STRATEGIC PARTNERSHIP IN PROMOTING TECHNOLOGY INCUBATION SYSTEM FOR SMEs IN INDIA

Dr.P.K.B.Menon

I. Introduction

India is now in a stage when it can take pride of having a strong network of S&T institutions, skilled manpower with innovative potential and a strong industrial base backed by equally efficient financial institutions. This has resulted in the building up of confidence among our entrepreneurs, scientists, engineers and academicians to come together to achieve integrated excellence and to take advantage of the new economic order, which has made the economy, technology and research globally competitive. The process of globalization, privatization and corporatisation of research has shifted the dynamics of knowledge production and dissemination and knowledge have begun to open up new dialogues on public good versus private profit. New models of innovation chain and new paradigms of the science and industry contacts have begun to emerge. The trends of technoglobalism are bringing in a silent revolution in India. It is rapidly becoming a global R&D hub. More than 300 companies have set up their R&D centers in India during the past few years to tap the knowledge capabilities of the Indian scientists and technologists. The Indian advantage will not just be cost but cost-cum-competence, considering the huge talent pool. R&D outsourcing market for information technology alone is estimated to grow to $9.1 billion by 2010 from $1.3 billion in 2003, according to a research agency Frost & Sullivan. The R&D outsourcing market for telecom in India is slated to grow from $0.7 billion in 2003 to $4.1 billion in 2010 at a compounded annual growth rate of 28.73 percent. The shift to India as an R&D destination will result in creation of increasingly new knowledge that determine critically the industrial competitiveness of major companies around the world being produced in India. It is obvious that India will gain a superior position as a knowledge power as the critical knowledge capitals will finds its abode in the human capital that will reside in the innovation centers located in India. Goldman Sachs predictions show that by 2050 India will be the third largest economy after China and the US. India has the potential to occupy the first position amongst the knowledge producing centers in the world.

The transition phase of Indian economy is reflected in the changing trend of R&D in such companies. Some of them have adopted complete restructuring of their in-house R&D with a change in focus from developing products for Indian market to a global market. Global Centers of Excellence have come up in selected areas of science and technology. Even though initially the R&D center was set up to support to Indian operations, subsequently they were restructured to meet the global need. Examples are the R&D centers of Astra, Uniliver, GE, and software development centers of Texas Instruments, Microsoft, Oracle and others. Thus the growing presence in India of multi national companies with large R& D operations and coupled with substantial rise in foreign direct investment have led to growing number of corporate research centers and joint R&D efforts with foreign partners. This is more visible especially in the pharmaceutical and biotechnology sectors. The challenge is how to continue to trap the incredible dynamism of global R&D so that Indian institutions and companies can assume the leadership in creating high-wage jobs and building new industries. This will require a sustained commitment to investment in science and technology to strengthen research infrastructure, development of capabilities and means to rapidly integrate new knowledge and technologies into products and gain access to growing global sources of innovation, development of technology centers and government incentives and protection of IPR.

The Prime Minister of India has recently unveiled a five-point agenda for India's Development as Knowledge Society. The Prime Minister stated "A knowledge based society will enable us to leap-frog in finding new and innovative ways to meet the challenges of building a just and equitable social order and seek urgent solutions". The five-point agenda underlines the following:

- Education for developing a learning society;
- Global networking;
- Vibrant Government-Industry-Academia interaction in policy making and implementation;
- Leveraging of existing competencies in IT, Telecom, Biotechnology, Drug Design, Financial Services, and Enterprise;
- Economic and business strategic alliances built on capabilities and opportunities, and setting up of an Education Development Finance Corporation.

The Science and Technology Policy announced by the Government in 2003 states "The growth rate in productivity of the Indian economy has been below its true potential, and the contribution to it of technological factors is inadequate. Similarly, Indian exports today derive their comparative advantage through resource and labour rather than through the power of technological innovation. The transformation of new ideas into commercial successes is of vital importance to the nation's ability to achieve high economic growth and global competitiveness. Accordingly, special emphasis will be given not only to R&D and the technological factors of innovation, but also to the other equally important social, institutional and market factors needed for adoption, diffusion and transfer of innovation to the productive sectors." The Policy also states that, "Every effort will be made to achieve synergy between industry and scientific research. Autonomous Technology Transfer Organizations will be created as associate organizations of universities and national laboratories to facilitate transfer of the knowledge generated to industry. Increased encouragement will be given, and flexible mechanisms will be evolved to help scientists and technologists to transfer the know-how generated by them to the industry and be a partner in receiving the financial returns".

The globalization process and the policy decisions of the Indian Government are moving up the R&D value chain and in this direction the present objective is to encourage higher value addition activities through the development and application of high technologies. One way of achieving this is to encourage technology incubation systems to promote start-up companies in frontier areas of science and technology. India has already stepped into this stage by creating institutional mechanisms for technology incubation and the growth of knowledge based industries.

II. Status of Technology Incubating System

Status of SMEs

India has nearly 3 million SMEs, which account for almost 50 percent industrial output and 42 percent of India's total export. They constitute the most important employment generating sector and an effective tool for balanced regional development. They account for 50 percent of private sector employment and 30-40 percent of value addition in manufacturing. They produce a diverse range of products (about 8000) including

consumer items, and capital and intermediate goods. As the nations integrate into a global village, these SMEs will have to respond accordingly, and thus deserves special attention. To enable SMEs to overcome their technological backwardness and to have easier access to new technologies, they need to be given a conducive environment, which, in the present context of globalization, calls for human centered approach, with tacit knowledge playing a predominant role.

The New Industrial Policy (NIP) announced by the Government of India in 1991 has created new vistas for technology transfer as well as industrial development. It has opened up the Indian industry not only to foreign investment but also to technology collaboration to "obtain higher technology, to increase exports and to expand the production base". The NIP states, "Foreign investment would bring attendant advantages of technology transfer, marketing experience, introduction of modern managerial techniques and new possibilities for promotion of exports". This in turn is expected to inject the desired level of technological dynamism in Indian industry. Indian companies will be free to negotiate the terms of technology transfer with their foreign counterparts according to their own commercial judgment. The predictability and the independence action that this has provided to Indian industry are expected to induce them to develop indigenous competence for the efficient absorption of foreign technology. Greater competitive pressure will also induce our industry to invest much more in R&D than they have been doing in the past. However, foreign investment and the related technologies will come to India only in those areas where manufacturing in India provides a cost or export advantage to the investing company.

Financial support for Technology Incubation

With a view to encourage knowledge based start-up companies in India, the Government has introduced several innovative schemes and policies. The Research and Development Cess Act (1983) and the Technology Development Board Act (1995) were specially introduced to mobilize finances for supporting technology development and its commercialization. A number of such support mechanisms are available today for the technology based start-up efforts. Some of the major schemes are as follows:

a) Technology Development Board

The Government of India constituted the Technology Development Board (TDB) in 1996 to encourage development and commercialization of indigenous technologies and adaptation of imported technologies for wider applications. The Board provides equity capital or other financial assistance to industries and other agencies for commercialization of R&D. The loan from TDB carries a simple interest of 5 percent and does not levy administrative, processing or commitment charges. The loan has to be repaid in five annual installments starting from the year after the successful completion of the project. The assistance is generally limited to 50 percent of the project cost. The equity subscription will be up to 25 percent of the project cost.

b) Programme Aimed at Technological Self Reliance (PATSER)

PATSER is a programme, which aims at promoting and supporting the industry's efforts in development of indigenous technologies and absorption of imported technologies. It provides partial financial support to research, design, and engineering projects undertaken jointly by industry and R&D organizations and academic institutions. These projects cover products and processes in various important industries such as metallurgy, electrical, electronics, instrumentation, mechanical engineering, earth moving and industrial machinery, chemicals and explosives.

c) Technopreneur Promotion Programme (TePP)

Realizing the importance of innovative and inventive minds to meet the challenges of changing industrial and technological requirements of the country, the Ministry of Science and Technology, Government of India, initiated a programme titled "Technopreneur Promotion Programme". TePP aims to assist and promote individual innovators/investors in the categories like farmers, students, scientists, engineers, doctors, etc. to translate their innovative ideas for the development of working prototypes/processes. TePP is crucial for individual innovators to become technology-based entrepreneurs. It also acts as an interface to enable innovators to avail of the other support mechanisms to scale up their successful development further. Thus, the basic philosophy of TePP is being one of turning grassroots innovators into technology-based entrepreneurs. Financial support under the scheme is limited to the maximum of 90 per cent of the project cost. The remaining 10 per cent is to be borne by the entrepreneur.

Apart from this, TePP also provides assistance in patent support and guidance, scientific and technical consultancy, fabrication assistance, market information and networking with research laboratories etc. in specific areas and needs.

d) Home Grown Technology Programme

The Home Grown Technology (HGT) programme is a major mechanism for supporting the commercialization of technologies developed by indigenous R&D. HGT programme assists to reach technologies from bench scale level to pilot scale or semi commercial level. In the process, it catalyses research and development efforts in the country and fosters closed linkages between R&D/technology institutions and the Indian industry. It also encourages multi-institutional funding for the technology projects, so that at various stages of the innovation chain, the entrepreneur may avail of assistance from more than one agency. HGT provides financial, techno-managerial and patent related support to deserving technology development projects. The financial support is limited to 50 percent of the project cost. It is necessary that the industrial partner or a major user must contribute 25 percent of the total project cost. The balance may be arranged from the financial institutions.

e) Opportunity.com Consortium

Council of Scientific and Industrial Research (CSIR) together with National Research Development Corporation (NRDC), global consultant Ernst & Young (India) and the leading US Stock Exchange NASDAQ have come together through Opportunia Enterprises in a major strategic alliance. The alliance seeks to promote technology based businesses in India, in the fast growth sectors such as biotechnology, pharmaceuticals etc., by assisting entrepreneurs to tap the potential of CSIR's excellent infrastructure, technology and technical skills. Opprtunia is one-stop platform where entrepreneurs and emerging fast growth companies get end-to-end support and solutions for all points in the business life cycle-conceptualizing, seeding, growth, diversification, IPO, mergers and acquisitions. The strategic partners in the consortium bring with them a vast complementary of experience and knowledge giving the entrepreneur an integrated business service for technology, IPR related issues, legal, financial, management and marketing.

f) Venture Capital

The first origin of modern day venture capital in India can be traced to the setting up of a Technology Development Fund in the year 1987-88, through the levy of a Cess on all technology import payment. TDF was meant to provide financial assistance- to innovative, high-risk technological programmes through the Industrial Bank of India (IDBI). In 1988, Technical Development and Information Corporation of India (TDICI), now known as Industrial Credit and Investment Corporation of India (ICICI) Bank Ltd., was set up followed by Gujarat Venture Finance Ltd. The Securities and Exchange Board of India (SEBI) issued the VCF regulations in 1996. Though young, by international comparison, the Indian Venture Capital industry has matured fast because of the liberalization processes initiated by the government in early 1999's. Today, there are more than 55 VCFs; out of which majority are members of the Indian Venture Capital Association.

The Indian Venture Capital Association (IVCA) is the nodal centre for all the venture activity in India. As most funds are of private equity kind, size of investments has shown an increase in the past. There is infusion of funds from overseas, private individuals, 'angel' investors and a host of financial intermediaries and total pool of Indian Venture capital today, stands at Rs 50 billion according to industry estimates. Though the InfoTech companies are among the most favored by venture capitalists, companies from other sectors were also benefited. The health care sector with pharmaceuticals, medical appliances and biotechnology industries also get much attention from VCF companies. With the deregulation of the telecom sector, telecommunication industries have also joined the list of favorites. So far, these trends have been in keeping with the global scenario of venture financing.

The Financial Institutions mainly drove the venture capital industry, when it started in India, viz, Industrial development Bank of India (IDBI), Industrial Credit and Investment Corporation of India (ICICI) and Industrial Finance Corporation of India (IFCI). More recently, the Small Industries Development Bank of India (SIDBI) has launched a Venture Capital Fund and the corpus (as on March 31, 2001) stood at Rs 1.55 billion. The nature and extent of assistance is determined based on requirements and package of assistance, which may include any one or, combination of instruments such as equity,

conditional and normal term loans. SIDBI has also floated a national level venture fund, viz. ***National Venture Fund for Software and IT Industry***, exclusively dedicated to the software and IT industry. The fund, promoted jointly with the Ministry of Information Technology (MIT), Government of India and IDBI has an initial corpus of Rs 1 billion. The ICICI Venture Fund is available for idea stage start-ups, companies with one to three years of revenue record that require growth financing and companies close to initial public offering. ICICI Venture has the following active funds: i) Global Opportunity Fund, ii) IT Fund, iii) Technology Incubator Fund, and iv) Equity Fund. ICICI Technology Incubator Fund seeks investment in conceptual/early stage start-ups in the IT area. The fund has a targeted corpus of Rs 500 million. The incubator team of the fund also guides the incubatees through the initial start-up phase by providing them with managerial inputs and various support services. ICICI Biotechnology Incubation Fund is dedicated to start-ups in the area of biotechnology and Life Sciences. The targeted fund size is Rs 1 billion.

Status of Technology Incubation System

The National Innovation System in India has changed in the last decade, since the introduction of the New Industrial Policy in 1991, and some of the trends currently visible are likely to continue resulting in a considerably different innovation system in the years to come. The economic policy changes –removal of industrial licensing, freer trade, reduced emphasis on the public sector (in some cases even divestment and privatization) – are well documented. These trends and the linkages between them are shown in Fig. 1 These phenomena have been the result of two broad forces-economic pressures for survival and growth of Indian organizations in a relatively open economy, and the new opportunities arising from greater integration with global economy. While productivity and operational process improvements, new product development, the commercial orientation of publicly-funded R&D, and the propensity to cluster have been driven predominantly by the pressures to survive in a more competitive economy, the emergence and growth of software industry and IT enabled services, and the growth of engineering/IT education and venture capital have been driven predominantly by the new opportunities that have arisen. The single most important feature of the innovation system

is the entrepreneurial leadership exercised by key players in different sectors of economy (Krishnan R.T. 2001).

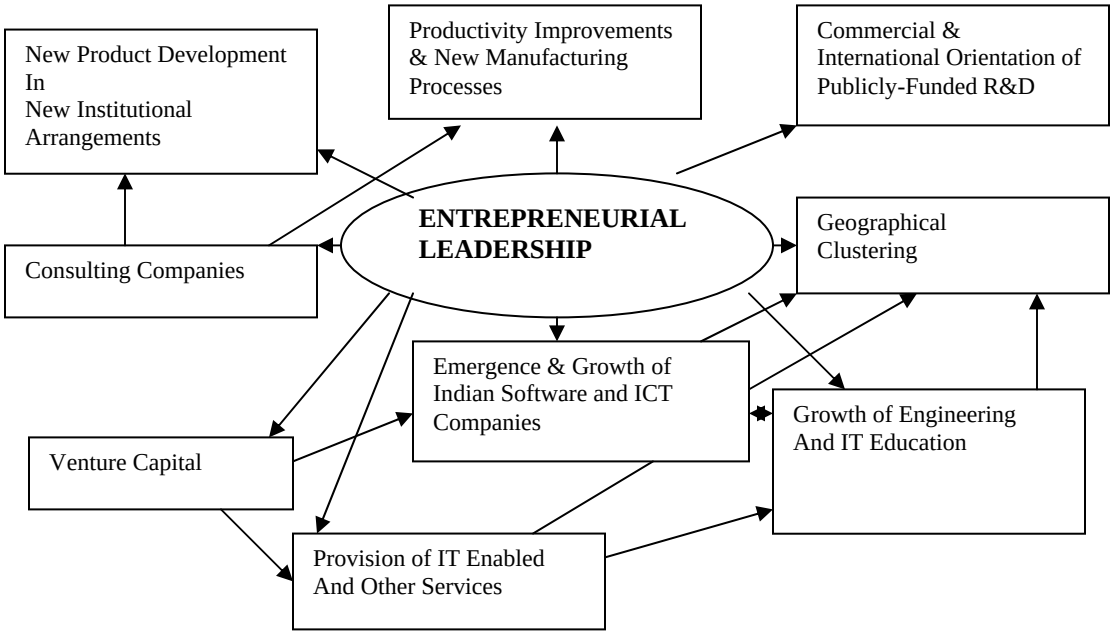

Fig.1 Indian National Innovation System and the Linkages.

Source: R&D Management Conference, 2001

The process of technology incubation was prevalent in India for a long time through non-institutional linkages between academia, R&D institutions and industry. The National Science and Technology Entrepreneurship development Board (NSTEDB) was established by the Government of India in 1982 “as an institutional mechanism to promote gainful self-employment in the country and to link idle S&T manpower with the under utilized institutional credit facilities”. The NSTEDB initiated the programme of Science and Technology Entrepreneurs Parks (STEP) to promote business incubation by technically qualified persons. This was the beginning of a formal technology incubation process. Subsequently, other mechanisms were evolved and today, there are the following institutional arrangements for encouraging technology-based entrepreneurship:

- Science and Technology Entrepreneurs Parks (STEPs): 17 (sponsored by the Department of Science and Technology, Government of India);
- Technology Business Incubators (TBIs): 16 (Sponsored by the Department of Science and Technology, Government of India);

- Software Technology Parks of India (STPIs): 40 (Sponsored by the Ministry of Information Technology, Government of India);
- Small Industry Development Bank of India promoted Incubation and Innovation Centers at IIT, Kanpur and Birla Institute of Technology, Ranchi;
- Technology Business Incubators at IIT, Delhi; and IIM, Bangalore;
- A private Incubator called IndiaCo at Pune;
- Kanwal Rekhi School of Information Technology and Incubator at IIT, Mumbai;
- Other organizations with similar mandate are as follows:
    - Tidel Park, Chennai;
    - Technopark, Trivandrum;
    - TeNet Group, IIT, Chennai;
    - International Technology Park, Bangalore;
    - Rural Innovation Network, Chennai;
    - Mahindra City Business Park, Chennai;
    - MIDC-IT Parks, Mumbai and Pune;
    - Indian Food Park, Virudhunagar, Tamil Nadu;
    - KINFRA Food Parks in Kerala;
    - State Government promoted industrial parks in Tamil Nadu, Kerala, Karnataka and Andhra Pradesh.

The STEP and TBI Programme

The STEP has a primary mission of ushering in a technocrat industrial society through HRD inputs enhancing the managerial and technical capabilities in particular and providing infrastructure and expertise support for enhancing productivity, quality, finance, R&D personnel, management capabilities etc. during the establishment, sustenance, and growth of the incubating enterprise in general. However, the STEP should reach a financial self-sufficiency with out loosing focus on the development, which has an impact on the economic activity in the region. The STEP model, therefore, has been designed in striking a balance between development and self-sustenance. The areas of activities such as entrepreneurship training, product development, database, information, servicing, consultancy, quality assurance, business felicitation, continuing education and skill development training etc. are grouped under three categories as follows: Promotional,

cost and profit activities. The deficit arriving out of the promotional and cost activities will have to be augmented through the profit activities in due course of time. Promotional and cost activities are aimed at aspiring entrepreneurs and start-up companies covering entrepreneurship development, business facilitation, skill development etc.

The goal of technology incubators is to promote technology-based firms, and to address regional and local developmental issues through S&T. TB1s are located at or near technical institutions and are characterized by institutional links to knowledge sources including technology transfer agencies, research centres, national laboratories and skilled R&D personnel. TB1s promote technology transfer and diffusion while encouraging entrepreneurship among researchers and academics. Therefore, the objectives of TBI in the Indian context are the following:

- Creation of technology based start-up companies
- Creation of value added jobs and services
- Developing new tools for technology transfer
- Fostering the entrepreneurial spirit among S&T persons
- Speedy commercialisation of R&D outputs
- Business facilitation to the tenant companies as well as other SMEs by way of specialised services.

The Chart 1 indicates the number of STEPs, TBIs and STPI established year wise. Initially, only STEPs were established in different parts of the country. The task was to create an “employer culture” where increasingly S&T people will seek to create their own employment. It also involves changing the existing attitude of seeking wage employment to look for a career in small business. To create an impact on this situation requires changes in the educational curriculum, in the way in which occupational choice is developed, in the way in which career advice is given and ultimately the role of small scale sector in wealth generation. It was possible to develop more than 800 SMEs through this programme. The first TBI was established in 2000. The mandate of the TBI,

unlike that of STEP, was mainly to promote knowledge based companies in and around technical institutions.

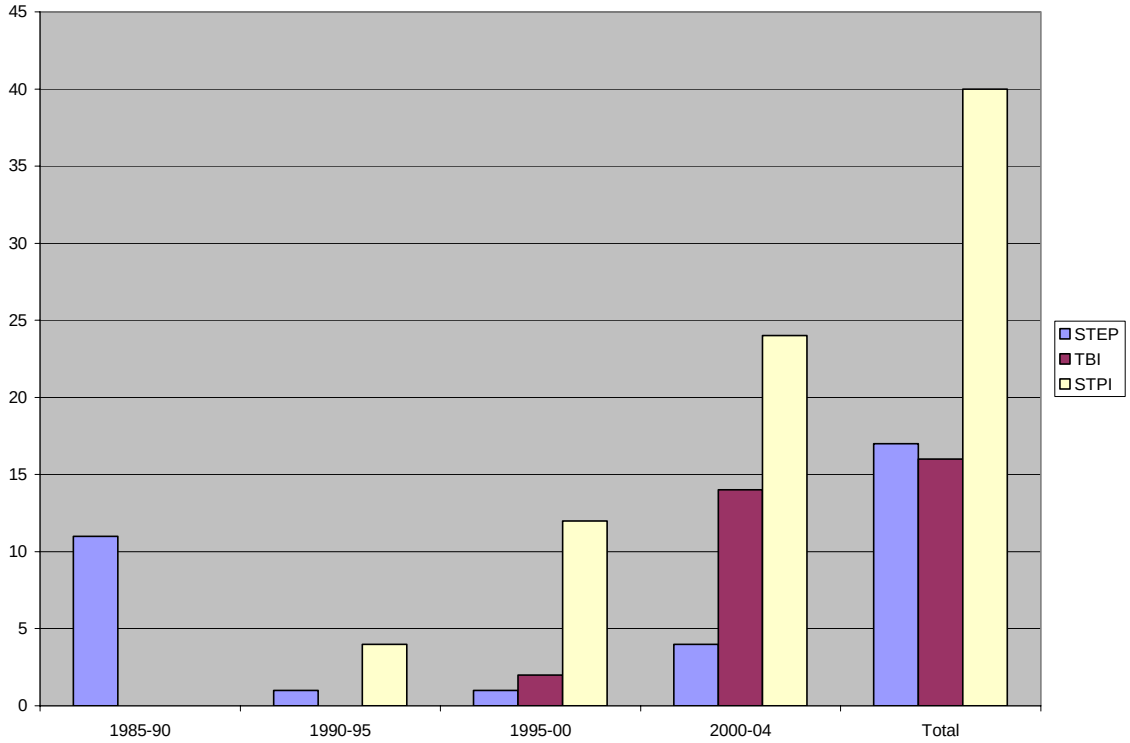

Chart 1. The establishment of STEPs, TBIs and STPIs year wise.

Each TBI would focus attention on one or two thrust areas depending on the core strength of the sponsoring institution and would be based on the expertise and facilities available in the institute, and the market potential for the products and processes. Additional facilities in the selected thrust areas for the scaling up of the technology and sample production will be created through governmental support. Each TBI follows a model, which is relevant to the location and the strength of the host institution. Therefore, there is no typical model, which has been evolved for replication in other parts of the country. The idea is to provide necessary infrastructure and other facilities to the entrepreneur to reduce his initial investment in his project so that its viability can be demonstrated before graduating from the incubator and setting up the complete unit elsewhere. The services provided by the TBI to the incubating companies are the following:

- Assessing market potential and provision of marketing assistance
- Business planning and training
- Management, technical and legal assistance
- Assistance in obtaining statutory approvals
- Technological back up
- Arranging finances
- IPR related assistance
- Equipment and infrastructure facilities of the host institution
- Modern work space
- Other shared common services such as fax, conference room, library etc.

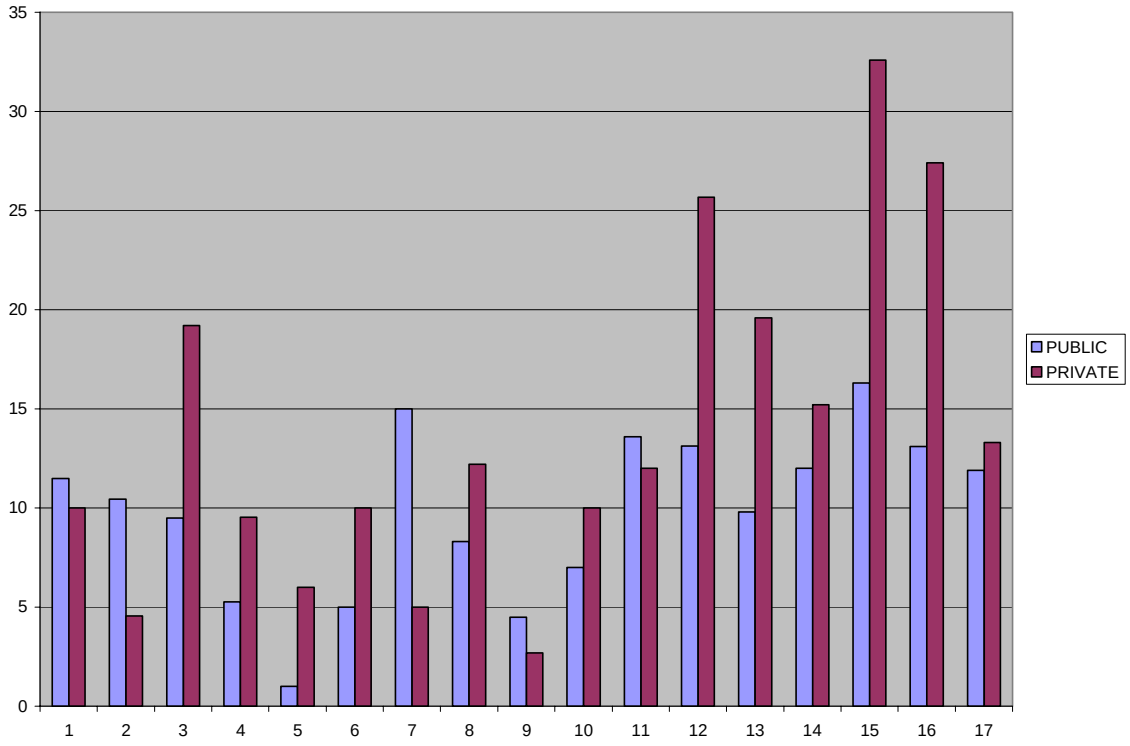

Chart 2. Public-private partnership in the establishment of STEPs. The private funding, here, means the contribution from host institutions and loan from FIs.

The private participation has increased significantly in the STEPs established recently as indicated from numbers 12-17 (Chart. 2.). A similar comparison for the TBIs is shown in Chart 3.

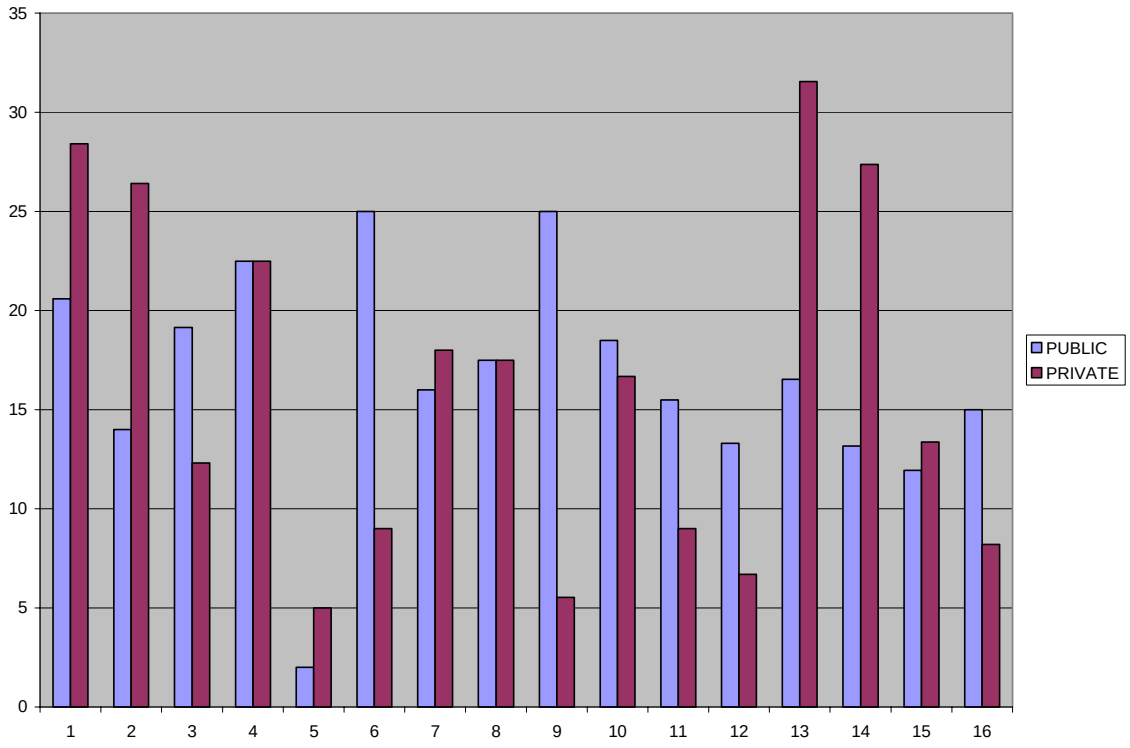

Chart 3. Public-private partnership in the establishment of TBIs. The private funding, here, means the contribution from host institutions and loan from FIs.

In almost every case, the funds for building and other utilities have been borne by the sponsoring institution of the TBI (the host institution). The Government support is mainly for the equipments, staff (for a maximum period of 5 years), training etc. Each TBI will have to reach a self-sustaining stage within a period of 5 years. Therefore, the activities of the TBIs, in addition to providing all support to start-up companies to grow, also included consultancy, training, entrepreneurial programmes, industrial projects etc. as profit making activities. Some of the TBIs also participate as equity partners in the tenant companies. The public-private partnership varies depending on the organizational structure of the host institution- whether it is a public or private funded. The host institutional structure varied from Technical Institutions, R&D Laboratories, Financial Institutions, Management Institutions, Technical Consultancy Organization, and Non-Governmental Organizations etc. (Chart 4)

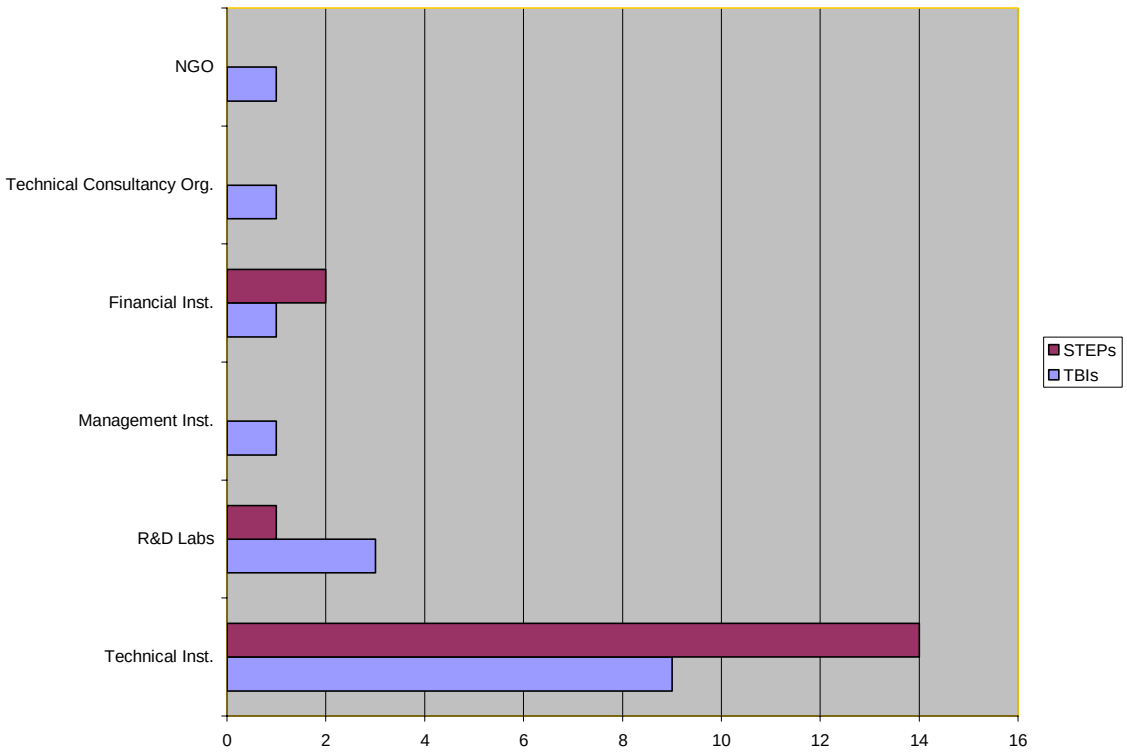

Chart 4. Types of Host Institutions promoting STEPs and TBIs

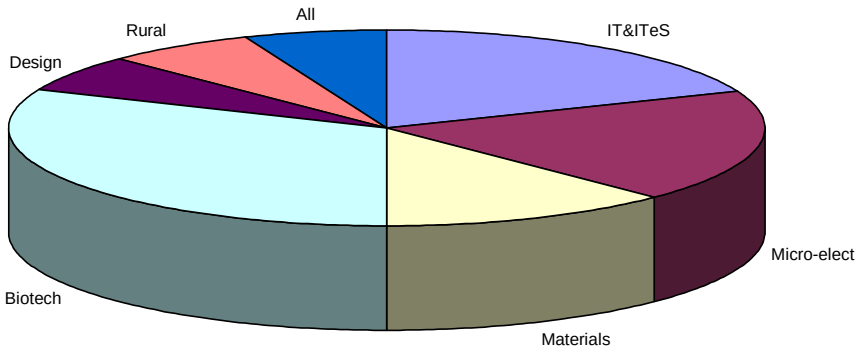

Chart 5. Sector wise distribution of TBIs

As mentioned elsewhere, each TBI has a focus area of technology depending on the host institution promoting the venture. A few of them, however, had no such focus and encouraged ventures from all the sectors. The sector wise classification of the TBIs is shown in Chart 5. Majority of the TBIs focused their technological areas on biotechnology, IT&ITeS, and microelectronics. However, there are TBIs specializing on new materials, design and rural technologies. The STEPs covered all sectors of technology and there was no particular focus here, where as the STPIs concentrated only on IT & ITeS.

III. Conclusion

Technology Business Incubation is an institutional mechanism to develop an atmosphere for innovation and entrepreneurship; for active interaction between academics and industries; for sharing ideas, knowledge, experience and facilities and for the development of new technologies and its rapid transfer to industries through setting up of start-up companies in the emerging areas of technology. Both industrialized as well as industrializing countries are arguably poised on the threshold of a major economic transition from manufacturing based economies to knowledge-based economies. Simultaneously, nations around the world are showing renewed interest in entrepreneurship and technological innovation. It is increasingly recognized that entrepreneurial start-ups have important contributions to technological innovation, economic growth, employment generation and social equity.

Effective planning and execution of TBI alone would not make it a success. The presence of an outstanding R&D institution alone does not cause the development of high-tech start-ups. The Incubator is envisaged as a service function and a facilitator that can encourage the development of high technology enterprises, but it cannot create the trend. The catalytic factors for technology incubation include, among others, i) National policies and legal frame works for TBIs and enterprises, ii) Financial support system including venture capital, iii) A society open to innovation and entrepreneurship, and iv) the support services provided by the incubators to the enterprises. If TBIs are to be of significant value in promoting new technology based enterprises and generating jobs, the economic and cultural seedbeds need careful preparation to receive the entrepreneurial seed. The key factors that can affect growth of technology-based enterprises are: i)

Access to skills and competencies, ii) Access to financing, iii) Access to market, and iv) A conducive environment for innovation and entrepreneurship. The Technology Business Incubator dimension should include, among other things, the following: i) Enterprise development, ii) A business and technical consultancy network, iii) Entrepreneurial synergy, iv) Flexible affordable working space, v) Technical infrastructure and vi) Shared office space.

The Government, financial institutions and R&D centers all have significant role to play in creating an environment conducive to the growth of TBIs and high technology based enterprises. At the same time, TBIs alone are not sufficient to stimulate advanced technology commercialization. Rather, TBIs are one of the services that are available today to create a growing, advanced technology industry. Various other methods for encouraging innovation, technology commercialization, and entrepreneurship are also required for fast economic growth. A successful knowledge strategy involving key elements such as, i) massively tapping into global knowledge, ii) investing heavily on education, and iii) also investing heavily in ICT has to be followed, in addition to appropriate macroeconomic management and good economic incentive regimes, for sustained economic growth rate.

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