SCIENCE PARKS TO DEVELOP AND NURTURE TECHNOLOGY AND INNOVATION

By

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I. SCIENCE PARKS AS A KEY S&T INFRASTRUCTURE

Science parks have constantly been used as an excellent policy tool to move a country towards an innovation economy. It is considered as a means to realize higher returns on research and development (R&D) investments by providing specialized services and infrastructure needed by high-tech industries and creating a critical mass of facilities and human resource. Also, it can effectively play a crucial role as a bridging organization and act as an agent for technology management and extenders of innovations.

Science parks have diverse roles in developing and nurturing technology and innovation. It facilitates innovation and enhances the competitiveness of firms, encourages the formation of innovative hi-tech firms, attracts leading hi-tech companies from around the world and creates dynamic clusters that accelerate economic growth. In this respect, the development of science parks in Thailand is interesting and could have implication for other countries planning and developing science parks.

II. THE CASE OF THAILAND SCIENCE PARK

A. Overview

Thailand Science Park (TSP), the country's first science park, was established in 2002 by the National Science and Technology Development Agency (NSTDA) on 80 acres of land in Pathumtani province in the northern outskirts of Bangkok. TSP was created as a key infrastructure to support the development of technology-intensive business and to promote R&D and innovation in the private sector. It provides its tenants business space, advanced facilities and environment conducive to R&D activities.

At TSP, flagship organizations like NSTDA and four of its national research centres – the National Centre for Genetic Engineering and Biotechnology (BIOTEC); the National Metal and Material Technology Centre (MTEC); the National Electronics and Computer Technology Centre (NECTEC); and the National Nanatechnology Centre (NANOTEC) – are located, besides NSTDA's Technology Management Centre (TMC). TSP is sited in one of the strategic locations for innovation to grow, next to three leading universities – Asian Institute of Technology (AIT), Thammasat University and Sirindhan International Institute of Technology. The spatial proximity of TSP provides opportunities for corporate tenants to gain access to highly skilled personnel, including over 1,600 full-time researchers, of which over 400 have Ph.D.holders.

B. Largest R&D hub in Thailand

1. 'Hard' and 'soft' facilities

TSP is acclaimed as the largest R&D hub of the country. It is the ideal venue for R&D-intensive companies to develop and nurture their technology and innovation. The park is well-resourced with physical and knowledge infrastructure that encourages companies to innovate technological products and services. Being the R&D hub, TSP provides both 'hard' and 'soft' facilities, as well as encourages the creation of public-private partnerships and fosters relations among tenants.

'Hard' facilities to support R&D activities range from incubation area and laboratory and office space to long-term leased land. Incubation area is made available for technology-based start-ups or small projects of established technology-intensive firms. This area offers excellent facilities at affordable cost for R&D activities. Multi-tenant buildings are provided on rent to established firms. The facilities in these buildings include wet/dry laboratory space and office space. Pilot plants, greenhouse facilities and design service centres are also offered to corporate tenants. Long-term leased land is available for large companies and multi-national corporations that can construct their own R&D facilities. Apart from these three types of space, conference, exhibition and training centres are also available at TSP.

Besides the above, TSP offers a number of support and services to facilitate innovation. These include:

- Financial support that covers R&D grant, soft loan, joint investment in R&D project and tax incentive programme for R&D expenditure;
- Business services such as technology business incubation for start-up firms and guidance for them on technological, business and management aspects;
- R&D and technology support services covering contract and joint research, industrial consultancy, testing and analytical services, and information and technology acquisition;
- Intellectual property (IP) services such as guidance on IP management and protection, and licensing and commercialization of NSTDA's research results to end users; and
- Human resource development (HRD) that encompasses Thailand Graduate Institute of S&T (TGIST), NSTDA On-line Learning Project, specialist database and specialist recruitment.

2. Linkages to create public-private partnerships

TSP also facilitates linkages between tenants, NSTDA and the four national research centres, and universities. Specifically, it encourages the model of modern innovation process where knowledge creation takes place through collaboration among innovating firms, universities and research institutes. At present, one-fourth of the tenants' R&D projects is developed under this model. Examples of government labs and industry linkages are collaborative R&D projects between Betagro (a TSP tenant engaged in agro-industry) and BIOTEC, and collaborative projects between ADTEC (a TSP tenant who conducts research on advanced materials for dentistry) and MTEC.

TSP has attracted leading high-tech companies from around the world and links universities, research labs and companies. There have been several linkages between the four national research centres and international firms located in TSP. For instance, Novartis works with BIOTEC, Shiseido collaborates with NANOTEC, ACTL has a joint venture with MTEC, Western Digital has partnered with NECTEC and Fraunhoffer has joined force with NSTDA.

Furthermore, TSP and NSTDA together with the Office of SME Promotion and Office of Higher Education jointly established the Thai Business Incubator and Science Park Association in early 2009 as a hub for incubations coordination, development and information dissemination. This new office to promote business incubation is located at TSP.

3. Fostering relations among TSP tenants

TSP has developed several means to network private companies with research institutes and universities through the use of formal and informal events. 'Executives Club@TSP' is one of the events in which the executives of NSTDA and TSP tenants meet to build up their relationships and explore opportunities for collaborative activities. 'Forum@TSP' is an open forum for TSP tenants to facilitate discussion and knowledge sharing among the tenants with interests. An 'Exchange Programme' allows TSP tenants and NSTDA to exchange their researchers for three months to learn more about R&D activities of each other.

C. Privileges and incentives package

Tenants at TSP benefit from R&D incentives provided by the government and can enjoy Board of Investment (BOI) privileges package. These privileges include: exemption of import duty on machinery; corporate income tax exemption for a period of eight years; and 50 per cent reduction of corporate income tax for a period of five years from the expiry of the eight-year corporate income tax exemption.

In addition, the tenants can claim tax deduction for research expenditures at 200 per cent from the Revenue Department, and they can use accelerated depreciation rate for R&D machinery and equipment. The tenants also have preference in applying for work permit and visa facilitation for foreign specialists and researchers.

D. Development of TSP

1. Phase 1 – Building up the critical mass

TSP was planned to consist of three development phases. The first phase focused on building up R&D critical mass and was completed in 2002. TSP became the headquarters of NSTDA, and NSTDA's four national research centres and Technology Management Centre. In this phase, TSP had 140,000 m^2 of space to accommodate the four national research centres and corporate tenants.

2. Phase 2 – Bringing in the private sector

The second phase of TSP, which is currently ongoing, concentrates on bringing in the private sector to establish their R&D-related businesses in the park. At present, TSP accommodates 60 companies, of which 70 per cent are Thai firms and 30 per cent are companies from Japan, the United States, Germany and France. In terms of firm size, 70 per cent of the tenants are small enterprises, 15 per cent are medium enterprises and 15 per cent are large enterprises. In terms of industrial sector, TSP targets technological businesses that are related to the four national research centres. TSP tenants are in a wide range of industries, including biotechnology, food and agriculture, health and medical, advanced materials, and information & communication technology (ICT) and electronics (Table 8). There are also tenants who are service providers for R&D-related business, such as testing services company, renewal energy consultancy and a patent law firm.

Table 8: A partial list of tenants at TSP

Sector	Company	Field of operation
ICT & Electronics	NICT	Linguistics technology
	G Sofbiz	Thai lang. mobile application
	Western Digital (Thailand)	Hard disc drive
	Embedded Technology	Embedded system
	Fujikura (Thailand)	Solar cell technology
Food & Agriculture	ECOLAB	Food safety
	Betagro Science Centre	Meat & poultry
	Air Products Asia	Cryogenic technology
	Alltech Biotechnology	Animal nutrition
Health & Medical	Stem Cell for Life	Stem cell research
	MBS Asia	Monoclonal antibody
	BioEDEN Asia	Stem cells banking service
	Novatec Healthcare	Medical materials
	Advanced Dental Tech Centre	Dental transplantation
Biotechnology	Heron Diag	Lateral strip test
	RPD (Thailand)	Ready-to-use media
	Bio Design	Custom oligonucleotide synthesis
	Shiseido Southeast Asia Research Centre	Cosmetics
Materials Technology	Flexo Research	Enzymes for pulp recovery
	Poly Plastic Tech Centre	Engineering plastics
	SCG Building Material	Construction materials
	SCG Chemical	Advanced polymers
Others	Design & Engineering Consulting Services Centre	Engineering design
	Shimadzu Bara Tech Centre	Hazardous/trace element analysis
	TUV SUD PSB (Thailand)	Testing service
	Full Advantage	Renewable energy consultancy
	Rouse & Co. International (Thailand)	Patent law

TSP is a preferred location for many world-leading high-tech companies (Table 9). International biotechnology companies that have regional research centres located within the park include Shiseido, Ecolab, Air Products, Alltech Biotechnology and Marine Biotechnology. Several international firms have been using TSP as a means for industry-academic-government linkages. Western Digital, a global leader in the development and manufacture of hard disk drives, utilizes TSP as a base to develop human resource for hard disk drive producers. Polyplastics has established an Asian Technical Solution Centre for engineering plastics to support its customers in the region. TUV SUD PSB Thailand Limited, a subsidiary of TUV SUD Group, Germany, the largest of the German Technical Testing and Inspection Organizations (TUV), is also located in TSP.

Table 9: International companies located at TSP

Company	Country
Rouse & Co. International (Thailand) Ltd.	United Kingdom
TUV SUD PSB (Thailand) Co. Ltd.	Germany
Virbac S.A.	France
Shiseido Southeast Asia Research Centre	Japan
National Institute of Information and and Communication Technology (NICT)	Japan
National University Corporation	Japan
Tokyo Institute of Technology	Japan
Polyplastics Marketing (Thailand) Co. Ltd.	Japan
Shimadzu Bara Technical Centre	Japan
Fujikura (Thailand) Co. Ltd.	Japan
Air Products Asia (Technology Centre) Co. Ltd.	United States
Western Digital (Thailand) Co. Ltd.	United States
ECOLAB Southeast Asia Regional Technical Centre	United States
Alltech Biotechnology Corporation	United States
MBS Asia Co. Ltd.	United States

The park has been developed to be a science and technology (S&T) research hub for the private sector. The 60 corporate tenants in TSP hire a combined workforce of over 500 skilled workers, of which more than 300 are research personnel. Additionally, there have been over 160 new research projects each year by TSP tenants, and over 25 per cent of these research projects are collaborative research between the public and the private sectors. More than 10 companies are currently in the pipeline to establish their R&D-related activities in TSP.

3. Phase 3 – Growing into a centre of R&D community

Paving the way forward, the next development phase of TSP involves the Innovation Cluster Complex, which will begin to operate by the third quarter of 2011 and will be the largest fully integrated R&D hub in the country. This new facility will have in total 124,000 m^2 of space with approximately 72,000 m^2 for occupation, of which 40,000 m^2 are earmarked for private companies. The Complex will support over 150 tenants and more than 2,000 professionals, in addition to the current phase.

The new facilities of TSP comprise four interconnected towers (by walkways on every floor) built around the concept of “Work-Life Integration” to create an environment conducive for today’s knowledge workers to live, work and play. Also, there will be numerous green spaces throughout the buildings.

The development of TSP in this phase is expected to speed up the pace of new innovation development and strengthen collaborations among the government sector, private sector and research institutions.

E. Recent success stories in TSP

Flexoresearch Group Co. Ltd., a TSP tenant carrying out R&D in blended enzyme for recycling paper, was recently selected by the World Economic Forum (WEF) as a

'Technology Pioneer' in the energy and environment category for its clean technology innovation. The company was also acknowledged by Time Magazine in 2010 as one of "10 Start-Ups That Will Change Your Life".

At the start of its business outside TSP, the company had limited access to testing facilities for its new enzyme formula. This restricted the number of new formulas developed each year to just 4-6. The company then entered TSP Incubator in 2007 and graduated from there in 2009 and became a TSP tenant. This provided it with easy access to testing facilities at BIOTEC. Consequently, new enzyme formulas could be developed and tested within 1-2 weeks. This gave the company the ability to custom-develop enzyme blends rapidly and thus a competitive advantage over its competitors. At present, Flexoresearch Group has developed over 10,000 formulas of blended enzyme. With TSP's support, the company was able to establish its business within a short period of time while developing innovations to reach commercial success and, importantly, to be recognized on the world stage.

Hi-Grimm Environmental and Research Co. Ltd., one of the TSP tenants working on innovative products to solve different kinds of environmental problems and hazards, recently launched "KEEEN" a bioremediation agent. The product is the result of a two-year collaborative research project between Hi-Grimm and BIOTEC on selecting oil-degrading bacteria for commercial bioremediation. KEEEN is an environment-friendly bioremediation agent, which uses microbes to eliminate hydrocarbons, fat, oil, grease and organic substances from contaminated areas.

III. REGIONAL SCIENCE PARKS IN THAILAND

TSP has been recognized as a seedbed of innovation to help build closer links and collaborations among R&D-oriented businesses, leading government research centres and academic institutes. In this respect, the concept of using such parks as a tool to develop technology and innovation has been widely appreciated by both public and private sectors. Accordingly, there have been later initiatives to establish science parks in other parts of the country.

At present, there are three regional science parks in operation in Thailand. The Northern Science Park (started in 2004) is managed by the Thailand Institute of Scientific and Technological Research (TISTR), headquartered at Chiangmai University. The Northern Science Park and the Southern Science Park (started in 2007) are being operated by several local universities – the Northern Science Park jointly by four universities and the Southern Science Park jointly by six universities. The Software Park at Phuket is a private body.

In the initial period, these regional science parks provided only 'soft' services to local firms. There were no physical infrastructure and 'hard' facilities such as rental space and laboratories available. The soft services were being provided through Technology-Business Incubation, by means of technological consultancy, training and contract and collaborative research projects. The idea behind using technology and business incubation as key services in the preliminary development phase of these regional science parks was to have the local universities realize their own strength in providing technological services and working with industry in various fields, as well as to study the demand of local businesses and their markets.

The development of regional science parks in Thailand is currently moving into the second phase. They are now in the process of planning and implementing the Science Park in full scale, providing ‘hard’ services as well.

Interestingly, there is also a move from the private sector to establish a science park in the eastern part of the country. Amata Corporation Public Co. Limited, the owner of Amata Industrial Park, has joined hands with the Ministry of Science and Technology and signed Memorandum of Understanding with eight universities to establish Thailand’s first science city called ‘Amata Science City’.