3.1. Evolution of Science and Technology Parks

The United States and select countries in Europe were the first to set up dedicated Science Parks during the sixties. Unlike the sector-specific parks in vogue today, many of these parks were set up to cater to the requirements of multiple knowledge or technology intensive sectors such as engineering, chemicals, and electronics. In Asia, the phenomena of setting up dedicated parks to enable knowledge sharing started in the early seventies, with countries like Japan and Korea taking the lead. However, many of these Parks primarily had government research and development institutes and universities as occupants, with limited representation from non-government business ventures. Consequently, the focus continued to be on basic research and converting research outputs to product prototypes, which could then be taken up for commercial purposes.

It was only in the late seventies and early eighties that the non-government sector started to play a role in this sector. The trend started with a number of applied research and development organizations promoted by private businesses setting up operations in the park to avail the benefits of government support to research and development. This gradually gave way to manufacturing facilities being set up in designated areas of the park and ultimately, a substantial portion or the entire operations of the business venture getting relocated to the park. By this time, with markets opening up, international trade flows and inter-regional technology transfer arrangements also started to impact knowledge or technology intensive sectors in particular.

The resultant impact on science or technology parks was two-fold, namely i) With individual sectors achieving critical mass and becoming more specialized, many parks started acquiring a sector or industry specific character and ii) Issues like intellectual property protection, promoting local enterprises for regional development, establishing backward and forward linkages became increasingly important and many existing parks reoriented their business models to provide these services. The role of the non-government sector in park management also increased as many of these services were of a specialized nature. Simultaneously, with most of the sectors achieving self-sustainability, the role of the government became primarily that of a facilitator and regulator from that of an investor and driver.

Current science and technology parks can therefore be categorized into two types, namely i) Horizontal parks straddling a number of sectors and ii) Sector-specific parks in knowledge/technology intensive areas.

3.2 Our Approach

The first step in the assessment included identifying five countries for further analysis, based on an assessment of the relative competitive positioning of individual countries as detailed in the previous section. Given the relatively higher focus of the current study on developing countries, 3 developing countries were included in the final sample in addition to 2 developed countries.

Next, a total of 6 IT Parks were identified across these countries so as to constitute a representative sample covering both i) successful and not-so-successful IT Parks and ii) IT goods as well as IT and BPO services. As a first step, an attempt was made to understand the relative performance of individual IT Parks through key parameters like number of occupants vis-à-vis years of operation, nature and credibility of occupants, and relative importance in the country’s IT sector.
3.2.1 The CLIP Framework of Analysis

The individual dimensions of the CLIP framework, namely, Capital, Linkages, Infrastructure and People were then used for assessing individual IT parks. The individual parameters of the framework have been explained below.

- Capital attempts to assess i) Investment, ownership, and management-related issues of the IT Park in terms of how it has been funded, role of the government and the private sector; ii) Mix of anchor occupants and early stage companies in the park, and iii) Provision of business incubation services by the park management and availability of private equity/venture capital and other means of financing.

- Linkages include i) Nature of products & services offered by key occupants and their fit with the target markets; ii) Assessment of forward & backward linkages of key occupants of the park; iii) Relationships between key occupants and resource organizations such as academic institutions and R&D centers, given the nature of products & services offered by key occupants; and iv) Value-added services offered in terms of market access, business planning and operational support, developing appropriate linkages within and outside the park, etc.

- Infrastructure addresses i) Availability and relative cost of land/space; ii) Quality of physical infrastructure in terms of connectivity, urban infrastructure, etc.; iii) Nature of social infrastructure such as recreational facilities, and remoteness; iv) political stability and law & order and v) Intra-park, domestic and international data and voice connectivity.

- People issues in terms of i) Quality of educational institutes; ii) Annual employee salaries and benefit levels and iii) Availability of people both in terms of numbers and skill-sets.

3.3 Taedok Valley, Taejon, Korea

3.3.1 Background

Taedok Valley is located about 150 km south of Seoul and represents one of the first science & technology parks in Korea. The development of the valley started in 1973–74 with the construc-
tion of Taedok Science Town (TST) by the Ministry of Science and Technology, government of Korea, as part of an effort to overcome the increasing population (and consequently infrastructure) pressures on Seoul and develop additional centers of innovation and growth. The overall objective of TST was to foster closer links among research institutes, academia, and industry through the effective placement of government supported research institutes. The site was strategically selected so as to be close to the city of Taejon, one of the largest cities of Korea and the headquarters of the Korean Armed Forces. The development of Taedok Valley took place over a period of 20 years and included the following major milestones:

- 197–74: Basic planning and commencement of construction of Taedok Science Town, comprising research & educational facilities, residential zone, commercial zone (for industrial enterprises) and green or open zone.
- 1977: Announcement of Taedok Industrial Base Development Area comprising 2 Industrial Parks supported by the research & development (R&D) institutes in Taedok Science Town.
- 1978: Commencement of relocation of key government research & development institutes such as the Korea Advanced Institute of Science and Technology (KAIST) and Electronics and Telecommunication Research Institute (ETRI).
- 1983: Merging of Taedok Science Town with Taejon City.
- 1990–98: Completion of phased relocation of government supported R&D and academic institutes; Commencement of Science Expo facilities and first exhibition in 1993; Passing of the Taedok Science Town (TST) Administration Act in 1993 designating Taedok Science Town Administration Office (TAO), Ministry of Science and Technology as the nodal agency for administration & management; Setting up of R&D facilities by large private sector players such as LG, Hanwha, Shinsung, and Dacom.
- 1999–2004: Reform of the TST Administration Act in 1999 with a focus on R&D commercialization promotion, setting up of business ventures; Patent Court relocated to Taedok in 2000; Special law for Taedok R&D Special Zone in 2004.

3.3.2 Applying the CLIP Framework to Taedok Valley

**Capital:** The estimated total investment in Taedok Valley was USD $4.8 billion, out of which around 50% represented investments in industrial units/clusters and private sector R&D institutes. The balance was funded by the Ministry of Science and Technology, government of Korea. In line with government policy trends in Korea, the park is managed by Taedok Science Town Administration Office (TAO), which is an arm of the Ministry of Science and Technology. The key functions of TAO include effective utilization & management of land in line with regulatory guidelines, preserving the green zone and natural landscape and providing effective support to the occupant organizations.

More than 800 companies operate out of Taedok Valley, with around 45% being in the IT sector, 20% in biotechnology and the others focusing on areas such as chemicals and plastics. There are around 3 companies with annual revenues of over USD $30 million and another 5 companies with revenues exceeding USD $11 million. It also houses 399 research institutes, 21 public institutes, and 24 universities. Venture capital support is provided through the Taedok Angel Mart and a dedicated venture capital fund, with cumulative investments having exceeded USD $20 million. However, a number of large Korean conglomerates such as LG and Daelim have dedicated R&D facilities in the Science Town and serve as anchor occupants.

**Linkages:** The focus of IT sector occupants is primarily on areas such as basic and advanced telecommunications technology, telecommunication network operating technology, and data communications, in line with the relative competitive strengths of South Korea. Most of the units cater to the domestic and export markets. R&D support is available from the government-promoted Electronics and Telecommunications Research Institute (ETRI), as well as private R&D institutes set up by entities such as Dacom and Korea Telecom. The park also has an international intellectual property training institute which supports capability development in this area. There are around 23 business incubator centers, which offer marketing and sales support.
through focused technology transfer fairs and other events.

**Infrastructure:** Spread over an area of over 6,800 acres, Taedok Valley includes a i) residential zone, ii) commercial zone housing the industrial parks, iii) research & educational zone and iv) a green or environment-friendly zone. The cultural and social amenities include convention & concert halls, a sports complex, swimming pool, and athletic parks. The Valley is about 30 minutes from the Cheon Gju International Airport and is also well connected domestically through 3 major highways and 2 railway networks. Data and voice connectivity is provided by Korea Telecommunication Authority, which also has a dedicated international gateway in the region. There are around 13 buildings identified for business ventures, which are offered at discounted rents to occupants.

**People:** In line with the focus of Taedok Valley, the total number of scientists and researchers deployed in the research institutes, government institutes, universities, and businesses is estimated at over 25,000. There are 3 higher education institutions within the Valley, namely Korea Advanced Institute of Science and Technology (KAIST), the Chungnam National University and Chungnam college, all of which are government promoted, with a cumulative throughput of over 30,000 highly qualified resources. Around 3,300 patent applications originated from the Valley during 2001, translating to a ratio of 23.2 patents per 10,000 persons.

### 3.3.3 Key Lessons

Considering that the primary objective of TST was encouraging innovation through fostering linkages among research institutes, academia, and industry, the park appears to have attained a degree of success as is evident from the profile of its occupants. TST’s success in innovation can be measured by patents generated from the park, which was 23.2 patents per 10,000 people in 2001, as compared to the national average of around 7 patents per 10,000 people. The R&D investment in the Park for year 2002 was $1,997.7 billion (2.1 billion USD), which was 12.4% of the total national R&D investment.

The key lesson from the TST case study is that good linkages amongst park occupants, like industry, academic institutes and research & development institutes, is one of the essential factors for facilitating innovation through development of new product and services. IT Parks, which focus on R&D, should be developed in proximity to good academic or R&D institutes and/or should be housed in the campuses/neighborhood of such institutes.

### 3.4 Zhongguancun Science Park (ZSP), China

#### 3.4.1 Background

Zhongguancun Science Park (ZSP) is located in the northwest of Beijing, about 15km from Tiananmen Square. Zhongguancun, in the Haidian District, was selected by Chen Chun Xian, a nuclear physicist, as the location for the first non state-owned science & technology company in 1980. By 1986, it was home to more than 100 non-state owned S&T companies, with its main street acquiring the name of “Zhongguancun Electronic Street”. In May 1988, the State Council approved the setting up of the Beijing Experimental Zone in Haidian, which marked the formal development of ZSP.

The objectives for establishing ZSP are three-fold; (i) economic development through the promotion of hi-tech industries, (ii) employment generation, and (iii) creation of a base for innovation in the field of science and technology.

The park has been in existence for the last 18 years and has achieved the following milestones during the course of its journey to becoming one of the largest science and technology parks in China.

- 1991: Beijing Shangdi Information Industry set up as the first incubator in ZSP.
- 1992: Fengtai Science & Technology Park and Changping Science & Technology Park were established.
- 1994: ZSP was classified as a single zone including multiple parks.
- 1997: ZSP sponsored the first annual Zhongguancun Computer Fair and it also became the first group network member of APEC Science Parks.

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1998: The Overseas Students Pioneer Park was established within ZSP.

1999: The State Council approved “Request for instruction on actualizing the strategy of flourishing country by science and education, and accelerating the construction of ZSP”, thereby leading to the constitution of the current ZSP Management Committee, which was subsequently vested with the powers of municipal economic administration in the park.

1999: Three companies, namely, Beijing Science Park Construction Co Ltd, Beijing Science Park Bidding Co Ltd, Beijing Zhongguancun Science Guarantee Co. Ltd. were established to speed up the construction of facilities within ZSP.

3.4.2 Applying the CLIP Framework to Zhongguancun Science Park

Capital: From its inception in 1988, the government has been funding facilities development in ZSP. The park is managed by the ZSP Management Committee, which comprises nominated members of different government bodies (e.g., municipal management committee, different municipal departments). The major services offered by the park management committee include land use and facilities planning, investment services, labor management, business services, and environmental protection.

The occupants of ZSP primarily include IT companies (68% of total number of companies), optics-machinery-electronics integration companies (10%), and new materials, new energy and environmental protection companies (12%). According to the 2004 Beijing Statistical Handbook, there are more than 12,000 enterprises across ZSP’s seven parks. However, only 10–20 companies, such as the Stone Group Corp., Legend Group Corp., and BD Founder Group, which are market leaders in their respective fields, have revenues over USD$200 million, with another 100 companies managing to cross USD$10–20 million in revenues. Around 20% of companies represent joint ventures with investment from countries such as the United States and Japan. There are also around 1,500 R&D centers and hi-tech companies set up by global companies such as Microsoft, IBM, Intel, Sun Microsystems, and Mitsubishi. The balance includes small companies and start-ups which are involved in trading or copying media. Despite the existence of domestic venture capital funds of over USD$150 million managed by the Beijing Municipal government and loan arrangements with commercial banks, these companies find it difficult to mobilize resources as there is a pronounced policy preference towards the larger companies.

Linkages: Companies in ZSP account for over 40% of the total software and IT services sales in China, primarily due to large companies like the Stone Group (80% share of the Chinese word processing market), Founder Group (market leaders in Chinese electronic publishing), Legend, Taiji, Nantian (leading system integrators). It also has companies like the Legend Group, which is not only competing for domestic market leadership but also features in the top 5 exporters of PC mother boards and add-on cards. Many of these firms have benefited significantly from their association with universities/centers of learning like Beijing University and Tsinghua University, and research institutions located in this area.

In ZSP, 39 institutions of higher education under Beijing University and Tsinghua University are present. There are 213 national scientific institutions and laboratories represented by the Chinese Academy of Science and Chinese Academy of Engineering present in ZSP which have excellent linkages with the companies located in this park. The presence of R&D centers and the research institutes has lead to more than thousand sophisticated discoveries from this park.

Infrastructure: By virtue of its location, the park is able to leverage Beijing’s extensive road and rail connectivity, urban infrastructure, social infrastructure and amenities. It uses optical fibre for internal data connectivity, backed up by international gateways in Beijing. Voice connectivity is provided by China Telecom. Over time, there have been concerns on increasing land prices and property rentals. Land is owned by the government and leased out to the occupants. Typical lease period is 70 years.

People: Haidian district is home to 68 universities and colleges that produce high quality graduates for ZSP. Haidian is an educationally advanced district, with over 25% of the population having received higher education. In ZSP, 39 universities are located including Peking University and Tsinghua University with a total of student population of
400,000. From these universities around 100,000 students graduate each year.

The quality of manpower at ZSP is also quite high, as is evident from the over 55% university degree holders, 36% bachelors’ degree holders and 19% Masters’ degree holders or PhDs. ZSP enjoys close proximity with the prestigious Qinghua University, Beijing University and the Chinese Academy of Science. Around 3,218 patents were applied for from ZSP in 2004. The park also has a set of policies for encouraging overseas students and professionals to set up their own enterprises in ZSP. In 2004, over 5800 returned overseas Chinese students and scholars have started their own enterprise in ZSP. During 2003, more than 83,000 new jobs were created in ZSP with the total staff employed reaching around 489,000. Currently, it is estimated that around 650,000 persons are employed in ZSP. The average annual salary of IT professionals at the middle management level is around USD$10,000 to $12,000.

3.4.3 Key Lessons
ZSP is the pioneer of Chinese Science Parks and is also the largest, with an average annual growth of 20–30% over the last 10 years. ZSP contributes around 60% of the annual industrial growth of Beijing, with its business income accounting for 18% of the total income of all 53 Chinese hi-tech parks in 2001. Today, ZSP is considered to be a model for other science parks in China to replicate.

Key factors that contributed to the success of the park have been detailed below:

- Attractive fiscal incentives provided by the government to firms located in ZSP, including additional tax waivers, income tax benefits on expenses related to R&D activities, technology transfers and technology consulting. These incentives along with availability of world-class infrastructure within the Park have attracted well-known domestic enterprises (e.g., Lenovo Group, Stone, Founder Group) to operate from ZSP as well as many Fortune 500 companies (e.g., Nokia, HP, Microsoft, Oracle) for setting up R&D institutions in the park.
- Attracting academic institutes in and around the park and establishing industry—academic linkages also helps. ZSP is well placed in terms of its proximity to academic and research institutions, surrounded by 39 leading universities and 213 research institutes including Tsinghua University, Peking University and the Chinese Academy of Sciences. Leveraging this proximity with academic institutions, the government, has established a useful platform for attracting and training innovative talents. This includes providing specialized incubator services aimed at returning overseas Chinese students which have resulted in over 450 start-up IT organizations.

3.5. Hitec City, Hyderabad, India

3.5.1 Background
The Hyderabad Information Technology Engineering Consultancy (Hitec) City is located in Hyderabad, the capital of the state of Andhra Pradesh and one of the fastest growing cities in India. As per the Census of India, 2001, Hyderabad was the sixth largest city in India with a population of 5.5 million. Andhra Pradesh was relatively a late starter among the Indian states with respect to IT sector development. The government of Andhra Pradesh (GoAP) wanted to create an enabling IT sector environment in Hyderabad with an objective to attract large domestic and foreign IT companies to locate in the city and generate employment in the state. Moreover, GoAP wanted to position Hyderabad as the knowledge hub of India. Hitec city was the first step towards fulfilling GoAP’s objectives.

Hitec City is located in the northwestern part of the city and is around 350 acres in area. Key milestones in the development cycle of Hitec City include:

- November 1998: Construction of Cyber Towers, the first multi-occupant 10 story building with four quadrants or zones, spread across 6 acres of
Box 1. Cyber Towers – Multi Occupant Model

Cyber Towers was developed as the signature building of Hitec City by L&T Infocity, a joint venture between Larsen & Toubro Ltd (L&T), one of the leading engineering companies in India and APIC. While L&T held 89% stake in the company, APIC’s stake was 11%. While APIC provided the land for development, L&T was responsible for construction of the facility, marketing of the space and facility management & maintenance. L&T Infocity also developed other facilities within Hitec City such as internal roads, sewerage system, and optical fibre network for data and voice communication. Cyber Towers was conceived as a 10-story building with around 0.6 million square feet build-up area. The construction of Cyber Tower was completed within 14 months of allotment of land and it was fully occupied within 4 months of construction.

Around USD$28 million was invested for construction of Cyber Towers. The main revenue streams for the developers included i) selling of the floor space, ii) leasing out of the floor space, iii) leasing out of car parking space and iv) maintenance charges. It is understood that L&T Infocity achieved break even within 4 years of construction. The built-up space has been sold to financial institutions such as Housing and Development Finance Corporation (HDFC) and ICICI Bank and to IT companies like Keane, at rates of around USD$33/sq ft. The current selling price is around USD$57/sq ft. Initially, the lease rentals for anchor investors like Microsoft India Limited and Oracle ranged between USD$0.44 to 0.55/sq ft/month. Subsequently, the rates increased to around USD$0.77/sq ft/month for unfurnished space and USD$1.55/sq ft/month for furnished space. Currently 60% of the space is on rent and 40% of the space has been sold.

All occupants pay USD$0.1/sq ft. as service and maintenance charges to L&T Infocity. The services provided by L&T Infocity include backup power supply, air-conditioning facility, waste disposal & treatment, internal security system and parking facilities. Occupants of the facility include eateries, courier service providers, banks and telecom service providers which meet the requirements of IT and BPO companies.

(Based on interactions with Mr. R. Sridaran, Chief Operating Officer, L&T Infocity)

land, with a total built-up area of around 580,000 sq. ft. Cyber Towers was constructed in 14 months and achieved 100% occupancy within 4 months of completion.

- 2002: Completion of Cyber Gateway or Phase II of Hitec City, a multi-occupant trapezoidal structure, spread over 8 acres of land, with a total built-up area of around 866,000 sq. ft. It offers ready to use space with plug & play facilities, ranging from 1700 sq. ft. to 36,000 sq. ft. or multiples thereof, depending on the occupant’s requirements.

- 2003: Completion of the Hitex Exhibition Center within the park, for hosting internal exhibitions, trade shows and other corporate events. The Center is spread over 100 acres of land and includes 3 large exhibition halls of over 30,000 sq. ft. each, an open exhibition area spread over 350,000 sq. ft. and a trade fair complex.

- October 2004: Commencement of operations at Cyber Pearl or Phase III of the park, comprising over 300,000 sq. ft. of ready-to-use space with plug & play infrastructure.

- 2004–06: Completion of a number of independent IT Parks (e.g., Mindspace IT Park, Vanenburg IT Park, RMZ Futura IT Park), with built-to-suit facilities.

- January, 2006: Inauguration of the Hyderabad International Convention Center, spread over 15 acres of land, with over 291,000 sq. ft. of meeting space capable of accommodating over 5,000 delegates and a conference complex comprising break-out rooms with state-of-art automation and audio-visual facilities. The complex also includes a 287 room business hotel, operated by Novotel.

An estimated 5,000 acres of land adjoining Hitec City, comprising campuses of large IT companies such as CMC, TCS and Microsoft and residential blocks is currently in an advanced stage of development.

3.5.2 Applying the CLIP framework to Hitec City, Hyderabad

Capital: The Hitec City comprises multi-occupant buildings such as Cyber Towers (please refer Box 1 for details) and Cyber Pearl and stand-alone individual company facilities such as Infosys Development Center, Satyam Technology Center, HSBC Call Center, and Deccan Park TCS. The
estimated total investment in the park (without considering the adjoining area of around 5,000 acres which falls under Cyberabad) is estimated at USD$375 million. The multi-tenanted facilities within the City were promoted by government of Andhra Pradesh (GoAP) in partnership with reputed private sector companies like L&T, K. Raheja Group, Ascendas and the Emaar group, Dubai. Andhra Pradesh Industrial Infrastructure Corporation (APIIC) which is the nodal agency for the state/provincial government provided the land for development while the private players developed and manage the facilities. This public-private partnership (PPP) model enabled leveraging of the i) Facilities development capabilities, ii) Financial strengths and ii) Marketing skills of the private sector partners (please refer Box 1 for details). The construction cost of the multi-occupant buildings varied between USD$22 to 33/sq. ft.

More than 150 companies currently operate out of Hitec City, with almost all focusing on IT and BPO Services. These include around 15–20 anchor occupants like GE, Microsoft, Oracle Corporation, HSBC, Keane, Accenture, Qualcomm, Verizon, Bank of America, CSC, most of which were provided space at concessional rentals factoring in discounts as high as 30%.

Many of the large IT companies like Microsoft, GE, Dell, Infosys initially commenced operations in the multi-occupant buildings like Cyber Towers, Cyber Pearl & Cyber Gateway and subsequently set up their own facilities in the built-to-suit portion of the land. Plots were provided at significantly discounted prices by APIIC, with discounts as high as 50%.

**Linkages:** The focus of the occupants is primarily on IT services such as system integration, application development, and package implementation and BPO services such as finance and accounting, payroll processing, and customer care services, in line with the relative competitive strengths of India as a country.

Most of the units cater to the export markets including HSBC, Dell, TCS, Accenture, and Google, which essentially operate as captive shared services centers for their parent companies. The total IT and ITES exports from the state of Andhra Pradesh was USD$2.8 billion in FY06, translating to around 16% of India’s exports of IT and BPO services. According to industry experts, 50% to 60% of the exports are from companies located in and around Hitec City. The clustering effect was also clearly visible, with a number of smaller companies like SDT Technologies relocating themselves to Hitec City, to leverage proximity with larger players which represented prospective clients.

Given the product & services profile of key occupants, linkage to entities such as research & development institutes and centers of excellence does not appear to be critical. For promoting better co-ordination among IT companies located in Hyderabad and interactions with government, the Hyderabad Software Exporters Association (HYSEA) was formed in 1991. Box 2 describes the role played by HYSEA in development of the IT sector in Hyderabad. The association has also played an important role in development and growth of Hitec City.

Other than facilities management, the management of the IT Park does not offer any value-added services such as market access, business planning & operational support, or resource mobilization.

**Infrastructure:** Spread over an area of over 350 acres, Hitec City is only 30 minutes from the central business district of Hyderabad and about the same distance from the Hyderabad International Airport. Hyderabad is the 6th largest city in India, and is well connected to all major cities in India through the national & state highway and rail network. To improve the road connectivity with other parts of the city and Hitec, a outer ring road is being constructed around the city. A new international airport is being constructed at Samshabad, about 20 minutes from Hitec City. This will further improve the air connectivity of Hyderabad.

Hitec city has a robust communication infrastructure in terms of the following:

- Voice connectivity within and outside the park is provided by the state owned BSNL and private sector service providers like Tata Teleservices, Reliance Infocomm and Bharti.
- High speed optic fibre data connectivity is provided by VSNL and Software Technology Parks of India (STPI), both of which are connected to international gateways.
The price of built-up space in Hitec City ranges between USD$55–$67/sq. ft. Monthly rentals range between USD$0.67–$0.77/sq. ft for unfurnished space and USD$1.33–$1.55 for furnished space.

Where the space is leased out, the occupants need to sign an agreement with the developer. Salient features of such agreements include:

- In-built escalation of 12%–15% of rental every three years
- Deposit equivalent to 6 to 12 months rentals
- Lock-in period of 3 years for unfurnished and 5 years for furnished spaces
- Lease renewal option solely with tenant

A comparison between the monthly rentals in Hyderabad and other cities of India has been presented in Figure 4 below.

Hitec city has a dedicated 132 KV electricity substation for providing uninterrupted electricity supply to its occupants.

In addition, multi-tenanted buildings such as Cyber Towers, Cyber City, and Mindspace have generators as standby to ensure 100% reliability, in event of electricity outage.

The unit cost of electricity is comparable with other major Indian cities. Figure 5 compares the unit cost of electricity of Hyderabad with other Indian cities.

The social infrastructure of Hyderabad is comparable to any other metropolitan city of India:

- It houses two sailing clubs, flying club, golf course, a turf club and a number of shopping complexes, restaurants, and multiplexes.

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**Figure 4. Space Rental (USD/sq. ft)**

<table>
<thead>
<tr>
<th>City</th>
<th>Lowest</th>
<th>Highest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyderabad</td>
<td>0.44</td>
<td>0.84</td>
</tr>
<tr>
<td>Kolkata</td>
<td>0.51</td>
<td>1.00</td>
</tr>
<tr>
<td>Chennai</td>
<td>0.58</td>
<td>1.00</td>
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<tr>
<td>Bangalore</td>
<td>0.76</td>
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<tr>
<td>New Delhi</td>
<td>0.55</td>
<td>1.90</td>
</tr>
<tr>
<td>Mumbai</td>
<td>1.00</td>
<td>3.30</td>
</tr>
</tbody>
</table>

Source: Cushman and Wakefield
The city has a large number of quality hotels such as Taj Krishna, Taj Banjara, Marriott Viceroy, and ITC Kakatiya.

Hyderabad has a number of strong specialty hospitals such as Apollo, CARE Hospital and Indo-American Cancer Institute and Research Center. A number of reputed schools are present in Hyderabad such as Delhi Public School, International School of Hyderabad, and Hyderabad Public School.

Prominent residential areas like Banjara Hills, Jubilee Hills, Begumpet are well connected to Hitec City. The city has been expanding in the direction of Hitec City with a large number of residential and commercial complexes being constructed in and around the region.

The good physical and social infrastructure, stable law and order situation, location advantage (more or less centrally located between the northern and southern parts of India) and multicultural dimension of Hyderabad, ensures excellent quality of life for the residents of the city. According to many industry sources, companies located in Hyderabad have been able to attract and retain skilled human resources from other parts of India due to the better quality of life offered by the city. Box 3 below describes the experience of Keane India Limited, one of the anchor tenants of Cyber Towers.

**People:** It is estimated that more than 160,000 persons are employed in the IT and BPO industry in Andhra Pradesh. Around 80,000 employees are estimated to be employed at Hitec City, comprising a mix of engineers, IT specialists and graduates (in BPO companies). The state of Andhra Pradesh has 23 universities and over 230 engineering colleges, with an aggregate output of 86,000 engineers every year, including 32,000 computer science engineers and graduates in computer-related courses. The total number of students graduating from the universities in other disciplines of science, arts or commerce is more than 350,000 per year. Hyderabad itself has four universities which account for a large proportion of the workforce in the IT & BPO sectors, namely, University of Hyderabad, International Institute of Information Technology, Osmania University and the Jawaharlal Nehru Technological University.

According to industry experts, manpower cost in Hyderabad, for IT and ITES professionals, is one of the lowest in India.

**Box 3. Keane India Limited Operations at Hitec City, Hyderabad**

Keane India Limited started its operations in 1998 from Cyber Towers, Hyderabad. The company provides BPO services in areas of insurance, healthcare and financial services to clients in the US and UK. The revenues generated from its Hyderabad facilities was around USD$20 million in 2000 with the company having a staff strength of 500 within the park (50% of its total strength in India).

Keane was one of the first few occupants of Cyber Towers and hence received a concessional rate of USD$33/sq. ft as against the prevailing price of around USD$45/sq. ft. The company currently occupies the entire 8th floor of Cyber Towers (Built up area of 52,000 sq. feet).

In the initial years, the physical infrastructure in and around Hitec City was inadequate. However, GoAP invested heavily to develop quality infrastructure, including road network, electricity, water supply system, sewerage & drainage lines, and transportation system. To ensure quality communication infrastructure in Hitec City, STPI-Hyderabad was relocated to Cyber Towers in 1998. One of the key advantages highlighted by Keane was the proactive attitude and easy accessibility of senior GoAP officials in resolving infrastructure and other issues during the initial period.

*(Based on interaction with Brig. Harikumar Krishnamurthy, Head- Knowledge and Learning, Keane India Limited)*
The average salary of a junior level IT professional (less than one year work experience) in a company located in Hitec city is around USD$3,300 to $4,500 per annum.

The average salaries of middle level IT professionals (2 to 4 years of work experience) and highly experienced IT professional (more than 5 years work experience) ranges between USD $8,900 to 11,000 per annum and USD$17,700 to 33,300 per annum respectively.

Interaction with companies located in Hitec City indicate that they are satisfied with the quality of professionals available. While more than 80% of the workforce of small companies like SDT technologies (a software product development company) represent localities, the proportion is around 40% to 50% for larger companies like Keane India Limited.

To meet the human resource requirements of the IT sector, the state government has undertaken a number of initiatives, including:

- Government in partnership with the private engineering colleges and industry has launched a unique program named “Jawahar Knowledge Center” (please refer to Box 4 for details). The Jawahar Knowledge Centers (JKCs) act as the finishing schools for IT students imparting them with industry oriented skills.

- GoAP has made English compulsory in graduation stage to increase the supply of English-speaking graduates.

### 3.5.3 Key Lessons

Hitec City is one of the more successful IT Parks in India. The park has been able to achieve its objective of generating employment with Hitec, employing more than 160,000 people. Using Hitec City as the focal point, a larger IT City—Cyberabad has developed in the surrounding area. Today, Hyderabad with its world-class infrastructural facilities required by the IT sector is one of the preferred destinations for IT companies in India. Large IT companies such as Microsoft, IBM, SAP, Oracle, Infosys, TCS, Satyam, Wipro, and CTS are located in the Hitec City. The key elements that have led to the park’s success are as follows:

- A supportive and proactive government, which properly marketed the IT Park and was able to attract key large anchor investors like Microsoft and Oracle.

- World-class physical and virtual infrastructure, which has been created through a public-private partnership and managed by an efficient private management team that provides world-class quality service to occupants.

- Steps were taken by government on a public-private partnership basis to augment the human

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**Box 4. Highlights of the Jawahar Knowledge Center Scheme**

The gap in the quality of talent available locally was initially identified as a limiting factor for the industry in AP. In order to improve the quality of IT students, especially from private colleges, GoAP started the Jawahar Knowledge Centers (JKCs) in 2004. The Jawahar Knowledge Center was an initiative started collectively by the private colleges, industry participants and different agencies of GoAP like the Department of Information Technology, Institute of Electronic Governance and Andhra Pradesh State Council of Higher Education. These JKCs act as finishing schools for the final year students. As part of this program industry grade skills are imparted to final year students to make them industry-ready. In each of these JKCs, training programs are conducted by industry-trained mentors and JKC trained students. Hands on training is provided through live projects. GoAP offers the students small computerization and e-governance projects for Urban local Bodies, Rural Local Bodies and Government departments. The participants are trained both in soft (e.g., mock interviews, group discussion, teamwork) skills and technical skills. A number of IT companies actively participate in the training programs.

In 2004, in the first year, 36 JKCs were created. The program covered 1066 female students from 102 private engineering college. Out of these 235 students were recruited by companies like IBM, Infosys and Satyam. In the second year, the intake was increased to around 6000 from 163 colleges spread across AP. Around 1300 students were recruited by companies like Wipro, Satyam, Infosys, IBM, TCS, CA, and Intelligroup. In the second year JKC was also extended to 11 nongradinging degree colleges to train students in BPO skills (e.g., medical transcription, data processing). 45 such trained students were selected by Nipuna, a Hyderabad-based software company. In 2006, the program has been extended to cover 13000 students from over 200 colleges.

Based on discussions with Dr. G. Subbarao, State Chief Information Officer & E.O. Special Secretary to Chief Minister, GoAP & Dr. T.S. Reddy, Academic Director, Institute for Electronic Governance, Hyderabad.
resource and thus improve the quality of manpower for ensuring supply of skilled manpower resources for the IT Park occupants.

- Single-window clearance system created in the form of APIIC, which reduced the procedural delays for the real estate developers and thus enabled them to construct multi-occupant buildings/built to suit facilities in the park, minimizing delays on account of clearance/regulatory processes.

3.6 IT Park, Hubli, India

3.6.1 Background

The IT Park at Hubli is located about 420 km north of Bangalore, the capital of the state of Karnataka, which is often hailed as the Silicon Valley of India. Hubli-Dharwar is the second largest urban center of Karnataka after Bangalore with a population of around 900,000.

With the rapid growth of Bangalore city, fueled by the growth of the IT sector, there has been a tremendous pressure on the city’s infrastructure. Moreover, given the shortage of available office space in the city, rentals have been increasing at a rapid pace, which was forcing several IT companies to explore options of locating their operations in other states. With the objective of reducing pressure on Bangalore and retaining/attracting IT organizations in the state, the government of Karnataka wanted to develop the Tier II cities as an alternate destination for the IT companies. The development of the IT park at Hubli was part of such an initiative launched by the state government.

The construction of the park started in the late nineties and spanned a period of around 2–3 years. The first 277,000 sq. ft. multi-occupant building was ready for occupation in 2002. Till date, around 100,000 sq. ft. of the existing facilities have been occupied. Key milestones in the development of IT-Park Hubli include:

- 1998: Government of Karnataka (GoK) decided to develop Tier 2 cities such as Mangalore, Hubli-Dharwar and Mysore as additional IT hubs, to provide alternate and low-cost options for IT companies.
- 1999: GoK decided to redesign a commercial complex being constructed by Hubli-Dharwar Municipal Corporation as the IT Park-Hubli.
- 2000: Larsen and Toubro Ltd., a well established construction company with extensive experience in constructing IT parks, was appointed by GoK to redesign the commercial complex and construct IT Park-Hubli.
- September 2002: IT Park-Hubli was inaugurated. The initial occupants were STPI-Hubli, Tata Teleservices and Karnataka State Electronics Development Corporation Limited (KEONICS)
- 2002–2004: Other than the initial occupants, no major IT firm had taken space in the IT Park. The other occupants in the IT Park were non IT commercial organizations. However, a few local small IT players leased out incubation space at the STPI facility in the IT Park-Hubli.
- May 2006: To overcome low occupancy rates, GoK organized an event called “Destination Hubli” to attract IT companies to the park. GoK also initiated steps to reduce the rental cost of the space available in IT Park, Hubli through policy actions.
- June 2006: GoK announced plans to develop an additional 40 acres of land adjoining the existing IT Park building as stand alone development centers for IT & BPO companies.

3.6.2 Applying the CLIP Framework to IT Park, Hubli

Capital: The estimated initial investment in the physical facilities of the park was USD$ 10 million, with the Department of Information Technology funding the entire investment. The park is managed by KEONICS, a state-owned enterprise.

Despite four years having passed from completion of development and increasing demand from established IT and BPO services companies for setting up new facilities in second tier Indian cities, only 10 companies have set up operations at the park.

- Many government agencies like STPI-Hubli (4,000 sq. ft.), Koenics (2,300 sq. ft.) and Indian Institute of Information Technology (IIIT), Hubli (22,000 sq. ft.) are occupants of

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the IT Park. In addition to Tata Teleservices which provides voice connectivity to the park and occupies around 14,000 sq. ft., all these agencies were among the initial occupants of the park.

Koenics acts as the manager of the park and provides facilities such as backup electricity supply, maintenance, security, and car parking. It also runs a IT training center inside the park. Though IIIT-Hubli has occupied space in the park from 2002, it is still not operational. The space is occasionally used by the IIIT management for meeting and seminars.

A few start up/initial stage companies like Sagar Technologies and V-7 Technologies operate out of the business incubation center run by STPI-Hubli.

Neilsof, which has its Indian head quarters located in Pune, started its operations from the incubation center in STPI-Hubli and has subsequently rented out around 10,000 square feet space in the IT Park.

Other occupants include service providers like Tata Teleservices and commercial establishments such as banks, computer service centers, and shops.

However, the park failed to attract large IT & BPO companies unlike other tier 2 cities in Karnataka like Mysore, where Infosys Technologies, one of the largest IT companies in India, has set up its corporate training center at an estimated investment of USD$56 million. GoK, having realized the importance of attracting anchor tenants into Hubli for development of the IT sector in the city, is currently offering both land and built-up space at concessional rates to such players.

Linkages: The focus of the current occupants is primarily on IT services like application development and BPO services such as customer care services, insurance claims processing, and engineering designs & cad-cam drawings, in line with the relative competitive strengths of India. However, services offered by current occupants appear to lack requisite depth, given that these are all early stage companies. Consequently, Hubli-Dharwar accounts for only USD$1.2 million IT and BPO revenues, which is only 1.5% of IT & ITES revenue of the state.

Given the product and services profile of key occupants, linkage to research & development institutes, centers of excellence do not appear to be critical. The park is managed by Koenics, which does not offer any value-added services such as market access, business planning and operational support, or resource mobilization. Recently, in September 2005, to create an environment suitable for growth of the IT sector in North Karnataka and to increase interaction between industry, academics and government, the BPO-ITES-CRM (BIC) Society was formed. The Society acts as a common forum for all the stakeholders and facilitates exchange of ideas.

STPI-Hubli, which is housed in IT Park, Hubli, provides incubation space to small start-up companies. The facilities provided to these companies include internet connectivity, telephone connections, fax, access controlled security system, conference facilities, electricity backup and computers.

The rental charged for such space is USD$145 per workstation per month with the number of workstations currently available being 24. A number of Hubli-Dharwar based small companies have availed such facilities and then moved out to locations outside the park after achieving a minimum scale of operations.

Infrastructure: Hubli is one of the most prominent cities in North Karnataka and is about 600 kms from Mumbai, 400 kms from Pune, 560 kms from Hyderabad and 800 kms from Chennai.

National Highway (NH 4) connects Hubli with Bangalore, Pune and Mumbai. NH 4 is a part of the Golden Quadrilateral Project, which aims to augment road connectivity between important cities in India. Bangalore and Pune are around 8 to 10 hours from Hubli by road. The city is well connected by state and national highways to other cities in North Karnataka such as Belgaum, Haveri, Davangere, and Bellary.

Hubli is also well connected to Bangalore, Pune and Mumbai by rail, with travel time to Bangalore and Pune being around 8 hours and Mumbai around 12 hours.

Though the road and rail connectivity of Hubli with other parts of India is satisfactory, it is not well connected by air. Hubli has its own domestic airport, however, there is only one flight operating from the airport connecting Bangalore and Belgaum. The nearest interna-
International airport is around 180 kms from Hubli located at Goa, which is around 3.5 hours journey from the city by car. However, the closest international airport with a critical mass of international flights is Bangalore International Airport, located about 400 kms from the city.

Robust communication infrastructure exists within and outside the IT Park. The data and voice connectivity infrastructure is provided by two state owned operators, namely, BSNL and STPI along with Tata Teleservices, a private sector telecom operator.

- Voice connectivity services are provided by major telecom service providers including the state owned BSNL and private sector players such as Tata Teleservices, Reliance Infocomm, and Bharti.
- To ensure high quality data connectivity, TPI-Hubli is housed within IT Park Hubli. STPI-Hubli, the fifth internet gateway in Karnataka, has its earth station in the IT Park. High speed optical fibre data connectivity (4 Mbps gateway upgradeable to 45 Mbps) is provided by STPI, which has its international gateway in Bangalore.

The relatively high rentals at IT Park-Hubli, compared to other similar facilities available in Hubli and other second tier cities of Karnataka have been identified as one of the main reasons for low occupancy.

- The rental charged for leasing out space in IT Park-Hubli varies between USD$0.33 to 0.66/ sq. ft/month as against USD$0.11 to 0.22/sq foot/month in other parts of the city. For this reason, companies like N.S. Infotech, Transparent Technologies, IBSI India and Rite Scribe have decided to set up offices in other parts of the city.
- GoK has since recognized the problem of high rentals and in May 2006, it has issued a government order reducing the rentals to around USD$0.22 to 0.33/sq. ft/month for IT Park, Hubli. Post reduction in rentals Neilsoft has leased 10,000 sq. ft. area in the IT park.

Being a tier 2 city, rentals and land prices in Hubli are cheaper than other Indian cities such as Kolkata, Pune, and Bangalore.

- The average commercial space rental in Hubli is less than half compared to tier 1 cities such as Kolkata, Bangalore, and Hyderabad.
- Residential rentals are 20% to 30% lower than other second tier cities such as Ahmedabad and Kochi.
- The state government has announced a scheme recently to provide land to large IT and BPO companies at a subsidized rate (20% to 30% cheaper than the market rate). Additionally, depending on the quantum of investment made & employment generated, such companies will receive a concession on stamp duty & registration charges on such land procured ranging between 50% to 100% of the amount.

Though the IT Park has excellent electricity connection in terms of a dedicated 11 KV feeder and 100% generator backup facility, Hubli itself often faces electricity shortages. The electricity utilities charge a concessional rate of USD 8 cents per unit, in comparison of 10 cents per unit charged other industries (Source: Karnataka Electricity Regulatory Commission). GoK is spending USD$5 million to improve the electricity system and provide reliable electricity supply by replacing old poles/conductors and transformers.

The IT park is dependent on the urban infrastructure at Hubli, which is essentially a tier II city and lacks the infrastructure and amenities of a tier 1 city such as Bangalore, New Delhi, or Mumbai. As per industry sources, one of the main reasons why Hubli-Dharwar could not attract major IT and ITES companies is the lack of quality physical and social infrastructure. The city does not house any multiplex and has very few quality shopping centers, recreational facilities, eateries, or modern housing facilities. Further, there have been law and order problems in the past on account of tension between two communities.

People: The state of Karnataka has 19 universities and over 100 engineering & technical colleges, with engineers, IT specialists and computer-related courses over 75,000 students graduating every year. Traditionally the Hubli-Dharwar twin cities are considered as the educational hubs of the North Karnataka region.

- Hubli-Dharwar has two universities with more than 180 colleges affiliated with these universities.
There are 16 engineering colleges in North Karnataka, with two of these engineering colleges being located in Hubli. Around 1100 students graduate from these 2 engineering colleges annually.

There are more than 60 graduate colleges situated at Hubli, out of which 24 are degree colleges. Around 20,000 students graduate from these colleges every year.

The average cost of human resources available in Hubli is cheaper compared to other cities located in the state of Karnataka like Bangalore, Mysore, and Mangalore.

The average salary of junior level IT professionals varies between USD$2,200 to $3,300 per annum.

For an IT professional working in the middle and top management level, the average annual salary varies between USD $4,400 to $6,600 and USD$8,900 to $13,300 respectively.

The local IT and ITES industry is satisfied with the quality of students graduating out of the colleges present in Hubli. Major IT companies present in India such as IBM, Infosys, Wipro, Sasken, Mindtree, Progeon, and Tata Consultancy Services recruit engineering graduates from Hubli. In Hubli-Dharwar and Belgaum (situated around 90 kms from Hubli-Dharwar) around 300 IT and ITES professionals are employed. More than 95% of these employees are local.

3.6.3 Key Lessons

The IT Park at Hubli has not been able to fully achieve the envisaged objective of attracting IT companies that could consider Hubli as an alternative to Bangalore. Thus far, there are no large IT companies occupying space in the IT park. In 2006, the IT park housed some small companies, government training institutes, and service providers.

However, more than 50% of the park was vacant. The case study of Hubli IT Park highlights the following key lessons:

- In the initial phase, it is important to attract large anchor tenants in an IT Park. One of the key motivators for anchor tenants to locate to an IT Park is comparatively lower rentals and similar benefits.

- For the IT park to be successful, it is important that basic social infrastructure (health care, education, recreational facilities) is present in the neighborhood of the IT Park. Without such facilities, it is difficult to attract quality human resources.

- The management of IT Parks needs to provide value added services, especially to relatively small and medium sector occupants, such as business development support, networking support, and accounting assistance.

- Private players are best suited for managing IT parks as they enjoy relatively higher operational flexibility vis-à-vis government. For example, when changing the rent schedule, government needs to pass an order, which is time consuming. Such decisions can be taken in the private sector without having to follow the similar approval processes.

3.7 Singapore Science Park, Singapore

3.7.1 Background

Singapore Science Park (SSP) is one of the earliest science and technology parks of Singapore. In the late 1970s Singapore’s economy was driven mainly by the manufacturing sector. In the early 1980s, Singapore identified new technologies and research and development as key areas of the country’s future economic growth. In this backdrop SSP was established in 1980s.

The main objective for developing SSP was to stimulate innovation and generate economic benefits by assisting knowledge-based firms and knowledge intensive activities.

The development of Singapore Science Park took place over a period of more than 25 years and included the following major milestones:

- 1982: The first tenant of the park, Det Norske Veritas (DNV) sets up office at Science Park I.
- 1988: The National Computer Board of Singapore officially inaugurates its building at SSP.
- 1992: Technology Parks Pte Ltd, a subsidiary company of Jurong Town Corp., established to
manage the Singapore Science Park on a commercial basis.

- 1993: Construction of Science Park II commences.
- 1996: The Park introduces an array of value-added services to benefit tenants such as sports facilities, restaurants, organized activities, free shuttle bus services and childcare. The Innovation Center opens at the Science Park as Singapore’s first incubator facility for start-ups. The S$12 million Science Hub opens at the Park as Singapore’s first business and recreational hub exclusively for SSP’s corporate tenants.
- 1997: Arcasia Land Pte Ltd. replaces Technology Parks Pte Ltd as developer and manager of SSP consequent to a series of corporate restructuring exercises.
- 2000: SSP partners with Sophia Antipolis Science Park of France to explore collaborative business initiatives.
- 2001: Ascendas Pte Ltd. replaces Arcasia Land Pte Ltd as a result of a merger between Arcasia and JTC International, former international arm of the Jurong Town Corporation.
- 2002: Galen, the first building in Science Park III is completed. Ascendas Real Estate Investment Trust (A-REIT) is listed on the Singapore Exchange as Singapore’s first business and industrial property trust. The four multi-tenanted Science Park buildings in the A-REIT portfolio include Alpha, Gemini, Aries and Capricorn.

More than 300 companies operate out of SSP, with around 50% of them being in the IT & telecommunication sector, 11% in chemical, 10% in engineering, and the balance focusing on areas such as life sciences, pharmaceuticals, and food & flavors. About 50% of the tenants are foreign firms. In terms of their origins, 27%, 11% and 9% are from USA, Europe, and Japan, respectively. Around 70% of the local firms are small and medium enterprises, with 23% being start-up companies. The Park’s foreign occupants include global players such as Sony, Silicon Graphics, and Lucent Technologies. The Park provides business incubation services to start-up companies, including helping tenants initiate contact with venture capitalists. Singapore has a vibrant venture capital sector with more than 160 venture capital firms, managing funds of over S$17 billion.

**Linkages:** The focus of the SSP occupants is primarily on EDP and office equipment, IC and components, basic and advanced telecommunications technology. Most of the units cater to both domestic and export markets. R&D support is provided by government-promoted R&D institutes such as the Center of Wireless Communication and the Institute of Microelectronics, as well as academic institutes such as National University of Singapore, and the Nanyang Technological University.

Ascendas, the private company responsible for managing the park, provides a number of value added services. Such services include:

- Market access services to occupants to help them enter new markets
- Promotional services for occupants’ products, technologies, applications, and services
- Helping the occupants collaborate with compatible business or technology partners, through its wide network of alliances with organizations and science, technology, and industrial parks
- Helping companies recruit through its alliance partners

SSP has established linkages with a number of Science and Technology (S&T) Parks all over the world to explore complementary and synergetic opportunities of the respective occupants in these parks. Examples of such S&T Parks include Sophia

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3.7.2 Applying the CLIP Framework to Singapore Science Park, Singapore

**Capital:** Singapore Science Park\(^\text{10}\) is owned and operated by Ascendas Pte Ltd\(^\text{11}\). In the initial phase, SSP received significant support from the government of Singapore. The government allocated the park around 15 acres of land at Ayer Rajah Road during Phase I development and committed around 30 acres of state land for its Phase II development. The Park development was incorporated into the National Technology Plan. Moreover, to enhance the Park’s development and competitiveness, some of the key government organizations like the Science Council of Singapore, the Singapore Institute of Standards and Industrial Research, the National Science & Technology Board, and the Information Technology Institute were relocated into or established in the Park. These government organizations have effectively acted as anchor occupants of the Park.

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Antipolis Science Park, France; Alberta Research Council, Canada; Zernike, Australia; Heidelberg Technology Park, Germany; Technopolis, Finland and International Business Incubator, USA.

**Infrastructure:** Spread over an area of over 133 acres, SSP includes a number of amenities and facilities such as auto-banking, conference facilities (at Science Park I and II), clinics, childcare facilities, convenience stores, eateries and restaurants and fitness corners. Intra Science Park shuttle bus service is available to users. Box 5 below describes the experience of DNV, one of the anchor tenants located in SSP 1.

The Park is located about 30 minutes from the Changi International Airport and is well located at the heart of Singapore’s Technology Corridor near Jurong Industrial Estate and the Central Business District. Figure 6 shows the location of SSP. The advantageous location helps the Park to leverage the urban, transportation and social infrastructure of Singapore together with data and voice connectivity. SSP’s rentals and land leases are quite competitive with the rentals in the Innovation Center being 30% to 50% lower than the average market rate.

**People:** 7,000 research engineers, scientists, and supporting staff are employed at the park, with 52% holding basic degrees, 16% holding Masters’ degrees, and 12% PhDs. There are four educational institutes located near SSP, namely, National University of Singapore, Nanyang Technological University, Ngee Ann Polytechnic and Singapore Polytechnic. Singapore produces more than 14,000 engineers and IT specialists, MBAs annually from Universities, colleges and polytechnics, with the average annual salary of IT professionals at the middle management level being around USD$40,000. As per Infocomm Development Authority (IDA), in Singapore more than


**Box 5. DNV, Anchor Tenant in SSP**

DNV, Tech Center was established in SSP 1 on 17 January 1984, at 10 Science Drive and it was one of the first companies to set up offices at SSP. DNV was provided land on lease for 20 years, which subsequently was extended by another 10 years. The company benefits from world class utilities & services available to park occupants in terms of telecommunication services, electricity supply, water supply and drainage & sewerage. Occupants are also offered discounted memberships at the recreational clubs in SSP 1. Moreover, Singapore as a city provides excellent physical, social, and recreational infrastructure to the occupants. Transport services connecting SSP are expected to improve further with a new MRT terminal coming up.

To DNV, being able to set up their office in SSP 1 has added tremendously to the company’s brand image. This is primarily an account of stringent entry & operating standards as part of which only companies involved in areas such as high end technology, engineering, and R&D services are allowed to operate out of the Park. Consequently, the occupants command instant recognition and a distinct brand image within Singapore.

(As discussed with Mr. Fung Chan Hua, Head- Risk & HSE Services, DNV Technology Services, Singapore)
110,000 persons are employed in Infocomm industry. This represents around 5% of the total workforce of the country. Figure 7 shows the distribution of Infocomm personnel across occupational categories. Employment in the sector is projected to grow at 4–5% per annum over the next 4 to 5 years.

### 3.7.3 Key Lessons

SSP is one of the most successful parks in Singapore and houses large companies focusing on R&D in high end technology. The park has 100% occupancy rate. Being located in SSP I is considered a privilege in Singapore, which adds to the occupant’s corporate/brand image.

The SSP case study highlights the following key lessons:

- A vibrant and pro-active park management team is key to the success of the IT Park. The management team at SSP provides a number of value added services such as business plan development, networking, accounting assistance, and incubation space.
- Close linkage with academic institutions like universities and colleges and R&D institutes are essential for parks where the primary focus of key occupants is technology innovation.
- Creating a powerful brand image of the park is one of the key elements that has led to SSP’s success.

### 3.8 Cyberjaya Flagship Zone, Malaysia

#### 3.8.1 Background

The government of Malaysia developed the Multimedia Super Corridor Project with the objective of creating an ideal multimedia environment to attract world class multimedia/IT companies. The project aimed at creating a hub for Malaysian multimedia/IT companies to enable them to become world class standard over time, through operating in a highly competitive environment. The Cyberjaya Flagship Zone (CFZ)\(^{13}\) is one of the five cybercities developed during phase I of the Multimedia Super Corridor project, conceptualized and implemented during the period from 1995–2006. Key milestones in the development of Cyberjaya include:

- 1997: Groundbreaking ceremony at Cyberjaya; Cabinet announces decision to have University Telekom or Unitele set up its multimedia faculty in Cyberjaya, marking the beginnings of the Multimedia University.
- 1999: Inauguration of Cyberjaya and launch of the MSC Central Incubator in Cyberjaya.
- 2002: Launch of the MSC Flagship Center (now known as MSC Innovation Center) comprising Creative Application Development Center (CADC) and Solution and Assessment Development Center (SADC) in Cyberjaya.
- 1999–2006: Various companies commencing operations in Cyberjaya; alliances with different countries such as the United Arab Emirates, Sri Lanka, and India.

#### 3.8.2 Applying the CLIP Framework to CFZ

**Capital:** The estimated initial investment in the physical facilities of the park was around USD$2 billion, funded by a joint venture company between the government and four other companies, namely, Setia Haruman Sdn Bhd, Nippon Telegraph and Telephone Corporation (NTT), Golden Hope Plantations, Permodalan Nasional Berhad (PNB). CFZ has been developed through public-private partnership. Cyber View, a government Linked

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Company (GLC), is the owner of all the land in Cyberjaya. Setia Haruman Sdn. Bhd, a private enterprise, is the master builder. Sepang Town Council, a local authority, is responsible for all planning approvals for Cyberjaya. There are 363 companies operating from the park, which include around 20 large global players like Shell, DHL, HSBC, Motorola, Fujitsu, Ericsson, and small, local companies. The park offers business incubation services through the MSC Central Incubator including venture capital support.

**Linkages**: The focus of the current occupants is primarily on BPO services such as finance and accounting and payroll and human resources processing with most of the global players having their captive shared services centers in Cyberjaya. Consequently, many of the occupants are focused on export markets. The government is in the process of implementing a number of e-Government applications, where Multimedia Super Corridor\(^\text{14}\) registered companies, of which CFZ is a component, are given preference. The Multimedia Development Corporation (MDeC)\(^\text{15}\), an arm of the government acts as a single window for obtaining requisite government approvals and facilitates business linkages with the government. MDeC also undertakes capacity development programs in areas like process standardization and conformance to good practice.

**Infrastructure**: Spread over an area of over 7,000 acres, Cyberjaya includes i) a residential zone (>3000 houses & apartments), ii) an enterprise complex/office area (>2.2 million square feet), iii) an incubation center (> 60,000 square feet), iv) a commercial zone (> 30,000 sft) and v) a green and environment friendly recreational zone, Taman Tasik Cyberjaya (around 89 acres).

Number of persons residing in CFZ is around 11,000.

- Being a comparatively new township, people perceive CFZ as dull and boring compared to Kuala Lumpur.
- The facilities and amenities present in CFZ include supermarkets, book stores, healthcare facilities, petrol pumps, banks, fire station, schools, hotels, and spas. However, CFZ lacks adequate number of eateries & restaurants.

Cyberjaya is about 45 minutes from the Kuala Lampur International Airport and is also well connected domestically through major highways and railway networks. According to the users, through the road network connecting CFZ is good, public transport services need to be augmented.

CFZ has a robust communication network is terms of the following:
- It is served by state-of-the-art optical fibre telecommunication network with a capacity of 2.5 to 10 Gbps.
- CFZ has a dedicated international gateway at Kuala Lumpur.
- Voice connectivity within and outside the park is provided by telecom service providers like Telekom Malaysia and Maxis Communications.

Services such as electricity and water supply are provided by public utilities. The average electricity tariff is 8 cents per unit. The occupants need to pay between 50 to 60 cents per m\(^3\) of water consumed. All service providers enter into a performance agreement with users as part of which:
- Services are to be provided for 24 hours and 365 days a year.
- A 99.9% reliability guarantee is to be provided.
- If the services are not provided as per agreement, the service providers are subject to financial penalties. The space rentals in CFZ are competitive compared to rentals of similar space in other IT Parks in and around Kuala Lumpur. However, the land prices at CFZ are higher for enterprise and commercial zones. A comparison between the monthly rentals and land costs of CFZ & other cybercities in Malaysia has been presented in Figure 8 below.

**People**: Around 15,000 employees are estimated to be deployed at Cyberjaya Flagship Zone, comprising a mix of engineers, IT specialists, and graduates (for IT enabled services). Many of these employees are foreign citizens. The total number of foreign citizens are estimated at 1,300 in 2006. Figure 9 provides details of the distribution of foreign citizens by their country of origin. The Multimedia University and

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LimKokWing University College of Creative Technology are situated in Cyberjaya providing a ready pool of more than 13,000 human resources trained in foreign languages and IT skills annually. The average annual salary of IT professionals at the middle management level is around USD$20,000 to 25,000.

3.8.3 Key Lessons
CFZ has moderately been able meet the envisaged objectives. A number of global players like Dell, HSBC and IBM have started their operations in the IT Park. In 2006, 15,000 people were employed in CFZ.

3.9 Critical Business Success Factors and The Relative Positioning of IT Parks
Based on the individual IT Parks assessed as part of the study, a summary of the positioning of individual parks with respect to critical business success factors has been provided below.
### Figure 10. Capital

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<thead>
<tr>
<th>Ownership</th>
<th>Hi tec City, India</th>
<th>IT Park-Hubli, India</th>
<th>SSP, Singapore</th>
<th>CFZ, Malaysia</th>
<th>Taedok Valley, Korea</th>
<th>ZSP, China</th>
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<td>Anchor Tenants</td>
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<td>Government agencies</td>
<td>Government &amp; Private companies (mainly R&amp;D)</td>
<td>Global IT and BPO companies</td>
<td>Large Korean Private, Companies, Large public R&amp;D Institutions</td>
<td>Global IT and hardware companies, Large Chinese companies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access to VC/PE</th>
<th>No dedicated funds; Fairly matured VC/PE market</th>
<th>No dedicated funds; Fairly matured VC/PE market</th>
<th>Vibrant VC/PE market</th>
<th>Dedicated Government sponsored VC funds</th>
<th>Dedicated VC Fund</th>
<th>Dedicated VC funds administered Beijing Municipal Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Incubation Services</td>
<td>Not provided</td>
<td>Provided by STPI-Hubli, limited space</td>
<td>Provided – it is one of the focus services</td>
<td>Provided</td>
<td>Provided</td>
<td>Provided through individual universities</td>
</tr>
</tbody>
</table>

PPP: Public Private Partnership; VC: Venture Capital; PE: Private Equity

### Figure 11. Linkages

<table>
<thead>
<tr>
<th>Product &amp; Services</th>
<th>Hi tec City, India</th>
<th>IT Park-Hubli, India</th>
<th>SSP, Singapore</th>
<th>CFZ, Malaysia</th>
<th>Taedok Valley, Korea</th>
<th>ZSP, China</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT &amp; BPO services</td>
<td>BPO services</td>
<td>R&amp;D, hi-tech products, IT services</td>
<td>BPO services</td>
<td>Telecommunication technologies, R&amp;D</td>
<td>IT goods &amp; services, Chinese language software for domestic market</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Forward &amp; Backward Linkages</th>
<th>Export market oriented</th>
<th>Mainly domestic market oriented, few companies export oriented</th>
<th>Domestic and export market oriented</th>
<th>Export market oriented</th>
<th>Domestic and export market oriented</th>
<th>Domestic and export market oriented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added Services by Park Management</td>
<td>None</td>
<td>None</td>
<td>Business development support, marketing support</td>
<td>None</td>
<td>Marketing and Sales support, R&amp;D support</td>
<td>None</td>
</tr>
<tr>
<td>Centers’ of Excellence</td>
<td>None</td>
<td>None</td>
<td>R&amp;D Institutions, NUS, S&amp;T Parks outside Singapore</td>
<td>Multimedia University</td>
<td>R&amp;D Institutions, KAIST, ETRI, ICU, Chungnam University</td>
<td>Beijing &amp; Tsinghua University, Chinese Academy of Science, Chinese Academy of Engineering, R&amp;D Institutions</td>
</tr>
</tbody>
</table>
3.10 Business models for IT Parks

It is evident from the individual case studies that there are significant variations in the business models followed for developing and managing sustainable IT parks. The role played by government and the private sector in promoting IT parks differ significantly in the six case studies. For example, while Andhra Pradesh Industrial Infrastructure

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**Figure 12. Infrastructure**

<table>
<thead>
<tr>
<th></th>
<th>HITEC City, India</th>
<th>IT Park-Hubli, India</th>
<th>SSP, Singapore</th>
<th>CFZ, Malaysia</th>
<th>Toedak Valley, Korea</th>
<th>ZSP, China</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity Supply</strong></td>
<td>Government, dedicated electricity line, backup facilities present</td>
<td>Government, dedicated electricity line, subsidized price, backup facilities present</td>
<td>Reliable supply, service level contract present</td>
<td>Reliable supply, service level contract present</td>
<td>Government, dedicated supply</td>
<td>Government, dedicated supply</td>
</tr>
<tr>
<td><strong>Telecommunication</strong></td>
<td>Competitive Market</td>
<td>Competitive Market</td>
<td>Competitive Market</td>
<td>Competitive Market</td>
<td>Competitive Market</td>
<td>Competitive Market</td>
</tr>
<tr>
<td><strong>Road Connectivity</strong></td>
<td>Good</td>
<td>Fair</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Urban &amp; Social Infrastructure</strong></td>
<td>Leveraging the quality infrastructure of Hyderabad, one of the largest cities of India</td>
<td>Inadequate, given that Hubli is non-metropolitan city</td>
<td>Leveraging the quality infrastructure of Singapore</td>
<td>Good, integrated commercial and residential clusters</td>
<td>Good, integrated township with commercial, residential &amp; other land uses</td>
<td>Good, integrated township with commercial, residential &amp; other land uses</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td>Good, available near the IT Park, mainly Private Sector/PPP</td>
<td>Worse, compared to Tier 1 cities</td>
<td>Excellent, leveraging the quality housing stock of Singapore</td>
<td>Average, around 3600 houses &amp; apartments within the park</td>
<td>Good, around 16,400 houses inside the park</td>
<td>Good</td>
</tr>
</tbody>
</table>

---

**Figure 13. People**

<table>
<thead>
<tr>
<th></th>
<th>HITEC City, India</th>
<th>IT Park-Hubli, India</th>
<th>SSP, Singapore</th>
<th>CFZ, Malaysia</th>
<th>Toedak Valley, Korea</th>
<th>ZSP, China</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineering Throughput</strong></td>
<td>&gt;20,000 from Hyderabad (90,000 from AP)</td>
<td>11,000 from Hubli (75,000 from Karnataka)</td>
<td>14,000 from Singapore</td>
<td>13,000 from CFZ</td>
<td>30,000 from Toedak Valley</td>
<td>100,000 from ZSP</td>
</tr>
<tr>
<td><strong>Annual Average Salary (USD)</strong> for middle management employees</td>
<td>$9,000–11,000</td>
<td>$4400–6600</td>
<td>$40,000–50,000</td>
<td>$20,000–25,000</td>
<td>$&gt;25,000</td>
<td>$10,000–12,000</td>
</tr>
<tr>
<td><strong>Employment within Park</strong></td>
<td>80,000</td>
<td>300</td>
<td>7,000</td>
<td>15,000</td>
<td>&gt;25,000</td>
<td>650,000</td>
</tr>
</tbody>
</table>

---

Corp., a government organization, has partnered with private players such as Ascendas and Larsen & Toubro Ltd. to develop Hitec City, Hyderabad, the IT Park Hubli is promoted and managed entirely by different agencies of the state government of Karnataka. The role of government ranges from providing land or funds for developing IT parks to managing facilities post commissioning such parks. The private sector partner on the other hand brings in experience and expertise in construction, financial resources, and better marketing skills.

Based on ownership and management of IT parks, different business models can be worked out for developing and operating such parks. A summary of the business models adopted by the individual IT parks covered as part of the exercise has been presented in Figure 14.

Based on the case studies it is observed that government is best suited to facilitate the development of IT Parks, rather than developing and managing IT Parks themselves.

Government can facilitate IT Park development in the following ways:

- Create enabling infrastructure, such as connecting roadways, main water supply lines, and constructing sewerage and drainage lines to the IT Park.
- Help park developers acquire land. Typically, development of IT Parks requires huge chunks of land. It is very difficult for the park developers to buy such large chunks of contiguous land from the market. Government can act as a facilitator in this respect, and assist the private players in acquiring requisite land. In case the land is owned by government, it can further help the park developer by taking an equity stake in the project, which is equal to the cost of the land.
- Develop enabling policies and regulations for both park developers and occupants for ensuring that the objective with which the park was established is fulfilled.

IT Parks are best managed and operated by the private players, given their flexibility in operations and decision making. The private sector is best suited for customer facing services and can commit to service level agreements with the park occupants. The success of any IT Park is measured by its ability to attract world class occupants and retain them by providing services as per their expectations. Private sector IT Park management organizations are also capable of providing a number of value added services to the occupants, such as support for marketing, recruitment support, access to external finances such as venture capital and business angels, establishing networks with other companies and/or universities, developing business plans, and business education and training. These services are usually availed by the small & medium enterprises in the IT Parks as well as those availing incubation facilities. This also helps the government’s objectives in encouraging SME sector development in the IT sector.

**Figure 14. Business Models for IT Parks**

<table>
<thead>
<tr>
<th>Management</th>
<th>Ownership</th>
<th>Government</th>
<th>PPP</th>
<th>Private</th>
</tr>
</thead>
</table>
moderate retail outlets, supermarkets, food outlets, bookstores, etc.

- **Real estate**: The growth of IT sector fuels the growth in real estate sector. For example, in Cyberjaya, 2.2 million sft area of office space has been constructed and occupied by more than 325 companies between 1999 and 2005. A number of such facilities constructed are multi-tenanted buildings like Century Square-Phase 1 & 2 (around 0.5 m sft), Enterprise 1 (around 98,000 sft), Enterprise 2 (around 72,000 sft), Enterprise 3 (110,000 sft) and Cyber Garden (56,000 sft), which accounts for around 1 million sft. Also, around 70,000 sft of incubation has been constructed. Moreover, 3600+ residential houses, bungalows and apartments, accounting for more than 4 million sft have been constructed between 2000 and 2005. An additional 2000 residential houses are under construction, and will be delivered within the next 2 years. It is estimated that more than 7 m sft. space was constructed in Cyberjaya Flagship Zone between 1999 and 2005.

In addition to the above, other spillover effects observed on local economies from establishing IT Parks include technology transfer and skill development of the local human resource.

In IT Park context, technology transfer occurs when a local IT company partners with a global IT company and commences operations in the IT Park. The occupant entity could either be a local IT firm having a technology transfer agreement with a global major or a joint venture entity with shareholding between a domestic player and a global player. While the global player contributes with technical know-how, design and drawings, etc., the local partner provides knowledge about the local conditions and markets, and access to local skills and resources. It is generally found that where proprietary know-how requiring intellectual property rights protection is required, global players prefer to operate through wholly owned subsidiary entities, which allow them to retain complete management control over the local entity. For example, in case of the Saigon Hitech Park in Vietnam, Nidec of Japan (computer hardware components) and Intel (computer chip assembly & testing facility) have set up/in the process of setting up operations as occupants of the IT Park through wholly owned subsidiary companies.

The other significant spillover effect is the skill development of the local population. Given the requirement of skilled local resources by IT Park occupants, the local educated population acquire the necessary skills required to gain employment through taking courses in colleges, universities, or computer training institutes. Organizations also have their own training/skill development programs which further help the local employees develop skills. For example, for its Vietnamese operations scheduled to begin in 2009, Intel has already recruited engineering graduates from local colleges and has sent them for on the job training to their Chinese and Malaysian plants for ensuring that they acquire the necessary skills to operate the Vietnamese facility once it commences.

### 3.12 Key Learning from the Case Studies

As is evident from the individual case studies, there are significant differences between the objectives underlying setting up of individual IT Parks. For example, the primary objective underlying Taedok Valley in Korea and the Singapore Science Park was better collaboration between academia, research and development institutes, and industry players for introducing new and disruptive technologies. On the other hand, most of the IT Parks in countries like China and India are guided by the primary objective of generating more employment. Given the diverse objectives, it becomes difficult to assess the relative performance of individual IT Parks other than parks like the IT Park in Hubli, India, where underperformance is obvious. Nevertheless, based on the case studies, we have attempted to identify representative critical business success factors that have impacted the performance of IT Parks, irrespective of geographies.

**Having the right product-services mix is critical**

Most of the parks that have not underperformed have by and large focused on products and services where their countries of operation have a competitive edge. Thus, Hitec City in India is focused primarily on IT & BPO services, while ZSP in China has EDP & office equipment, software (China-centric in the form of word processor and
3.11 Returns from IT Park Investments

Based on the case studies covered as part of the study, it is observed that returns for IT Park developers can comprise two components:

- **Returns from the core IT Park infrastructure including multi-occupant buildings and build-to-suit facilities for large anchor investors**, which usually accrue to the developer in the form of a one-time sale/lease payment, followed by periodic charges levied on occupants for facilities management services. In other cases where IT Park facilities are offered on rent, the periodic payment also has an additional component towards facilities management charges. While the usual returns from core IT Park facilities vary from country to country, it is observed to range between 15%–20% per annum. Sample return computations for a multi-tenanted building, which is a part of Hitec City, Hyderabad, and CFZ Malaysia, have been presented in Appendix 1 to this report.

- **Returns from ancillary infrastructure**: In some of the IT Parks like Hitec City, Hyderabad and CFZ, Malaysia, the IT Park developer is also mandated to develop ancillary infrastructure like retail and residential complexes, hotels and exhibition centers. The returns from these investments are usually higher than returns on core IT Park infrastructure about 20%–25%. Appendix 2 details indicative computations of returns from investments in residential complexes by IT Park developers in Hitec City, Hyderabad, as well as CFZ, Malaysia.

Consequently, many governments encourage IT Park developers to invest in a combination of core and ancillary IT Park infrastructure, so that the overall returns on their investments are adequate. This does not however alter the risk perception of the project, as both components are inter-dependent with demand for ancillary infrastructure being directly linked to the level of success of the IT Park. It is also observed that one of the primary tools used by policymakers for ensuring viability of core IT Park investments is allotment of land at subsidized rates than that allowed for residential and/or commercial end use. This has been the case for most of the IT Parks developed through public private partnerships like CFZ Malaysia and Mindspace, Hyderabad.

From the perspective of government policymakers, the major component of return from IT Park investments includes:

- **Direct returns on core and ancillary IT Park investments in cases of government making investments, either on its own or in partnership with the private sector.**

- **Returns in the form of direct and indirect taxes on incremental income generated by both companies as well as their employees.** As will be discussed in the subsequent section on impact of policies on IT sector development, many governments usually provide various fiscal concessions on this front during the initial period to ensure sustainable viability of the sector in the medium to long term.

- **Positive spillover to other sectors through generation of additional employment opportunities;** higher per capita income manifesting in higher spending in sectors like retail and real estate, which in turn lead to generation of further employment. Specific examples of such spillover effects in the context of the IT Park case studies covered during the exercise have been discussed below.

- **Increase in employment**: L&T Infocity estimates that for Hitec City, Hyderabad, for every job created in the IT sector, an additional four non-IT related jobs have been generated.

- **Retail investments**: In many countries, growth in IT sector has lead to the growth in retail sector. For example, in developing countries like India, organized retail has grown at the rate of 25%–30% for the last 3 years (KSA Technopak Study on Retail Sector in India). As per KSA Technopak Consumer Outlook survey, 2004, an average Indian urban household spent more than 20% of family income on recreational services/goods such as movies and theaters, books and activities, and eating out in 2004, which was much less than in the early 1990s. One of the reasons for such growth was the growth in the IT sector and the corresponding higher per capita income. In CFZ, the presence of the IT companies and the residential areas to accommodate IT sector employees created more demand for retail products. Such demand led to construction of more than 32,000 sft. of commercial space to accom-
digital publishing) and IT services as focus areas of its occupants. Similarly, most of the ventures in Taedok Valley have basic and advanced telecommunication as their primary focus. The only exception is Cyberjaya in Malaysia, which appears to have IT & BPO services as the primary revenue earner for its occupants, contrary to Malaysia’s traditional strength of assembling of EDP & office equipment. Malaysia’s annual IT & BPO services exports during 2004 was estimated at USD$120 million and USD $40 million respectively, which is significantly lower than market leaders like India, Ireland, and Canada. The average salary levels in Malaysia are also more than twice those of India and China, although they are around 30% of near-shore locations like Ireland. Given that the revenues are primarily being driven by captive shared services and data centers of global companies, this seems to be a conscious strategy of leveraging its not-so-distant location and cost advantages, viz. a viz. primary outsourcing customers in the United States and Europe.

**A supportive and proactive government is key**

Each of the case studies underlines the importance of the role of government in development of successful IT parks. The extent of government involvement has varied in individual countries, with the government also acting as an investor, promoter and playing a key role in managing the park in countries like Korea, China, in addition to its traditional role of regulator and facilitator. On the other hand, countries like Singapore have gradually moved to a model wherein development and management of IT parks are primarily carried out by the private sector, with the government ensuring a conducive policy environment. The relatively late entrants like India, Malaysia, and even some of the more recent parks in China, like the Dalian IT Park are based on this model. Even countries like Korea are gradually moving to a model where the private sector, including foreign investors, is likely to play a major role in the promotion and management of IT parks. Nevertheless, the government is expected to continue to play a key role in terms of formulation of appropriate policies for:

- Encouraging innovation through financial and non-financial measures, including protection of intellectual property.
- Promoting investments through appropriate financial and tax incentives, together with efficient and user-friendly processes for implementing the policies.
- Facilitating capacity building by encouraging mobility of skills, appropriate employment policies, and extending financial support to select capacity building initiatives.

Examples include the Malaysian and Indian governments, both of which have adapted the single-window mechanism for providing requisite approvals to IT sector companies through the Multimedia Development Corporation and STPI respectively.

**World class physical and virtual infrastructure represents bare necessities**

It is amply clear from the case studies that physical infrastructure like roads, urban infrastructure and social amenities for recreation, sports, proximity to airports, and virtual infrastructure in terms of state-of-art data and voice connectivity are absolutely essential prerequisites, even though they may not serve as competitive differentiators as far as IT Parks are concerned. In fact, weaknesses in this area have been identified as one of the primary reasons for the underperformance of the IT Park at Hubli.

**A judicious mix of anchor occupants and smaller companies helps**

Most of the parks that have done reasonably well have a mix of large credible domestic and global companies and relatively smaller local companies (including start-ups) as occupants. While Taedok Valley has many of the South Korean chaebols as anchor occupants, the large occupants at Hitec City, India, include global majors like GE, Microsoft, CSC, Verizon in addition to Indian multinationals like Infosys, TCS, and others. ZSP also has a mix of large international and domestic occupants, such as Microsoft, IBM, Intel, Legend Group, and Stone Group. Singapore Science Park’s list of reputed occupants include Lucent, Silicon Graphics while CFZ, Malaysia has been able to attract reputed companies such as Dell, HSBC, IBM, and Shell. The only exception is the IT Park, Hubli, which only has small local companies as its occupants, which is possibly one of the reasons behind its underperformance.
While development of the domestic IT sector definitely constitutes one of the key objectives for most IT Parks, having large, established companies as anchor occupants enables reduction of operational risks and uncertainties, and facilitates industry cluster effects. These large players primarily leverage the infrastructure of the park and use their own management and technical bandwidth to replicate their success in other locations. Consequently, many of the successful parks have adopted a strategy to acquire critical scale by inviting these larger players, while supporting the relatively smaller companies (including start-ups) through value added services like business incubation.

**Availability of angel investment, venture capital and private equity financing are essential pre-requisites**

Angel investment, venture capital and private equity have been identified as key enablers, specifically for development of start-ups and small & medium enterprises. Consequently, in countries like Korea and China, where the presence of global angel investors/venture capital/private equity funds is limited, IT parks like Taedok Valley and ZSP have set up their own dedicated venture capital funds, usually administered by government agencies/bodies. In addition, most successful parks have business incubation centers for supporting start-ups and small companies. However, irrespective of the venture capital/private equity set up of the individual park, infusing the requisite depth to the venture capital/private equity market at the country level is also essential, as it enables transfer and sharing of good practice. Singapore, India and China represent some of the countries that have been able to achieve an extent of success in this area.

**Providing Incubation facilities in the park is key**

Other than providing general office space and utilities, providing business incubation facilities is one of the key distinguishing factor of IT parks. Through provision of incubation facilities, IT Parks foster innovation through supporting commercializing of business ideas, by supporting entrepreneurs and providing world class quality infrastructure like telecommunication services, conference facilities and office space. They also provide value added services like establishing networks with other companies and/or universities, support for marketing, recruitment support, access to external finances such as venture capital and business angels, and developing business plans and business education and training. This helps in developing entrepreneurship, and the SME sector in the domestic economy and the IT Parks gains when these operations scale up to become regular occupants of the IT Parks.

**Linkages with Centers of Excellence are critical for select products and services, while skill linkages are essential for all types of products and services**

Close working relationships with academic institutions such as universities and colleges and R & D institutes are essential for parks like Taedok Valley, Singapore Science Park, ZSP, where the primary focus of some key occupants is on technology innovation in the areas of EDP equipment, telecommunications, integrated circuits & electronic components. The nature of requirements require leveraging of specialized R&D infrastructure for areas such as basic and applied research and prototyping, which are usually available with prominent academic and R&D institutes. Consequently, many of these parks have attempted to facilitate linkages between these institutions and industry players by co-locating them. For example, KAIST and ETRI are located within Taedok Valley, Quinghua University, Beijing University and the Chinese Academy of Science are occupants of ZSP and institutes like the Center of Wireless Communication and the Institute of Microelectronics are located within the Singapore Science Park.

On the other hand, such linkages are usually not as critical in IT & BPO services where innovation requirements are usually based on service delivery around existing software & hardware products and most market leaders possess the requisite competencies in-house.

However, for both the above categories of companies, availability of quality manpower resources is key to success and hence dictates the performance of the IT park. Consequently, many of the IT parks have been set up in close proximity with prominent
academic institutions and centers of learning. In addition, factors such as existing infrastructure & amenities and employment regulations play a key role in attracting the right competencies from other locations.

A vibrant and pro-active IT Park management team represents an added advantage

In addition to having the right infrastructure and linkages, the relative performance of an IT park is also dependent on the competence and level of initiative of its management team. Consequently, parks promoted and managed by groups/companies with requisite expertise have been found to outperform others. For example, Phase I of Hitec City was fully booked within 4 months of commencement of construction, one of the reasons being the extensive marketing exercise launched by the private sector promoters L&T Infocity. The initiative of the management team emerges as a key differentiator not only at the time of marketing the park but also during subsequent operation, particularly for start-ups and smaller companies, which are at times dependent on them for the required market and financing linkages. To this end, some IT park management companies like Ascendas have established relationships with organizations specializing in areas such as business planning and market assessment, and offer these services to occupants. It has also been observed that the private sector inevitably has an advantage on this front, as it has requisite practices in place to reward (or penalize) the respective management teams depending on their performance, unlike governments in most developing countries where performance based management is still in its initial stages.