Special Contribution

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Business Driven Science and Technology Parks (STPs) for Accelerating Innovation: Cases from Malaysia and India

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Abstract : This paper presents two cases of Science and Technology Parks (STPs), from Malaysia and India, that are driven by business organisations in partnership with governments. The need to locate the STP near to a university or a research institute has been considered crucial to attract firms to the STP – but in this paper, we illustrate the efforts to develop a locally relevant STP through the cases of Pahang Bio Science in Malaysia and the ICICI Knowledge Park (now known as IKP) in Hyderabad India. These two developments are anchored by business organisations that are playing a pivotal role in their development. The government plays a supporting role in terms of policy and supplying certain complementary resources. In addition, we note that the government support also provides legitimacy for the business organisation developing the STP. In the case of the Malaysian STP, we note the approach is towards inclusive development by developing linkages to local communities, and in the case of the Indian STP, one can see the development of the STP in a dynamic way changing according to the needs of the sector. Especially interesting is the foresight by the nodal business organisations in developing the STPs.

Keywords: Science and Technology Parks, Business driven Innovation, Biotech, India and Malaysia

1. INTRODUCTION

Science and Technology Parks (STPs) are considered as one of the important regional innovation policy initiatives as they are supposed to increase the likelihood of cooperation for innovation. In the recent past, emerging economies like Malaysia have embarked on developing science or technology parks to transform into an innovation based economy. While the traditional STPs have been linked to a university or are based on some real-estate or regional development, this paper presents the cases of two Science and Technology Parks (STPs) from Malaysia and India that are driven by business organisations in partnership with governments.

The concept of an STP has been around for more than half a century, the first one established in Menlo Park, California in 1948, and among the more famous early successful parks is the Stanford Industrial Park (est. 1953). STPs are widely believed to encourage greater collaboration among universities, research laboratories, and large and small companies, providing a means to help convert new ideas into the innovative technologies for the market. Definitions for STPs have come from both professional organizations and academics as well. The International Association of Science Parks (IASP) defines "A Science Park is an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets. It facilitates the creation and growth of innovation-based companies through incubation and spin-off processes. It also provides other value-added services together with high quality space and facilities (International Association of Science Parks - International Board, Feb. 6, 2002). Academ-

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ics have defined a Science and Technology Park (STP) as a property-based organization with an identifiable administrative center focused on business acceleration through knowledge agglomeration and resource sharing (Phana et al. 2005).

STPs have become an international phenomenon. While United States and Europe lead in the number of STPs, there is a growing number of STPs in Asia. In Asia, the first science park, Tsukuba Science City, was built in Japan in the early 1970s with other Asian countries following suit in the mid-1980s. Phana et al. (2005) mention that there are more than 200 science parks in Asia and still growing. This increased level of activity has stimulated discussions among academics about the different issues ranging from resources provided or created in an STP, role of different actors in STPs, the key issue of linkages among the actors, performance of STPs and also about policy related issues. Phana et al. (2005) also raise the issue relating to strategy formulation by organizations that manage science parks, incubators and tenants of these facilities.

In a study titled 'Characteristics and Trends in North American Research Parks: 21st Century Directions' by the Battelle Technology Partnership Practice in cooperation with Association of University Research Parks (2007), it was mentioned that today's research parks differ substantially from the model that emerged in the 1960s and 1970s. Early research parks were real estate development projects developed on vacant land in proximity to a university or other research institution. They would provide an attractive, campus-like setting, and it was assumed that firms would be attracted by proximity to the research institution. According to the AURP report, in the 1990s, research parks began to look for ways to be more attractive to technology companies. Many sought to attract research and development (R&D) facilities that could anchor the park and attract other tenants. In addition, incubator space was provided, and there was also multitenant space available to accommodate entrepreneurs and smaller, start-up firms.

According to Townsend (2009), the basic science park model of using low-cost land to attract technology companies is showing signs of ageing. Several of the big science park projects are in financial trouble as public funds for speculative development dries up. Additionally, newer variants of the science park model, such as technology incubators, find it hard to get funds as venture capital industry retreats to safer bets on late-stage start-up companies with identifiable exit strategies (Townsend 2009).

Organisations like United Nations Educational, Scientific and Cultural Office (UNESCO) have also noted "a transformation in the functions of university, industry, and government is taking place as each institution can assume the role of the other. Under certain circumstances, the university can take the role of industry, helping to form new firms in incubator facilities. Government can take the role of industry, and thus helping to support these new developments through funding programs and changes in the regulatory environment. Industry can take the role of the university in developing training and research often at the same high level as universities" (UNESCO Website). Phana et al. (2005) also state that it is evident that science parks and incubators take place in different environmental and institutional contexts, which are also dynamic.

Given the above discussion or background, it was felt that it would be pertinent to bring to discussion about two efforts at developing science or technology parks in Malaysia and India in the biotech sector: the Pahang Bio Science in Malaysia and the ICICI Knowledge Park (now known as IKP) in Hyderabad India. These two developments are anchored by business organisations that are playing a pivotal role in their development. The paper attempts to develop a portrait of these efforts to offer lessons to those involved in development of STPs. In the next section, the development of the Pahang Bio Science (PBS) in Malaysia is presented followed by a section on the ICICI Knowledge Park (IKP) in India. Finally, some conclusions are drawn suggesting an alternate approach to developing STPs.

2. BUSINESS DRIVEN SCIENCE & TECHNOLOGY PARKS – CASES OF PAHANG BIO SCIENCE, MALAYSIA AND IKP, HYDERABD, INDIA

2.1 The Case of Pahang Bio Science, Malaysia

Unlike an innovation system driven by the government or by a university / research institution, the Pahang Bio Valley project can be seen as an innovation system type project driven by a business organisation or corporation—in this case the Pahang Bio Science Sdn Bhd. Pahang Bio Science was established to anchor the Biotechnology Industry Development within its own realm of activities related to Xeno-Stem Cell Technology (use of animal cells, tissues or organs for treatment of human diseases). Pahang BioScience is to be positioned as the nucleus to create spillover activities and programs for creating other integrated sectors as a value add

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within its industrial value chains and scientific requirement. The company is a subsidiary of Pahang Technology Resources Sdn Bhd[1], an agency owned partly by the state government of Pahang, Malaysia and with some financing from commercial banks.

Pahang Bioscience started the project with a RM300 million stem cell research centre in Lancang located in the Pahang state of Malaysia. The facility includes an animal research laboratory, stem cell culture facilities, medical treatment areas, and a closed-colony rabbit farm. The role of the Pahang Bio Science corporation is similar to a manager of a STP in many ways. The industry player is leading the project with the development of the facilities and planning to indirectly develop a designated region in the stage.

The following related areas of development are also being planned:

- Herbs - Preservation, Documentation & Patenting of Herbs, Herbal Medicinal & Functional Food R&D; & Production, Holistic & Therapeutic Treatment, Herb Walk, Educational & Training.
- Integrated Organic Farming of Halal, Hygienic & Organic By Products, which involves other functions like Quality & Safe Food Production & Product, Improving Environment & Country side, Organic Dedicated Branding, Certification & Training.
- Health and Eco-Tourism – Establishment of boutique resorts and Home stay Programs, Healing & Wellness Centre, with a focus on Flora & Fauna Preservation, promotion and development of health food & local Cuisine, Development of local cottages industries, establishment of cultural and educational attractions, and finally Multimedia Portal and Interactive Multimedia Content.
- Water related - Finally they are also look at water preservation in catchment areas (Surface water and underground water), establishment of Quality Control and finally bottling for medical and consumer Use.

The initial role and responsibilities of the company included developing the idea, creating the main project proposal and inquiring acceptance from key Stakeholders. Following these activities, the organisation was involved in raising funds from different sources, identifying the technology sources / partners and developing the collaborations for the development of the stem cell facility. As the core project of stem cell treatments was planned to have "halal" accreditations, the organisation had to do the identification of appropriate suppliers and complete the needed documentation and related activities.

2.2 Role of Universities and Other Research Institutes

The project, even at the beginning stages, has required science expertise in different parts of the stem cell development. The project draws on facilities and knowledge of scientists from universities to support the needs in different parts of the value chain of the project. This has involved development of linkages and collaborations with laboratories in universities with relevant knowledge.

Role of Government: In addition to providing the initial funding, several interesting roles of the government in this innovation system emerged in the discussions with the respondents. The state also helps in providing resources—be it land or water—both crucial for the development of the stem cell facility, and the government has also earmarked a part of forest in the state to be accessed for plant or herbal resources for later part of the project development. The state government—by virtue of being a partial owner—allowed the firm to use the state's name 'Pahang', which has given 'legitimacy' to this new firm, and this in turn has allowed for ease in negotiations with either universities or foreign companies and also helped in raising funds from commercial financial intuitions etc.

At the next phase, this project also intends to develop a cluster-based development. All this is with a corporate social responsibility / sustainability theme, involving not just the existing players but also involving the society or community as a supplier and consumer of innovation, with a great emphasis of science communication to community. For these purposes, there are plans for future collaborations with institutions such as:

- Forest Research Institute Malaysia (FRIM)
- Institute for Medical Research (IMR)
- Malaysian Agricultural Research and Development Institute (MARDI)
- Department of Wildlife and National Parks (PERHILITAN)
- Department of Orang Asli Affairs Malaysia (JHEOA)

What is interesting to note in this STP type innovation system, being developed by Pahang Bio Science, is that knowledge

[1] Sdn Bhd stands for Sendirian Berhad (Malay). It means a limited responsibility company (Co., Ltd.).

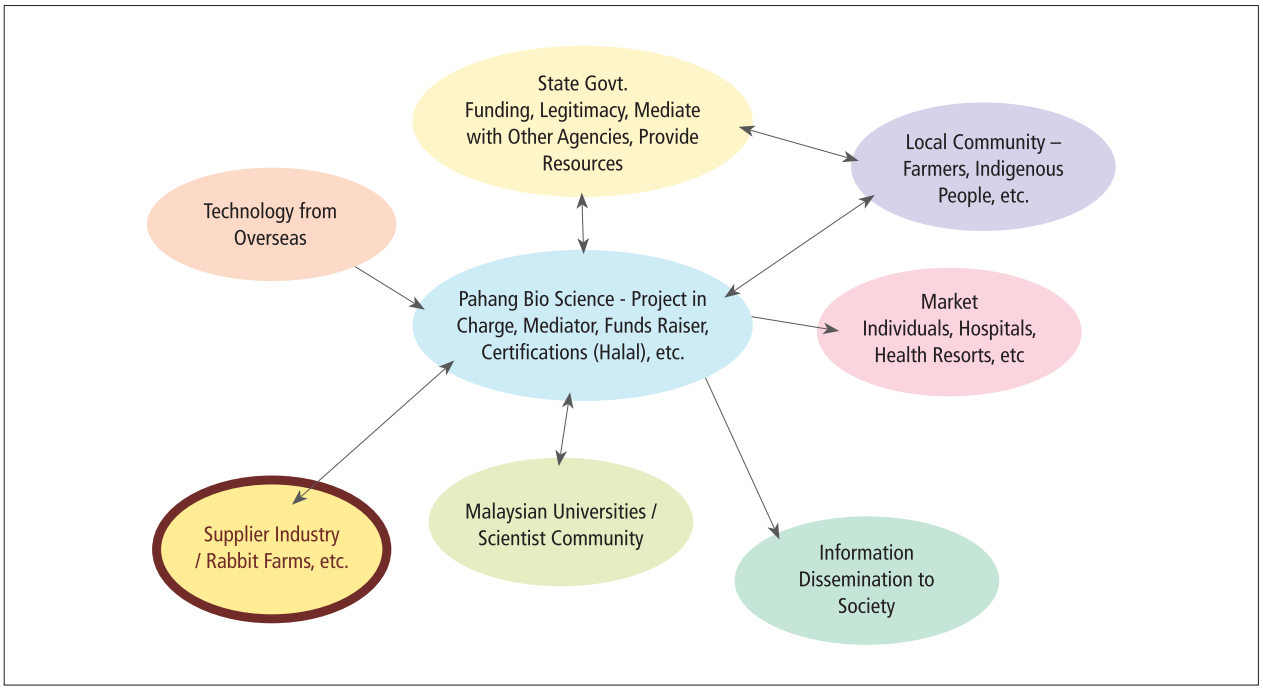

Fig. 1. Diagram depicting some roles of different players in the Pahang Bio Valley

in allied areas—such as environmental practices, traditional farming practices, etc.—are being harnessed from not only scientists or research organisations but also from local communities. Local communities are the farmers or other village 'elders' who are considered as a repository of traditional knowledge. This aspect of development is now being studied by researchers, policy makers and development agencies as 'new science' and 'old science' for sustainable development.

This is a project that can be described as work-in-progress—but is of interest because of it being led by a private company—that is played by the role of the innovation broker between universities / academia, industry, government and community.

2.3 Some Issues that arise in the Linkages in the Pahang Bio Science STP type Innovation System

Linkages and collaborations between the different players like the government, industry and universities, with their varying objectives and personalities, are bound to have some issues. Some of the issues are summarized below. One of the problems mentioned (in interviews with people in participating firms and universities) is due to the mismatch of the Key Performance Index (KPIs) of Academia/Research Institutes and Industry. The mismatch occurs due to dimensions of:

1. Time: where the timelines of the industry and research institutions are different,
2. Scope of projects (while the academic groups are concept or theory based, the industry group are more mode 2 or application based) and,
3. Research outcome related issues: research institutes are more interested in publications, whereas industry interest in bringing out applications, etc.

Another interesting issue that hindered smooth partnerships between university / research institutes and industry was the different expectations of payments in terms of royalties etc. The industry players claimed that too much was being expected in monetary terms by the university / research institutes and particularly by some scientists / professors, while the industry was being accused of trying to exploit the academics or scientists.

An interesting aspect of the Pahang Bio Science project is that they are looking at inclusive development approach by developing linkages with local aborigine knowledge and other actors within the region. The project, being led by Pahang Bio Science, is now at the critical stage of garnering finance for growth. It would be interesting to develop this as a longitudinal case study including the linkages that are developed and

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its performance in terms of innovation and returns to the developers.

3. CASE OF IKP (FORMERLY ICICI KNOWLEDGE PARK), HYDERABAD, INDIA

ICICI Knowledge Park (IKP), now known as IKP Knowledge Park, is located in a 200-acre campus near the city of Hyderabad in India. It has a mix of ready-to-use multi-tenanted modular wet laboratory blocks (Innovation Corridors) with in-built flexibility around some common, shared facilities and support services, as well as developed land for customized R&D facilities.

The IKP was set up in 1999 as a not-for-profit, wet laboratory[2], research park by ICICI Bank[3] Ltd., a private commercial bank, in partnership with the state government of (then called) Andhra Pradesh. The ICICI bank provided management support and initial funding of about Rs 400 million (approximately 8 million USD), and the state government supported by providing land and supporting policy initiatives. What is interesting to note is its mission statement, which reads, "To create a world class centre for leading-edge business-driven research in India".

3.1 Background to the Development of IKP

The genesis of the IKP, as a science and technology park (STP) at the bank, was during the 1990s when there were discussions about how to fund business organisations in the pharmaceutical industry. The key issue was when the WIPO/TRIPPS would come into place. It was noted that for many Indian companies in this sector, process innovation was the basis for their competitive advantage. However, with the WIPO-TRIPPS agreement, it was noted that there would be a need for product innovation and consequently a need for financing research and development (R&D). The management in the bank felt there was no funding options to support product related innovation and took the decision to not only fund R&D activities in this sector and related sectors (like biotech, etc.) but also to invest in and develop a science park to support R&D[4].

Location Decision of IKP: Having decided to fund and develop an STP, the next decision for the bank was to decide the location of the park. The first decision was to decide the city or region, for which there were several city/regions identified, and Hyderabad was chosen because there was a threshold of research institutes and several educational institutions including a large central or federally funded university. It also helped that the state government had aggressive policies and incentives to attract science and technology based industries.

In research literature and also in practice, it can be seen that universities or research institutes are crucial for the development of STPs, particularly in the field of pharma or biotechnology, and STPs would be located adjacent to or near-by such research institutions. In the case of IKP, the decision for a location of STP in the city needed to be made. It was consciously decided that the STP would not be near the large life sciences university in the city, but in the part of the city where there would be large tracts of land available for growth in the future. The reason for this decision was that there was a worry about a possible clash or a mismatch of the different 'cultures' and performance requirements in academia and industry.

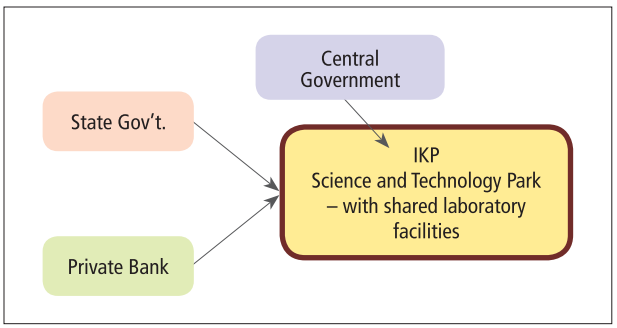

Fig. 2. Diagram showing the support for the IKP in the initial stages

What kind of firms to support or attract to the STP: When one refers to literature, typical STPs focus on incubators for creating new firms or supporting small and medium firms. But given that the STP was being developed by a commercial bank, whose expertise was finance and not business or technology, it was decided that the STP would focus on developing infrastructure for what was the lacunae in the industry. The decision was then made to support large firms, which were

[2] "Wet Laboratory space types are defined as laboratories where chemicals, drugs, or other material or biological matter are tested and analyzed requiring water, direct ventilation, and specialized piped utilities" http://www.wbdg.org/design/lab_wet.php

[3] ICICI Bank is India's second-largest bank with total assets of Rs. 4,736.47 billion (US$ 93 billion) at March 31, 2012 and profit after tax Rs. 64.65 billion (US$ 1,271 million) for the year ended March 31, 2012. The bank has a presence in 19 countries, including India. (Source: ICICI Bank)

[4] interview with IKP executive

diversifying into biotechnology sector. The rationale for such a decision was such firms would have the business acumen / knowledge and resources, but they need help with technology and related infrastructure, etc.

Thus at the beginning or the starting stage in the early part of this century, when the biotech industry was also in a nascent stage of development, this private bank supported STP starting with providing infrastructure support to large or medium sized firms that were entering into the "science business".

IKP has so far promoted 45 R&D based companies from six countries, and out of which 16 have graduated and currently there are 29 companies working in various areas of pharma, biotech and chemistry. The IKP is said to have achieved operational breakeven in 2005-06, and that can also be seen as a timeline for further developments in the park, in terms of the type of 'clients' it intended to support and consequent support being offered. In addition, after this initial phase, there were also linkages being developed to other institutions for the development of the STP.

3.3 Next Stage of Development of the IKP

The first major change in the STP was the governance structure. IKP Knowledge Park, when it incorporated in July 1998, had a partnership with the state government of (then called) Andhra Pradesh[5] and originally known as the ICICI Knowledge Park. Today IKP is a subsidiary of the IKP Trust and is a company under the Section 25 of the Indian Companies Act (1956). It has changed its name, IKP Knowledge Park, on 17 April 2009 after the transfer of its ownership to IKP Trust on 28 March 2007. The IKP Trust holds 81.9% equity in IKP. The IKP Group consists of IKP Trust as the holding Trust and IKP Knowledge Park, IKP Investment Management Company (IKPIMC), IKP Centre for Technologies in Public Health (ICTPH) and IKP Centre for Advancement in Agricultural Practice (ICAAP) as subsidiaries.

3.3.1 Government Support and New funding options

The state government continues to support the IKP in terms of land allocation and public infrastructure development.

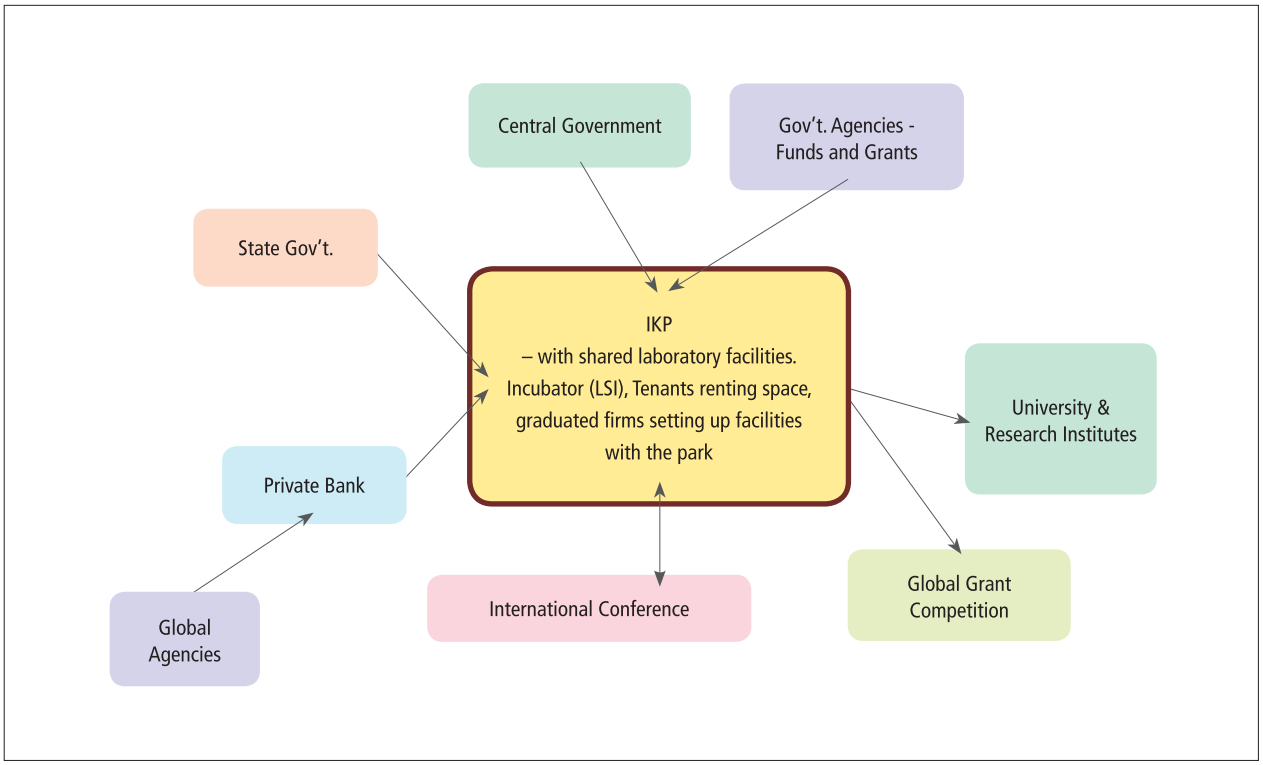

Fig. 3. Diagram showing the support for and linkages developed by IKP

[5] Currently the state of Andhra Pradesh has been divided into Telangana and Andhra Pradesh and IKP is in Telangana

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There is now a multi-lane expressway being built to better connect the park to the international airport and also to make it more accessible to develop linkages with the large life sciences university. The park now also receives support from the government of India. It is recognized as a SIRO (Scientific & Industrial Research Organisation), which entitles the park to customs and excise duty waivers. There is an extension counter of the Customs office at the park for speedy clearance particularly for perishable materials or substances. The Technology Development Council (of the state government) has set up a Patent Facilitating Cell at the Park for supporting the tenants in terms of patent related needs.

The ICICI bank has a Technology Finance Group (TFG) that assists industry and institutions for collaborative industrial R&D and technology development & commercialization. The funds are for the areas of biotechnology/healthcare, electrical/electronics, energy, environment, materials, etc. The TFG sources lines of credit from various global agencies like World Bank, United States Agency for International Development (USAID), etc., and structures concessional term loans through various programmes of these agencies, which is accessible by the IKP tenants.

3.2 Expansion of the IKP and its programmes

The Life Sciences Incubator (LSI) was set up in 2005 as an independent centre within ICICI Knowledge Park (IKP). The incubator focuses on ventures in the Life Sciences domain, viz Biotechnology, Pharmaceuticals, and Diagnostics. The incubatees along with other tenants, receive infrastructural support and administrative support services, including speedy customs clearance, environmental clearances, legal/ patent counseling, assistance in getting venture funding, S&T advisory services, liaison with government departments, secretarial services, etc. The LSI has state-of-the-art ready to use laboratories, so that a start-up firm or entrepreneur can start R&D activities as soon as they rent the facility. Also these facilities are provided at subsidized rates so that the start-up firms can have a larger portion of the grant available for research purposes.

There is a technology-licensing programme put in place in the IKP to provide support and guidance to tenant companies in the matter of intellectual property (IP). The programme also functions as an IP repository for research institutes in the country. In addition to the supporting role of tenant, there is also the function of educating local industry and student about the importance of intellectual property rights to safeguard the industry overall.

While there are programmes directly supporting the tenants through infrastructure, business, technology, funding, etc., the Park also organizes an international conference to develop global linkages with different actors (individuals and institutions) from around the world. There is also a competitive grant competition open to participants from around the world. In summary, IKP provides an interesting case of how an STP can be started and then transformed in the subsequent stages by a business organisation.

4. CONCLUSIONS - AN ALTERNATIVE FRAMEWORK FOR DEVELOPMENT OF SCIENCE AND TECHNOLOGY PARKS

From both these cases, it can be seen that there is an alternative to the traditional approach or framework for development of a STP, be it in terms of the ownership, where to locate, or for funding options. While in both cases, it is acknowledged that government support is crucial for the question on what other institutions (other than research organisations or universities) can drive a science and technology park. The answers can be a large business organisation, a large commercial bank or any of the development financial institutions, e.g. in the case of Malaysia, the Agro Bank or SME Bank.

In this paper, two cases are presented: the Malaysian case driven by Pahang Bio Science (PBS) organisation and the Indian case of the IKP driven by a bank. There are some interesting points for development of science parks—both are driven by private business organisations but differ in the motivations or interest—the IKP in India is driven by financial institution who had the foresight to see STP from the point of view of future funding needs by the industry. The case also shows the development in the IKP is dynamic and has been changing according to the situation. In the case of the PBS driven STP cluster type project, the focus is on economic development with a more sustainability orientation. There is an inclusion of community in the business plan to create economic opportunities while supporting their way of life. Both cases also show the need to have the support of the local government, which not only provide resource support but in the case of PBS, legitimacy for the firm to go into global markets to access resources and develop the project. In a way, it is hoped that these two cases can be also seen as a public-private partnership model offering some insight or ideas for other countries or regional on developing STPs.

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