

The role of incubators and Technology Parks as home for entrepreneurs in Saudi Arabia

By
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Objectives

The main objectives of the paper are defined as follows:

- 1- To promote general awareness at Saudi Arabia on the importance of incubators, science and technology park activities in today's knowledge-based economy.
- 2- To prepare the ground for the establishment of an incubator through discussions involving industry, government, university and world experts.
- 3- To understand the needs of industry to better address them in a future incubator, science and technology park.

The present situation reflects the increasing debate of the incubating concept at the county level. This paper introduces some practices at this field around the globe, I hope it will be benefit to select the appropriate model for the real Saudi Arabia needs.

What are incubators? [9]

The small business incubator is a flexible method of encouraging the development of new businesses and fostering local economic development. Incubators are facilities in which a number of new and growing businesses operate under one roof with affordable rents, sharing services and equipment, and having equal access to a wide range of professional, technical, and financial programs.

Because most small businesses fail within their first five years of operation due to under capitalization and lack of proper management skills, incubator facilities provide an environment where public and private resources can combine to meet the needs of small businesses during their critical stages of development. The typical low cost of operating a new business in an incubator facility is conducive to a more rapid growth and maturity into a viable business enterprise. They are particularly valuable for the transfer of high technology

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and other production and management knowledge to firms. Incubators aren't new by any means, but the concept has taken years to finally catch on. Although the first incubator opened in 1959 in New York, by 1980, only 12 existed. Today those numbers have skyrocketed: "There are 600 incubators in North America alone, and it's estimated there are 2,500 in the world," says Dinah Adkins, executive director of the National Business Incubation Association (NBIA). North American incubators have created nearly 19,000 companies still in business, and more than 245,000 jobs. Entrepreneurs can find support in one of three main types of incubators. NBIA statistics show that most incubators are mixed-use, meaning they serve a variety of industries. Technology incubators, which target clients involved in creating and commercializing new technologies, are another major category. Generally, these two types of incubators aim to bring outside investments into a particular geographic area to expand the tax base. The third type involves a smaller number of incubators (only 5 percent), but it appears to be a fast-growing segment. Known as empowerment incubators, these mixed-use facilities focus on clients considered underprivileged and underserved, such as minorities and women. Such empowerment incubators are often situated in economically distressed areas in hopes of revitalizing the regions. The benefits of the incubator approach are clear. Businesses participate in an environment where small businesses can share experiences and conduct business with one another, thereby reducing the risks inherent in business start-ups. They develop increased awareness of and access to financial, professional, and technical services assistance. They gain access to facilities and equipment otherwise unavailable or unaffordable. They increase visibility and presence in the marketplace. They pay below market rents and share reduced building maintenance responsibilities. Theoretically, the new business increase job creation and job retention, and improves the local economic base by transforming underutilized property into a center of productivity. In terms of SME promotion efforts, incubators are relatively high cost and risk but with consequential high gain. Substantial capital is "invested" in the facility, to finance the maintenance of SMEs, and to provide technical services while firms emerge into self-supporting businesses. Much depends upon the initial selection process. A poor determination of likely candidates may be disastrous for a program; however a good determination will likely yield high results and gains, with consequential employment generation. The high cost of this SME effort indirectly eliminates more marginal firms from participation, because of the intense selectivity involved. Some experts suggest that this is an "elitist" effort, aimed only at the best and strongest firms (e.g. those who already have

sufficient business acumen). Unlike other SME efforts, the “carrot” offered in incubators is a frequently substantial, distorting original mission. The availability of inexpensive real estate and office services and financing (in some cases) is often the prime incentive for businesses to participate, rather than training. In many nations, incubators are run for universities and research institutions, to commercialize their products. In almost all cases, there is little assessment of cost/benefit, the lasting impact of subsidized programs on businesses. However, a recent, extensive study of incubators in six nations concludes incubators are prime contributors to economic restructuring in former Socialist economies (China, Czech Republic and Poland) and making a significant impact on economic development. Elsewhere (Brazil, Mexico), their contribution is mixed. In all of the cases studied, however, the longevity of new firms, after they leave the security of the incubator, has yet to be measured.

Incubators: A Broad Spectrum [6]

Incubators vary in terms of the goals of their sponsors and the level of support to their clients. Some rely solely on government finance in support of social goals, others are private sector developments for profit. Most provide traditional services such as training, business planning, accounting and management development, together with shared office facilities. Some incubators provide debt guarantees and debt financing. They require both substantial capital investments.

<u>Sponsor</u>	<u>Target Goal</u>
University/research organization	Innovation, research, commercialization
Public/private partnership	Investment, employment, social focus
Private sector initiative	Income from services, tenant profitability
Venture capital-based	Profitable enterprises

as well as intensive human resources. In many nations, incubators are linked to universities for technological development, based upon local research, the “Science Park” approach.

Among the varied incubator efforts are: [8]

- **Regional or rural incubators** focuses on the use of local materials or resources from a specific area.
- Targeted incubators for specific populations, e.g. social minorities, women.
- **International incubators** to promote foreign investment that emphasizes design and quality, or may function as an Export Processing Zone.

- **Industrial subcontracting incubators**, built on linkages to large corporations to support new vendors.
- **Single business incubators** that target a particular class of product, such as computer software, metal working, handicrafts.
- **Technology incubators** attempt to raise the level of production in terms of sophistication and/or quality.
- **University incubators** support businesses developed by faculty and staff; A hub incubator to support satellite incubators with a full management team
- **Virtual incubator** or **incubator without walls** which is close to business development services

Business Incubation Modality [7]

Basically, the incubator provides the following: seven **Ss**":

- ☺ **W**ork **S**pace through flexible modular arrangements.
- ☺ **S**hared Office facilities such as receptionist, conference rooms, telephone system, fax, computer, copier.
- ☺ **S**ervices such as counseling on management and marketing, accounting, intellectual property and legal matters, through in-house expertise and by networking with external professionals.
- ☺ **S**kills development by training on SME management, marketing and other disciplines.
- ☺ **S**peed in securing the needed office facilities as well as facilitating the registration, taxes, and other regulations required by governments.
- ☺ **S**eed money access, through the incubator's reputation and better business plans, and often through an internal revolving fund that provides equity or small loans.
- ☺ **S**ynergy of sharing and networking, among tenants and with local community.

National Efforts [8]

The varieties of incubator programs suggest that while the name and broad definition apply, efforts vary considerably from nation to nation.

The United States

After two decades of rapid growth, the United States business incubation industry has reached maturity and can look back with satisfaction on its accomplishments. The network of about 600 incubators, the largest in the world, has a good record of job creation and regional economic growth, at reasonable costs in relation to benefits. Many incubators now take equity in tenant companies, and operate programs to serve affiliated companies outside the incubator. It is also a task of incubator managers to direct their graduates to the work environments (technology parks, industrial estates, export processing zones or others) most suited to their needs, and assist them in preparing for the transition.

A synthesis of good practices can be adapted into guidelines for improving performance of new and existing incubators. The results are impressive:

- **Job Creation.** First at incubators in the recent survey reported that these had created, on average, 468 direct and 702 total jobs. The majority (62%) of direct jobs was high value-added, at technological research and manufacturing enterprises. The bulk of the employment is created after the companies graduate from the incubator.
- **Cost Effectiveness.** The estimated public subsidy cost per job created was only \$1,109, over a seven-year period. This compares well with other business development services.
- **Return on Investment.** Local, state and federal subsidies for incubators may be considered as investment for generating tax revenues from companies assisted. For a sample of 23 incubator firms, the return as tax revenues was almost five dollars for every dollar invested.
- **Growth.** By 1996, firms in incubator programs grew by over 400 percent per year, with average annual sales growth of \$1,240,000 and employment growth of 3.7 jobs per year.
- **Survival.** While the survival rate of new companies after 4 years was only 37 to 70 percent, 87 percent of firms graduated from incubators were still in operation in 1996.
- **Social Benefits.** These are difficult to quantify but are nevertheless real, in transferring technologies, strengthening research-university-business relations, creating an entrepreneurial culture, and developing self-esteem in disadvantaged groups.

Austin Technology Incubator, USA [6]

The founders of companies in the Austin Technology Incubator echo one common goal: they want to successfully create and promote cutting edge technology. And the jobs and revenue they have produced certainly indicate great achievement. But how these companies metamorphose after graduating from ATI may be just as important as the technology they initially developed. In order to understand that, early graduates of ATI were asked how their various business decisions, new developments and participation in ATI impacted their vitality. In all, ATI has graduated approximately 50 companies. Collectively these graduates - along with 19 resident companies -- have created more than 1,900 jobs and generated more than \$720 million in revenue over the past 10 years. According to Joel Wiggins, director of operations for ATI, four companies have gone public, while approximately nine have been acquired. Between 30 and 35 companies are still privately held and principally owned by the same people that founded them. Only three have failed. Wiggins believes the success rate is higher for ATI graduates than start-up companies as a whole. "I think it's a great place for fundable companies to come and have their infrastructure needs met at an early stage," he says. DTM Corp. and PSW Technologies Inc. were the first two graduates of ATI. The two companies left in 1990. DTM went public in May 1997, followed shortly thereafter by PSW Technologies' IPO in June 1997. "A number of young companies were trying their best to become successful, with talented individuals performing at or beyond the edge of their experiences," says Tim Webb, president and CEO of PSW. "Both organizations [ATI and PSW] were in the process of defining themselves, and there was a free flow of ideas in both directions." PSW is a consulting and systems integrations firm that builds and deploys e-business solutions. The company is currently developing technology for t-commerce, or interactive television. The company employed 10 people when it was founded a decade ago. Today, PSW employees approximately 400 people across seven locations nationwide. Its first-quarter 1999 revenues reached \$10.4 million, followed by second quarter success of \$11 million. CEDRA Corp., formerly SEA Pharmaceutical Sciences Inc., was one of six companies in ATI's 1992 graduating class. President and CEO David Garcia says the company has been growing at between 30 percent and 40 percent per year. It started with five employees, and the company currently employees 120 people. CEDRA provides analytical and clinical study services to biotechnology and pharmaceutical industries and the federal government. Garcia says the focus of the business continues to be bio-analytical chemistry, but the company began offering services in in-vitro drug metabolism this past January.

"Although the affordable space provided by the incubator was a very valuable contribution, by far the greatest benefit of the incubator was the networking," Garcia says. "We had access to business advisors, accountants, bankers, attorneys...This aspect of the incubator was essential to our success." A founder of one of ATI's 1994 graduate companies speaks in even more dramatic terms. "I would bluntly say without the ATI, I would probably not be here," says Geza Nemeth, president and COO of I/O of Austin Inc. "I started as an engineer with no business experience...[ATI] nurtured me from an engineer into a business person." I/O of Austin was founded under the name CompuSeis Inc. and developed the Real-Time Acquisition Processing System, a Sercel SN368 upgrade that allows geophysical contractors the latest technology in the seismic industry. Its latest development includes satellites that allow engineers to provide remote assistance from anywhere in the world. The company was acquired by Stafford-based Input/Output Inc. in February 1998. "I had the choice: either bring in venture capitalists or sophisticated investors who knew my business," Nemeth says. "By then, our company was very much sought out by other companies. I felt like it was a prime time to make a marriage." Nemeth also believed being acquired would enable his company to achieve even more in terms of its technology development. "I thought I/O provided me a good opportunity to grow -- my instinct was right," he says. "They bought us because they needed our product and our skill." Another ATI graduate wasn't quite as pleased with the effects of an acquisition. Oscar Mitchell served as the vice president of engineering for Skipstone Inc., whose hardware and software established the de facto standard for IEEE 1394 development. The company graduated from ATI in 1997. In April 1997, Skipstone was acquired for approximately \$7.5 million by Adaptec Inc. "We then found afterwards it was a preemptive strike on Adaptec's part," Mitchell says. Mitchell says he realized in November 1997 that Adaptec was not interested in supporting the kind of technology he wanted to create, so he decided to leave. But Mitchell did not leave alone, nor did he give up his goals. Mitchell, along with two other Skipstone founders, have come full circle from their ATI days. "We were kicking around ideas on what to do next," Mitchell recalls. "We all began looking at the digital camera." It was then that they put their heads together and founded NORDview, which currently operates from the ATI and develops low-cost storage devices to make cameras more economical and portable. Mitchell says NORD view's product allows users to share, store, organize, print and even do minimal editing to images. While Mitchell may be one of ATI's few second-timers, others manage to stay connected as well. Webb of PSW recently agreed to serve as a member of the ATI Success Committee. Both Garcia of CEDRA Corp. and Nemeth of I/O of Austin regularly speak to visitors about their experiences.

Malaysia

Malaysia Vision 2020, a government-led initiative, is developing Technology Park Malaysia (TPM), a site that covers over 100 acres and with an initial government investment of US \$80 Million. It includes incubation enterprise centers, a fully-equipped prototype production center, a resource center and related facilities including research and development lots. It currently has 17 tenants and 43 affiliates with some 130 tenants planned.

China

The TORCH program, that bears the “flame of new economic growth” has taken the lead in developing business innovation centers aimed at technology development, marketing and production.. The project began in 1988 and has since supported some 2,000 small and medium sized enterprises, including more than 10 enterprise groups with a total asset value surpassing US \$12 million. The TORCH process includes training of entrepreneurs, commercialization of high and new technologies, provision of services and financial investment, through local bank loans. Because the focus is on technology, the large numbers of employees come from universities and research institutions. Among current incubator firms are firms working in electronic information, integrated machines/electronics, biotechnology, advanced materials, new energy, and environmental protection

The total results of 51 incubators sampled are:

Capital investment	\$62 million
Total number of firms	2,244
Total incubator employees	20,352

Egypt

The largest incubator network among developing Mediterranean countries is now in Egypt. The concept was initiated by United Nations Development Program and is being implemented by The Social Fund for Development as a component of its extensive SME development program. An incubator at Tala in the Nile Delta started in March 1998. Today a nearly dozen incubators are operating and others are in process of completion by the Egyptian Incubator Association, as the implementing agency. A master plan has been prepared to establish 34 incubators, including a biotechnology and information technology incubator at Mubarak Science City. The level of technical education and research in Egypt would now warrant a major push towards Information Technology, for local, and global markets.

Uzbekistan

As the Government of Uzbekistan forces the space of transforming its 70- year command system to a market economy, the business incubator program is helping to overcome the hindrances encountered by start-up self-owned business, including problems of cumbersome registration, high taxes, inadequate banking, materials procurement, and accessing credit and business support. With political support at the highest level and initial UN assistance, three pilot incubators were started at Tashkent and Samarkand in mid- 1995. The total investment and operating cost of the three pilots over the last three years is estimated at about US\$ one million, excluding the provision of vacant building spaces. This has resulted in the creation of over 200 new jobs, that is, under \$5,000 per job, a number which is declining as these incubators reaches maturity. Now, the Republic Business Incubator Network has been expanded to 23 incubators. The program is being used effectively to create private businesses and to leverage small enterprise friendly policies.

Ukraine

In contrast to the above cases of convergence, the situation in Ukraine is still difficult for local entrepreneurs. Earlier Rensselaer Polytechnic Institute had been involved in developing technological entrepreneurship in Ukraine. Through international cooperation between private and public institutions in the United States and in Ukraine, the infrastructure was built up for an incubator in Kyiv and a joint venture for technology transfer and commercialization. The Fund for Social Adaptation has helped establish an incubator at Belaya Tserka while USAID is assisting incubators at Kyiv and Lyin as well as a technology innovation center in Kyiv.

The Czech Republic

The Czech Republic is using the incubator as a prime tool for economic restructuring, with varied results. Unlike elsewhere, the government is not closely involved in the system, with most coming out of universities or private institutions. In the initial stage, some 22 incubators have failed either because of a lack of resources or technical knowledge. At present 27 incubators are in distinct stages of development with 17 functioning operating in 1994. Most incubators are devoted to enhance new high-technology enterprises:

3 engineering, industrial design	1 power production and supply
3 science based	1 handicrafts
2 new materials for electronics	1 environmental
3 general usage	1 information systems
1 communication	1 textiles

For example the Business Innovation Center of the Czech Technical University (BIC CTU) Prague is a non-profit institution affiliated with the Czech Technical University. With PHARE support of \$130,000 used for the purchase of office equipment and personnel training, the University covered the cost of refurbishing existing premises (\$US 130,000). This funding was supplemented by US \$27,000 from the Ministry of Economy. More than 4,000 sq. meters of offices and workshops were developed. With basic office services and technical help for the development of business plans, financial advising and contact to the Czech Technical University. The incubator has 11 management and support personnel. While results are still tentative, they suggest success:

- 1) Some 95% of the facility is occupied with 19 firms. Most are technology-oriented (11), while others offer business services (6) and two are engaged in traditional crafts.
- 2) The incubator has served 30 companies since 1991. Nineteen have commercialized various types of technology in the areas of electronics, holography, internal combustion engines and devices for environmental monitoring. Outside contractors provided support;
- 3) Some 150 jobs were created since 1991;
- 4) The failure rate of the firms is 10%. One joint venture was closed by the foreign partner, one service company went bankrupt, and one contract was terminated for failure to pay rent;
- 5) The incubator has operating costs of US\$ 200,000 in 1994, most of these covered by charged services (45%) and rental income (30%) 15% comes from PHARE.
- 6) The incubator receives 8-10 applications annually from entrepreneurs;

Poland

By 1995, Poland had 25 business incubators and 4 technology centers, run either by foundations, associations or city governments. Most offer advisory services in start-up, marketing and law, and close contacts with other entrepreneurs. The average investment averages \$100,000 with average annual operating costs in 1994 at \$44,000. 18% of these costs were covered by rents, 21% by service incomes, 38% by subsidies and 23% from "other sources." The average annual rent per square meter for production space is \$1.80 and for office space \$2.44. At the beginning of 1995, the 29 Polish incubators had 331 tenants with 1,582 employees. 68% of the firms were new, less than a year old. In all some 1,527 jobs were created.

Brazil

The Brazilian incubator program operates with the support of public and semi-private agencies. Ten years in operation, there is no unified national policy, perhaps a positive element since no single philosophy dominates. In 1995, Brazil had 45 incubators. Of 16 studied, the main sources of entrepreneur tenants (80%) were professors, students and researchers from universities and research incubators. Most incubators were, indeed, connected in some way to Universities. The Brazilian case is clearly high-end, aimed mostly at technology.

A typical 1,800 sq. meter incubator in Brazil has operating costs of \$101,000 per year, with each tenant occupying between 20 and 60 sq. meters, paying rent as high as \$8.60 per square meter. Almost half of the incubators had no specialized advisory services. Typically, businesses stay from anywhere from two to three years, depending on the evaluation of the incubator boards.

The main criteria for tenancy include:

- 1) Analysis of the business' product and market;
- 2) Technical viability and commercial potential of current and planned products
- 3) Qualifications of the applicant's business team;
- 4) Prospects for financial self-sufficiency in the long run
- 5) Consistency of the business with the objectives of the incubator
- 6) Little or no pollution, including noise
- 7) No direct competition with incubator tenants

Mexico

The Mexican incubator program began in 1990, with ten currently in operation. Start up capital for each of the sites averaged \$822,000, most of which went to construction costs. A wide range of office services is provided with the costs bundled into the rent payment. However most SME assistance for training, planning and marketing are charged. Most of the financing for these projects and the enterprises come from the National Council for Science and Technology (CONACYT) with support from the national development bank, NAFIN. "The incubators have yet to achieve or even approach financial sustainability.

Within the four incubators analyzed, some 19% were related to services, 16% to electronics, 13% to software, with the rest devoted to a broad range of technical support(biotechnology, energy, ecology, computer systems, engineering etc.)

The technology park meets the high standards of businesses that have made a commitment to profitability with environmental and social integrity.

Technology Parks [8]

The technology park can be defined as a property-based development which: has a high-quality, physical environment in a park-like setting, is located adjacent to or in a reasonable distance from a research institute or technical university, and emphasizes activities promoting the growth of research, technology commercialization and knowledge enterprise.

Egypt has a splendid physical facility at Mubarak Science City, west of Alexandria, which now needs to be filled with market-driven innovators, not just state research institutes.

The Silicon Valley, USA

The clustering of related activities in a single sector is many centuries old. In the U.S., for instance, the automotive industry grew around Detroit, entertainment around Hollywood and financial services in Wall Street. The Silicon Valley phenomena for growing high-tech ventures has attracted much attention abroad, and some of the advanced industrializing countries have sought, with very limited success, to replicate these.

The genesis of Silicon Valley may be dated to the 1940s, when the Stanford University engineering professor Frederick Terman inculcated the spirit of techno-pioneers to his classes. At Terman's instigation and with \$38 seed capital, Bill Hewlett and Dave Packard set up a shop in their garage in Palo Alto to produce their first marketable product, an audio oscillator. Sixty years later, the 50 mile strip from San Francisco, Berkeley to San Jose, California has grown to over 7,000 electronics and software companies with a market value of \$450 billion. Its 300,000 top scientists include some one-third born abroad. A dozen new firms and 300 new millionaires are created each week.

What makes this "innovation machine" at Silicon Valley work? A prime factor is the prevailing culture of risk-taking, competitiveness, and the freedom to fail. There is the critical mass of professional services from lawyers and accountants, to the technical infrastructure of proto-typing new devices and out-sourcing components, and to venture capital (about \$2 billion a year of the US total \$6 billion). There are also, the research universities to provide a stream of engineers and scientists with innovations and ambition.

India

Among developing countries, India had an early start on building small business support, entrepreneurship and scientific research capabilities. For instance, the Entrepreneurship Development Institute -India, Ahmedabad is world-class and the network of laboratories of the Council for Scientific and Industrial Research with 10,000 researchers, is among the world's largest. India is pursuing the computer industry as a major thrust area, focused on information technology for export and domestic markets.

Today 130 of the fortune- 500 companies outsource their software requirements to India. Currently India's software industry employs 150,000 people and produced over US\$ 1.8 billion in 1996. Exports are growing at 45% a year, mostly to the U.S. and mainly as end-user application products and services. The Y2K conversion work generated over \$5 billion. Main current constraints are skilled personnel and finance. This sector alone need over \$500 million of risk money, and several US venture capital companies have expressed interest.

A significant initiative of the Department of Electronics is the *Software Technology Parks of India* (STPI), to help strengthen the "India - Software Advantage". For out-sourcing software, these advantages include:

- 1-Large, English-speaking personnel pool, with technical & managerial skills.
- 2-State-of-the-art technologies and equipment, significantly lower development costs.
- 3-Quality assurance levels, ISO 9000 certification and copyright protection.
- 4-High-speed data links and time advantage, for 24-hour development.

Malaysia

In Malaysia the recent financial set back has hardly deterred the overall drive to move from an investment- led economy to an innovation-driven system. The technology park in Malaysia (TPM), inaugurated in 1996, covers 50 hectares and involves a state investment of US\$80 million. Located 10 Km from Kuala Lumpur, it is in the vicinity of five universities, eight national research institutes and emerging Multimedia Super Corridor. The integration of support services includes a modern prototype production center, quality control laboratories and a venture capital fund under park management. A further investment is planned to expand TPM to 280 hectares in the next four years and it is being implemented under public- private leadership. To enhance the benefits of convergence, the organization links the incubator and park under one director of technology who reports directly to the managing director. Further,

a single national association covers both parks and incubators in Malaysia, a linkage strategy adopted also at associations in other industrializing countries such as China, Indonesia, Brazil and Mexico.

Taiwan

At the *Hsinchu Science Based Industrial Park* the 180 high-tech companies, including 36 foreign owned, now represent a total investment of US\$ 5.6 billion, with sales of US\$ 11.3 billion (1995). They employ over 42,000 employees, including 2,00 returned expatriates. They spend over US\$ 300 million annually on R & D (4.6% of turnover). At the *Tainan Science Based Industrial Park (TSIP)*, that Taiwan is now building, to start operations at the year 2001. TSIP will focus on precision machinery, semi-conductor equipment, and agricultural biotechnology. Targeted activities in biotechnology cover ornamental plants, bio-pesticides, livestock vaccines and aquaculture. In both parks, land is available on lease only, not for sale. The National Science Council is establishing a new Center for Industrial-Academic Research and Development. This will provide an incubation system within TSIP, including prototyping product facilities, counseling, training, information and legal services, and a variety of grant, credit and equity financing arrangements. The park and incubation center will be linked to some eight national universities and six research institutes at Tainan and at Kaohsiung port.

Singapore

The Singapore Science Park, starting in 1981, now occupies 270,000 sq. m gross floor space, with some 180 tenants. It includes an incubator operated by the Singapore Institute of Standards and Industrial Research. An Innovation Center (2,000 sq. m with 29 startup companies) and Technopreneur Assistance Center have been added to provide a range of technical, business, training and shared facilities. Other support for early- stage companies includes finance for innovators, a Data- bank of Licensable Technologies, venture capital and patent application fund, as well as state agencies providing productivity, quality and design services. The park has been developed by technology Parks Pte Ltd., which is also operating a variety of multi-tenant facilities in Singapore and Building an Information Technology Park in Bangalore, India.

Hong Kong

A promising development is in *Hong Kong Industrial Technology Center*, established by the government to promote technological innovation and application in industry, combining incubation plus multi-tenant space for existing firms. The incubator will be expanded from the present 2,000 sq. ft gross to 54,00 sq. ft by end of 1997, and tenants will increase from 20 to 45. A second building is now planned. The support system comprises various activities: management training, marketing, technology support, business center, and financial support.

Japan

At a larger scale are the integrated, government-sponsored science cities such as *Tsukuba and Kazusa Akademia Park* in Japan. Tsukuba itself has three science parks, and some 50 government research institutes which account for half the national R & D budget. Yet, after 25 years it remains somewhat sterile with limited entrepreneurial and spin-off activity. The Kyoto Research Park, starting a decade ago, includes incubation facilities, On- Research-Training areas, and the Science Center Research Corporation, in alliance with the University City Science Center- Philadelphia, to promote networking and international exchanges.

Thailand

As these Asian facilities grow, they are expanding not only their physical space but adding sophisticated new services. To stay abreast of its ASEAN neighbors, Thailand is now building the S&TR&D Park, north of Bangkok and adjacent to two universities. It includes incubators, national research laboratories and extensive support services.

China

Starting a decade ago with *the Shenzhen Science and Industry Park and Beijing Experimental Zone*, China now has 52 national parks approved by the central government in special technology zones, 50 provincial parks managed by local administrations, and 30 university-related parks. The impetus and policy guidance comes from the State Science & Technology Commission's TORCH Program and the State Education Commission .

China's parks have special characteristics in comparison on those in other countries:

- 1-They are usually within industry zones and attached to concentrations of higher education and research institutes.
- 2-The parks are well integrated into the life of a district or city, reporting to the same administration

- 3-The State provides strong policy guidance, financial support and staffing
- 4-Preferential fiscal and other incentives, together with the buoyant economy, help attract considerable foreign investment
- 5-There is now perceptible movement from the catching-up-style socialist administration to an enterprise- management mode.

Hungary

The KFKI Technology Park Ltd., Budapest, provides for the basic OPERATION of the KFKI Campus as well as for LEASING OUT its free buildings and offices.

OPERATION covers the following services:

- Maintenance, operation and development of energy supplying networks and systems
- Central labor safety and fire protection
- Maintenance of free/leased buildings and other edifices on the common field
- Attending to the forest and gardens, cleaning of roads and parking lots
- Operation of the telephone exchange, maintenance of the telephone network
- Outpatients medical department with e.g. Professional health care and first aid services
- Armed security guarding, reception office, property protection
- Etc.

LEASING activities comprise:

- Marketing, public relations
- Preparation, concluding and taking care of leasing contracts
- Conversion of buildings/sites according to the tenants wishes
- Internet and other technical services completed with a number of those enhancing human comfort
- Satisfying individual needs of tenants

Conclusion

- ☞ The clients/tenants of business incubators and technology parks are mostly SMEs.
- ☞ In today's economy, SMEs under pressure. Everybody is constantly telling them that they must embrace the Internet and the digital economy. They must go into e-commerce and become global. But whereas everybody tells them so, not many people tell them how to do it. Science parks and business incubators should help.

- At the Chamber of Commerce & Industry for Eastern Province, Saudi Arabia, the Small and Medium Enterprises Development Center (SMEDEC) can play as a virtual incubator (an incubator without walls) in order to provide local SMEs with services and facilities pertaining to their needs and to improve their competitiveness.
- SMEDEC and King Fahd University of Petroleum and Minerals (KFUPM) can jointly sponsor a Business Incubator facility to help start-up entrepreneurs. KFUPM could participate as a hosting company, SMEDEC use its expertise for operating the incubator, a third partners (like the Saudi Credit Bank) can foster with the cost of rehabilitation of the incubator, and loans for start-ups.
- Some activities should be tenanted at the incubator pertaining to the Saudi environment and needs (e.g. gas, pharmaceuticals and petrochemicals industries, the technology of water treatment, and chemistry science).
- It will be advisable for a select governmental technology agency to guide and direct research and planning in Saudi technology incubators and technology & science parks. This may be done by the King Abdulaziz City for Science & Technology.
- Proposed Saudi science & technology parks must include the following facilities:
 - Center for mobilization of research and development: A facility handling operation and administration, and providing various kinds of services such as technology transfer, planning, and project management.
 - Prototype development center: A manufacturing facility for conducting rapid prototyping and experimental prototype development.
 - Open laboratory: Open-style testing and research facilities for all tenants.
 - Training facility: Study, training, and experimentation facilities handling classes and seminars for the purpose of the tenants and personnel training.
 - Information providing facility: A facility providing information retrieval, as well as personnel training videos and journals related to business and technical information.
- KFUPM can contribute to the national system of innovation by the following:
 - Foster entrepreneurship to support local high-tech enterprises.
 - Development of generic technologies for industry benefits at the eastern province.
 - Transfer of technology to industry for commercialization.
 - Training of highly qualified personnel.
 - Advancement of knowledge by way of research and reflective inquiry.
 - Collaboration by faculty/students in local/regional initiatives.

☛ KFUPM can help startup enterprises by the following:

- Investing in patents and other intellectual property protections and developing the technology to the startup enterprises and determining the role of inventor.
- Incorporating the enterprise, issuing stock, completing license agreements and executing other enterprise formation process.
- Developing the business plan of the enterprise.
- Providing technical and business support by assistance with human resources, contacts, flexible rental space and access to laboratories and equipment.
- Raising the substantial venture investment required to get beyond initial stages of business .

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