New | Biotechnology | — |
| 4. | Delhi University, Delhi | New | Microbiology | — |
| 5. | Ritunand Balved , (Amity Business Incubator) Delhi | 2005 | Chip Designing and Bioinformatics | 4 |
| 6. | National Design Business Incubation Ahmedabad | 2003 | Product/service design | 4 |
| 7. | NirmaLabs, Nirma University, Ahmedabad | 2004 | ICT | 9 |
| 8. | Indian Incubator for Innovation based Enterprises, Indian Institute of Management, Ahmedabad | 2001 | Hi-tech, mass impact technologies | 8 |
| 9. | TBI, Composite Technology Park Bangalore | 2004 | Composite materials | 30 |
| 10. | National Institute of Technology, Calicut | 2004 | IT and Electronics | 11 |
| 11. | Technopark Business Innovation Centre, Trivandrum | 2004 | IT, Bio Informatics | 55 |
| 12. | Society for Innovation and Entrepreneurship Indian Institute of Technology, Mumbai | 2000 | Knowledge based technologies | 12 |
| 13. | PSE National Chemical Laboratory, Pune | New | Biotechnology | — |
| 14. | TBI, Birla Institute of Technology & Sciences, Pilani | New | Embedded systems and VLSI Design | 5 |
| 15. | TBICKEC, Kongu Engineering. College, Erode | 2004 | Embedded Systems, Electronic | 13 |
| 16. | VIT-TBI, Vellore Institute of Technology, Vellore | 2003 | IT, Leather Autoparts, Biot-tech | 20 |
| 17. | TBI, Anna University, Chennai | New | Biotechnology | — |
| 18. | TBI. University of Madras, Taramani Campus | New 2006 | Herbal and biotech products | — |
| 19. | Rural Technology and Business Incubator, Indian Institute of Technology, Madras | 2000 | ICT Socially motivated business development | 20 |
| 20. | Bannari Amman Institute of Technology, Erode | New | Biotechnology | - |
| 21. | TBI, Welding Research Institute, Trichy | New | Welding consumables | - |
| 22. | Periyar TBI, Periyar Maniammai College of Technology for Women, Thanjavur | New | Herbal health products | - |
| 23. | JJSATE Science and Technology Park, Noida | 2004 | CAD,CAM , ERP, Embedded Systems | 7 |
| 24. | Krishna Institute of Engineering and Technology, Ghaziabad | 2007 | Electronic and Mechanical Design | 5 |
| 25. | TBI, Indian Institute of Technology, Delhi | 2002 | Leveraging IIT Technology | 6 |
| 26. | IndiaCo iCenter, Pune | 2001 | Diverse, Hi-tech | 100 (world wide) |
| 27. | NR Raghavan Incubator, Indian Institute of Management, Bangalore | 2002 | IT | 4 |
| 28. | SIDBI Innovation & Incubation Centre, Indian Institute of Technology, Kanpur | 2006 | Systems | 4 |