Foreword

The process of writing this thesis has been an interesting journey, first starting with a spark of interest lit during my stay in a very different country than China: Norway. This interest evolved into this thesis, which in many respects is just a starting point into the fascinating world of Chinese University Science parks.

During the process of writing this thesis, I was guided and supported by several people. I would like to thank the people of UKSPA, with special thanks to mister John Allen who pointed me to the right organization within China. And of course my Coach Patrick Reinmöller and my co-reader professor Barbara Krug for their support, feedback and enthusiasm on this topic.

Further, I would like to thank, my partner Christian for his support and understanding during this past period of time, where I was sometimes perhaps a bit absent minded.

I would, like to thank all three respondents who donated their time to this thesis and were so kind to provide me with all the needed information.

Special thanks goes to Tony Chen, not only for his translation work, but also for his advice on all matters relating to China.
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1. Introduction

Nowadays, companies are more and more likely to operate worldwide. By expanding their business worldwide new opportunities arise. Companies gain access to new markets and specialized resources, but also open up new sources of information, knowledge and business opportunities (Bartlett, Goshal and Birkinshaw, 2003). Especially, technology intensive firms need to have R&D competences in order to stay competitive, these competences may be obtained through cooperation with other firms or research facilities such as universities (Löfsten and Lindelöf, 2004). New technology based firms may find such resources on University based Science Parks.

Regional economic prosperity is an important topic for all nations, but even more so in the case of developing countries. This has sparked a deep interest, within these developing nations, into fostering technology intensive small and medium-sized firms to create a self-sustaining industrial growth based on collaborative networking through commercialising research achievements (Kang, 2004). Within this background, building science parks has developed into a popular policy tool worldwide for regional economic growth (Kang, 2004). The use of science parks as a policy tool, is a familiar phenomenon in several of the Western countries like Sweden, France, the UK, the United States and many other developed nations, but it still is a relatively new phenomenon in some of the emerging markets.

An emerging market and developing nation, which has been discussed a lot, is that of China. China is emerging as one of the major players in the world economy and the premier site for attracting Foreign Direct Investment (FDI) (Luo, 2001; Claver and Quer, 2005; Millar, Choi and Chu, 2005). In the past couple of decades China’s economy showed the largest growth worldwide, in the period 1978-1995, for example, real GDP growth averaged 8 percent, compared to just 1.5 percent in the USA (Luo, 2001).

The opening up of the Chinese economy has been a unique process not comparable with any other emerging markets. This economic opening up started during the early seventies, when after decades of isolation, it became apparent that technological weakness and outdated manufacturing equipment were detrimental to China’s
economic and social development (Hayter and Han, 1998). The failure of modernization led to more and more criticism from within the communist party, ultimately leading to some radical changes. After a shift in power in 1976 emphasis was placed on “readjustment and reform”, leading to more economic openness (Hayter and Han, 1998).

In the past few decades the Chinese government has been placing more emphasis on the transfer of science and technology, which is seen as “the route to economic development” (Webber, Wang and Ying, 2002). Among other measures, this is done by endorsing the development of Industrial parks and, more recently, University Based Science Parks (Zhang, Niu and Xiong, 2003). This development might be seen in the light of China’s slow transition from the “worlds manufacturing base” to a more knowledge, technology-intensive and innovation driven economy (Tan, 2006; Li, Qian, Lam and Wang, 2000). Consequently, one of the challenges we face now is to achieve a better understanding of successful technology transfer, and the role science parks play in facilitating this, within China (Tan, 2006). Taking China’s economic significance (Luo, 2001) into account, much can be learned by evaluating the university based science parks (USP’s) and their role in economic development.

1.1 Objectives of this research

The academic research objective of this study is to further develop insight into the way Chinese University based Science Parks were developed. A better understanding of the role and diversity of Chinese University Science Parks, may lead to aiding in enhancing the performance of University Science Parks, foreign firms operating in China, and domestic companies. Since, China is transforming into a more technology and innovation driven economy, instead of just being the world’s manufacturing base (Tan, 2006; Li et al, 2000). Another objective of this study is to describe this development in the light of Chinese state policy.

China’s shift to knowledge and R&D intensive industry with a high-tech focus should be understood by companies aiming for Hi-tech leadership, gaining customers, suppliers, and strategic partners in China (Tan, 2006). It is also important for companies to understand that these science parks in China are not always uniform, but may have different features across the country. This research will help with
recognizing these differences. The managerial objectives are to inform managers about this potential opportunity in China. And discuss to the possibility of starting up companies within Chinese USP’s.

1.2 Research Questions and Problem definition
In this thesis I investigate the development of Chinese USP’s, with the aim of describing the development and diversity of these parks in a traditionally heavily regulated state, and the role of these parks in promoting economic development of forming of and attracting businesses.

The main topic of investigation or problem definition of this thesis will be:

“What features of Chinese University-based Science Parks can be identified?”

The research questions needed for investigating this problem definition are:

RQ1: Who are the founders of the science parks and development zones?

RQ2: What were the motives for constructing these Science Parks, and have these motives changed over time?
   - For state Government?
   - For the local government?
   - For the Universities?

RQ3: How can the “toolkit” of these Chinese University based Science Parks best be described?
   - What tools, restrictions and rights do the parks have?

RQ4: In which ways do the Chinese Science Parks differ from each other?
   - Description of the science park diversity over China.

RQ5: To what extent are Chinese University based Science Parks comparable to Western science and university research parks?
1.3 Thesis Structure
This thesis is organized as follows; in the next chapter the Literature will be discussed and attention is given to the existing literature on University science parks and a history of China’s economic opening up is provided, followed by an outline of science and industrial park development, the emergence of the Chinese University science parks and research gaps within the literature. In the following chapter the methodology is discussed followed by the results, providing the current Chinese Science and Technology policy framework and the Case descriptions. The case descriptions are followed by the discussion where some interesting similarities and differences between the three cases are discussed. Lastly, a conclusion is given and suggestions for future research are provided.
2. Literature & Theory development

Most FDI, in China, was and still is, mostly, aimed at taking advantage of the low labour costs and the favourable tax regimes in the special economic zones. Businesses still constitute mostly of low-technology and labour intensive manufacturing (Wang and Meng, 2003; Li, Qian, Lam and Wang, 2000). With the Asian financial in 1997, the Chinese government became, even more, aware that competing on low cost in low-end manufacturing would not lead to sustained economic growth and that it was necessary for China to shift more into technologically sensitive fields (Webber et al, 2002). On national as well as on provincial level Chinese authorities are making a continuing effort to find new forms of connecting to the world economy, in order to make existing Science and Technology activities more effective and profitable and introduce new knowledge- and capital intensive forms of development (Webber et al, 2002).

In order to further promote technology transfer to and within China, the Chinese government has developed several new policies and regulations since the 1990’s. Goals of these new policies and regulations are to encourage FDI and domestic development in Hi-tech sectors (Wang and Meng, 2003). This effort is still current today within China. During the fifth China Hi tech fair of 2003, the subject of “transfer of technological achievements” was one of the major issues to be discussed (Huang, Amorim, Spinoglio, Gouveia and Medina, 2004). And also with respect to legal measures, action has been taken in the form of several different laws in the field of Science & Technology development, technology transfer, enterprise development and IPR protection (Huang et al, 2004).

A major element of this Hi-tech industrial development strategy, is the establishment of several Hi-tech zones in Chinese cities. On a state level 53 Hi-tech zones were established; these zones were specifically established in areas having a concentration of universities and research institutes (Wang and Meng, 2003). These state-level Hi-tech zones have been the topic of research and, without much further thought, have often been called science parks (Walcott, 2003; Tan, 2006). However, these state-level Hi-tech zones often are huge production areas, including many manufacturing
firms, and are usually initiated by the state government. These zones are, thus, better defined as being industrial parks and not specifically as university based science parks\(^1\) (Zhang et al, 2003).

### 2.1 The general concept of a university science park

University science parks were first developed in the US in the 1950’s. The first park of this nature was Silicon Valley founded in 1950 by Stanford University, and has been an often cited example of a successful university based science park (Link and Link, 2003).

A park like “Silicon Valley” facilitates knowledge transfer and functions as a center of gravitation for innovation (Tan, 2006). In western countries the initiative to construct a science park can come from a municipal or regional government or even a private property developer. But in most cases the university takes the initiative to construct a specific University Science Park (OECD, 1987).

### 2.1.1 University Science Park Features

But what is a university science park? The term “science park”, in general, is often used interchangeably with concepts such as: technology park, research park, innovation park or center and even with techno-pole and science city (Macdonald and Deng, 2004). Science parks and University science parks are considered to be systems in which an “innovative milieu” can be created, thus increasing the organizational efficiency of firms. Innovation is stimulated, through the links of on site clusters of firms and science based knowledge complemented with available skilled labor (Westhead and Batstone, 1998; Cassingena-Harper and Georghiou, 2005). Another generally accepted view is that the science park concept is a tool for generating and sustaining a concentration of firms capable of innovation and development, in order to improve a region’s long term economic viability (Luger and Goldstein, 1991). The literature thus proposes that:

“A USP creates an innovative milieu”

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\(^1\) Information from Mr John Allen (UKSPA)
The specific (Western) definition of a University science park according to Link and Link (2003) is that a University science park has some distinct components which are generally accepted as typical for a university science park. First it is a real estate development; second there is an organizational program of activities for technology/knowledge transfer. And the third characteristic is that it consists of a partnership between academic institutions, government and the private sector (Link and Link, 2003).

The definition of the United Kingdom Science Park Association (UKSPA) gives some complementary components; A USP is designed for fostering the formation and growth of innovative firms, a USP provides an environment encouraging networks and exchange of ideas between firms (in addition to the university) and a USP promotes formal and informal operational links with universities and research institutes (UKSPA, 2006; Siegel, Westhead and Wright, 2003b).

Thus, the definition of a USP puts emphasis on a clear link with an academic institution, the private sector and the government; bridging science and industry. University and industry resources are combined through a USP, the university supplies scarce research resources while industry supplies venture capital, the actual production, and application of knowledge (Link and Scott, 2003). So, the system of a university science park, can be viewed from a resource based view. Many tangible and intangible and personnel based resources (Grant, 1991) can be recognized. Resources like equipment, labs, facilities, and housing are tangible resources, while other resources like reputation, technology, research, being part of a network, and skilled personnel are somewhat more intangible (Löfsten and Lindelöf, 2004). A resource like scientific research can, for example be further divided into “basic research of a pre-competitive nature”, (University) and industrial research (Firm) which can be seen as direct input for product and market development (Christensen, 1995). Thus, from literature it can be proposed that:

“The USP combines resources from the university with industry assets”

2 The private sector in China is generally considered to be a combination of town or village enterprises and “regular” privately owned businesses.

3 www.UKSPA.org.uk
2.1.2 Motivations for the construction of USP’s

USP’s have effectively brought public and private funds together, some sources of funding are for example: Universities, local authorities, government, development companies and the tenant companies (Gower and Harris, 1994). A strong motive for universities for constructing USP’s can be that of financial gain (OECD, 1987; Gower and Harris, 1994; Löfsten and Lindelöf, 2005), while the majority of science park firms are usually motivated by the development of new products and markets (Löfsten and Lindelöf, 2005). Besides rental income, universities may also derive prestige from commercial activities (OECD, 1987) and are able to collect consultancy fees for their research, through taking an equity stake in ventures, licensing for cash or sponsored research (Markman et al, 2005). The firms on the USP also provide good opportunities for jobs and internships for university employees, graduates and students (Westhead and Batstone, 1998; Link and Scott, 2003). The following motivations can be proposed from the literature:

“Universities are financially motivated to construct a USP”

“Tenant firms are motivated, by the potential for development of new products and markets, to locate on the USP”

A specific benefit for universities, thus is the extra income that USP’s generate in a time where government funding often decreases, while firms may develop more innovative ability and capacity, and may improve their competitive performance (Vedovello, 1997; Löfsten and Lindelöf, 2002; Markman, Phan, Balkin and Gianiodis, 2005). The kind of firms which usually locate on science parks are newly founded and quite small; thus not equipped to conduct long term R&D, and sensitive to commercial pressures. The universities, on the other hand, are often not able to respond to commercial pressure with immediate problem solving activities. The system of a University Science Park solves this problem by bringing these needs, resources and different capabilities together (Löfsten and Lindelöf, 2005).

From the research of Löfsten and Lindelöf (2002) it can be seen that firms located on science parks tend to be significantly more involved in cooperation with universities, than off park firms. Other research done on British and Swedish USP’s implicates that
companies located on USP’s show a significant higher research productivity compared to similar companies located outside these USP’s (Siegel, Westhead and Wright, 2003a; Löfsten and Lindelöf, 2002).

Markman et al (2004) argue that universities are pressured to show a “return to society” from a taxpayer point of view, and are thus motivated to show tangible results for the received research funding. As a result universities (USA) view themselves more and more as catalysts for regional development and new venture creation (Markman et al, 2005). University administrators also perceive an increase in research outputs, like patents, extramural funding and publications when the university is formally connected to a science park (Link and Scot, 2003). Another motivation proposed by the literature is:

“Universities are motivated to show tangible returns to society”

2.1.3 Spill over and entrepreneurship effects
The close location to a USP improves and supports the possibility for students and university scientists to start up a company, which would otherwise, most probably, not have been initiated (Monck, Quintas, Porter, Storey and Wynarczyk, 1988). The main conclusion of the research of Löfsten and Lindelöf (2004) is that proximity to a university gives a firm an advantage, through building external networks, giving access to cooperative resources and promoting the exchange of ideas through formal and informal networks. The firm’s external network may contribute to the firm’s growth and profitability, through it’s ability to mobilize resources, attract researchers and identify entrepreneurial opportunities which are mediated through social relationships (Löfsten and Lindelöf, 2004; Markman et al, 2005). A major goal of a USP is to support the creation and development of new firms (Löfsten and Lindelöf, 2005).

Technology and knowledge transfer is a central given within USP’s both from the commercial viewpoint of firms and the university and from a more political viewpoint with respect to regional development. At the level of an individual USP there are two major forms of links between university and industry. First there is the direct University spin off formed by academic staff and students, who commercialise
research from the university and start their own firm (Löfsten and Lindelöf, 2004). And secondly there’s the occurrence of research links facilitating technology and knowledge transfers to industry. Industry can profit from academic research by establishing formal and informal links with the university (Löfsten and Lindelöf, 2004). These links may take the form of student projects, employment of graduates and joint research projects (Löfsten and Lindelöf, 2004). The literature here discussed, suggests that:

“There are students and university staff more likely to start up a company, if a USP is present”

“A major objective of a USP is to create new firms, in the form of USO’s and CSO’s”

Other objectives that the founders of science parks may have are; transfer of technology from the universities to firms, promotion of start-up companies, encouragement of university spin-offs (USO’s), creating jobs, attracting leading-edge technology firms, stimulating the growth of existing firms and creating synergy between firms through fostering strategic alliances and networks (Westhead and Batstone, 1998; Siegel et al, 2003b). But also objectives like improving the competitiveness and image of a location are often mentioned (Westhead and Batstone, 1998).

Some of the tangible benefits and resources these USP’s have for firms are easy access to skilled workers, research and the universities facilities and equipment (Harryman, 2006; Barrett and Rainnie, 2002), like for example the library and its databases. Universities are actively involved in the process of transferring technology and business skills to the participating firms (Tan, 2005; Monck et al, 1988). In addition to that, these parks often provide incubator and other support services (Harryman, 2006; Lalkaka, 2002; Barrett and Rainnie, 2002; Monck et al, 1988). The OECD (1987) identifies the presence of cheap housing, venture capital, services and good research facilities as being success factors for a well functioning USP.
More intangibly there’s the benefit of being in a network providing access to other resources (Löfsten and Lindelöf, 2004) and the discovery of opportunities and testing of ideas (Löfsten and Lindelöf, 2005). Many firms also see the prestige of a university as a benefit and reason for locating on a USP. Especially for newly founded firms, who need to connect to other stakeholders, reputation building is a strong motivation to locate on a USP (Westhead and Batstone, 1998). So, the literature proposes that:

“Firms benefit from USP prestige when conducting business”

Siegel et al (2003b) argue that the presence of fulltime management on the USP forms an important resource for inexperienced entrepreneurs. The science park managers usually have the role of developing both informal and formal links between universities and the firms. The park management is expected to develop and supply different supporting activities and services, like management support and business advice for university spin-off’s4 and facilitation of knowledge transfer for Corporate spin-offs5 (Löfsten and Lindelöf, 2005).

It is usually highly appreciated by tenant companies when USP management is able to establish a supportive environment. This can be done by lowering the fixed overhead costs of firms through providing joint services, for example business advice, financial, marketing, administrative, accounting and secretarial services But also with flexible leasing agreements and joint social and recreational facilities like restaurants, parks and sports facilities (Westhead and Batstone, 1998).

The USP management can also aid in establishing links between the universities and research institutes, by for example providing seminars and special magazines outlining the possibilities for firms (Westhead and Batstone, 1998). Furthermore, USP managers may also help in securing access to finance from private- and public sector sources (grants for example) (Westhead and Batstone, 1998).

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4 An University Spin-off is founded by university (post) graduates, employees of the university or a government research institution (Löfsten and Lindelöf, 2005).
5 The founders of a corporate spin-off come from corporations, often research departments. Or employees from any other department (Löfsten and Lindelöf, 2005).
2.1.4 Economic impact

The concept of a university science park is basically the linkage between the science park’s newly founded firms and the university. The USP itself can be considered as a “geographically distinct environment”, where institutional and social processes will merge and become more integrated through the development of more and more networks over time (Johannisson, 1998; Löfsten and Lindelöf, 2004). It is expected that the University-Industry linkages on the park will create an impulse to local economies, by attracting new R&D and creating Spin offs (Luger and Goldstein, 1991).

University science parks are often used from a political viewpoint for solving domestic problems; like stimulating underdeveloped regions (OECD, 1987; Larkin, 1994; Westhead and Batstone, 1998). Because, a USP utilizes the combination of efficiency and expertise from the business world with public interest, accountability and broader planning of the government, roles played by public and private sector agencies are matched and balanced (Larkin, 1994). Several Authors discuss the role of USP’s from the perspective of the government and its importance for regional economic development (Link and Link, 2003; Larkin, 1994; Barrett and Rainnie, 2002; Kang, 2004).

According to Löfsten and Lindelöf (2005) universities have proven to be “significant actors in their regions” when it comes to creating jobs and increasing economic activity. It is even argued that specific university based science parks, are more beneficial to regional economic growth, than other types of science parks (Siegel et al, 2003b; Kang, 2004; OECD, 1987). From this literature it can be derived that:

“USP’s lead to regional economic development, by generating jobs and new firms”

Policy makers also recognize the importance of technology transfer from universities to commerce (Löfsten and Lindelöf, 2005). Empirical evidence from the study of Löfsten and Lindelöf (2001) implicates that the “innovative milieu” on a science park leads to a significantly higher firm growth in terms of sales and jobs compared to
similar off park firms, although the same cannot always be said about profitability. Thus, another implication from literature is that:

“Motivation for USP construction, from government side, usually, is regional development”

Link and Scott (2003) suggest that public policies can have a large impact on the formation of science parks. An acceleration in the formation of science parks occurred, for example, after the passage of several technology initiatives in the early 1980’s (USA parks). Like, the “Bayh-Dole act of 1980” which reformed federal patent policy by providing increased incentives for the diffusion of federally-funded innovation results. The research and experimentation (R&E) tax credit of 1981 underwrote, through tax credits, the internal cost of increases in R&D firms; and the National Cooperative research Act of 1984 encouraged the formation of research joint ventures. And numerous local government policies were introduced which coincided with the adoption of US science parks (Link and Scott, 2003). The OECD (1987) noted that the introduction of all these policies, in the USA, “collectively represented a significant factor in removing entrepreneurial and technological barriers to economic growth”. The literature, thus, proposes that:

“Government policy may positively stimulate the development of USP’s”

Knowledge transfer between universities and industry can be greatly stimulated by geographic proximity, trust and flexible university policies on intellectual property rights, patents and licenses (Santoro and Gopalakrishnan, 2001). Löfsten and Lindelöf (2004) found strong correlations between network activities and the proximity of the university, suggesting that the University and its science park may have clear advantages for newly formed firms.

Some other findings implicate negative sides of science parks. Löfsten and Lindelöf (2004) state that many New Technology Based firms on university science parks are not able to convert investments into more patenting output than comparable off park firms. Product development through technological innovation was even found to be significantly less for on park firms, leading to the suggestion that the science park can
better be considered as learning centres than centres of innovation and thus, are more useful for science based innovation than actual development of new products and markets (Löfsten and Lindelöf, 2004). However, when looking directly at cooperation with the university and not just on site location, it is implicated that there is significant correlation between university cooperation and technological innovation (Löfsten and Lindelöf, 2004).

Some of these seemingly confusing results within this study of Löfsten and Lindelöf (2004) may be explained by the fact that most accessing of university resources, by on park firms, seems to be through lower level contacts. Leading to suggest that on park firms should intensify their contacts with the university on knowledge intensive subjects.

Westhead and Batstone (1998) distinguish three different strategies for founding and operating British USP’s. First of all they distinguish the university led and funded strategy, where the university starts and manages the USP on its own. Then there is the joint-venture strategy, here the joint venture company is a separate legal entity which runs the USP and is responsible for its development, besides the university other investors can participate in such a joint-venture. Thirdly, there’s the cooperative venture strategy, which is most common in the UK and does not involve a separate legal entity. Different partners have to work together within a relative informal framework (Westhead and Batstone, 1998). The last form is usually initiated by a local authority or a development agency who provides most of the funding (Westhead and Batstone, 1998). But, so far these observations only apply to the UK.

On the following page, the general conceptual model of the University Science Park is provided. This model is based on the literature discussed in this sub chapter. The model consists of the major “actors”, being the university, the government, the venture capital market and banks, new firms and the University park itself. For a further overview of the literature, see the main table (2) on page 59.

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6 All British science parks are affiliated with, and considered to be university based science parks (Siegel et al, 2003a).
2.2 History of China’s Economy opening up

In this section a history is provided of the way China opened up its economy during the past decades, in order to provide the right background and motivation for China’s Science and Technology program. An overview of this history is provided here, since the unique political, social and economic changes during this period in China can’t be evaluated against “normal” theoretical criteria derived from the principles of developed economies. History, geography and the embedded social system all contribute to a different view on orthodox economics (Webber et al, 2002).

During the period 1949 – 1979, the general perception, in China was that FDI is mostly beneficial for imperialistic countries. The concept of self sufficiency in
industrial and agricultural sense was quite important during this period of time. So, during this period China had to rely on its own resources for economic development. This global isolation severely worsened after 1960 when relations with the Soviet Union suddenly ended (Hayter and Han, 1998).

But, in the early seventies the result of this isolation became apparent through technological weakness and outdated equipment. The failure to modernize led to more and more criticism from within the communist party, ultimately leading to some radical changes. After a shift in power in 1976 (the purge of the Gang of Four) more emphasis was placed on “readjustment and reform” (Hayter and Han, 1998; Webber et al, 2002). During this decade the Chinese government started to borrow foreign funds and import new technology and knowledge in an attempt to improve economic development. FDI was not completely seen as a capitalistic tool anymore. This was supported by changes in the constitution (1977) and through the Ten-year plan (1976-1985) which was announced in 1978. Several measures followed from this Ten-year plan to facilitate the entry of FDI and the opening up of China’s economy (Hayter and Han, 1998; Webber, et al, 2002).

After 1979 the government allowed foreign companies to start joint-ventures with domestic firms (if beneficial to China), supported by several new laws regulating; legal-rights, equity, taxation, registration, foreign currency and labour relations. Special privileges were granted to enterprises using advanced technologies (Hayter and Han, 1998; Webber et al, 2002).

This strategy was geopolitical in nature, meaning that the opening up of the economy and the new laws were originally only aimed at Special Economic Zones\(^7\) (Webber et al, 2002). In 1984 and 1985 the new policy was to include another 14 cities along the coast, designated as open coastal cities (OCC’s) while the Yangtze and Pearl river delta’s together with the Xiamen, Zhangzhou, Quanzhou triangle became Open Economic Zones (OEZ’s) (Hayter and Han, 1998; Webber et al, 2002). Then in 1992 all provincial capital cities were granted an open status (Walcott, 2003; Webber et al, 2002).

\(^7\) Shenzen, Zhuhai, Xiamen, Shantou and Hainan island.
China started out from a very isolated and underdeveloped position, but has been developing in a rapid pace integrating with global economy. This increasing economic openness has paid off and resulted in fast economic growth (Luo, 2001). This growth was achieved almost entirely by improvement of total factor productivity from 3.6 up to 4.1 percentage points in 1995. Nowadays, the majority of transactions are market based and now dominating China’s economy, with more than 90 percent of all retail prices and over 80 percent of manufacturing and agricultural prices being set by the market (Luo, 2001).

In terms of “money” and economic growth China’s opening up has been quite successful. Having said that, what China needs more now and in the future, thus, is not necessarily more investment, but a better utilization of these investments (Luo, 2001). Several industries within China are already becoming quite competitive and depend on market demand, so no more government effort is required there. What China still lacks, though, is competitive high technology in its pillar industries. FDI and government assistance should be and is directed more towards upgrading technology in order to stimulate economic development, with an emphasis on western and central regions within China (Luo, 2001; Webber et al, 2002).

Special “tools”, in the form of Special and Open Economic Zones, are still being used to further economic development and stimulate high technology development. These zones are present in an enormous variety, to be found on different levels in China, like for example free trade zones, export processing zones, agricultural high tech zones, textile industry zones, foreign investment zones, etc. Some of these special zones are controlled by the central government while others operate under provincial, county or city ruling. And can be considered as “economic geographic entities” that are regional hubs for infrastructural development, investment and draw skilled and talented young workers to their location (Webber et al, 2002). Within these zones regulations and policies are different from regular policies in the rest of the country in order to be attractive for foreign investors. And the infrastructure is generally better developed. These Special Economic Zones serve as a “testing” ground for economic reform for the Chinese government (Webber et al, 2002).
The China Association of Economic Zones (CADZ) defines several different forms of zones designed for economic development and opening up to the world economy (CADZ, 2007). There are, for example 54 Economic and Technological Development Zones (ETZD’s) these represent specialized areas with a mission of nurturing businesses in a technology intensive sector of industry (Walcott, 2003). Pleasant investment areas have been created with good infrastructure according to international standards. These zones were specifically created to draw foreign capital and trade (CADZ, 2002).

Since 1990, fifteen Free trade zones (FTZ) have been established in harbour cities along the east coast, allowing for beneficial re-exporting of goods (CADZ, 2002). Another form of stimulating economic development can be seen in the creation of fifteen Export and Processing zones since 2000 (Walcott, 2003), which are enclosed areas supervised by customs aimed at stimulating exports (CADZ, 2002). National Border and Economic cooperation Zones are located in China’s central and western parts at the borders, these zones are also aiming at re-export and frontier trade they are have been developed since 1992 (CADZ, 2002). A special form of economic zones are the “National Tourist and holiday resorts”; regions with rich tourist resources, were chosen to open up and develop the tourism industry. Now there are eleven of these zones where foreign businesses are encouraged to invest in Tourism (CADZ, 2002). And in Fujian province three “Taiwanese Investment Zones” were created in order to stimulate trade relations with the Taiwanese business community (CADZ, 2002).

One of the most discussed and well known form of special economic zone is the “National Hi-tech Development Zone” (HIDZ) this form is also often called science park, because they depend for a part on China’s own scientific and technological strengths. These zones are part of the Torch programme. The focus of these zones is on both the domestic as well on overseas markets and investments (CADZ, 2002). On a local level several similar Hi-tech parks have been initiated (ATIP, 1995).
2.3 The National Hi-tech Development Zones

As part of the campaign for Hi-tech industrial development and technology transfer. Fifty three state level New Hi-tech industrial zones were established in Chinese cities, since the middle of the 1980's; these zones were specifically placed in areas having a concentration of universities and research institutes (ATIP, 1995; Wang and Meng, 2003). In the year 2000 there were 20,796 firms located on 51 state Hi tech industrial zones, employing 560,000 scientists (Walcott, 2003).

Some of these Hi tech zones are located near research institutions, others around traditional manufacturing labour pools (for example, Shanghai), in areas which are close to sites of overseas Chinese capital (Shenzhen), military productive capacity (Xi’an) or part of the government redistributive policy (Walcott, 2003). The major goals of these Hi tech industrial zones are (ATIP, 1995):

1. To promote the commercialisation of Hi tech R&D results
2. To become the industrial bases for Hi tech industries.
3. And, to serve as experimental sites for China’s innovation system.

In 1995 the Chinese government issued new guidelines relating to FDI, trying to direct FDI to its high technology sectors like; chemical fibre, micro-electronics, precision machinery, civilian aircraft, biotechnology and energy development. In 1998 the state planning commission listed a total of 18 separate industries, mostly in Hi-tech sectors (Wang and Meng, 2003). These sectors received a duty free status on capital equipment imports and broadening of the limits for foreign investors. Domestic firms were also granted the same benefits when locating in these High Tech zones. Wang and Meng (2003) consider this to be the first major open door policy; because for the first time domestic firms were treated without discrimination.

Several preferential policies apply to the Hi tech zones, for example, firms don’t need an import license for processing export products and only have to pay 15 % income tax. Start-up firms are even exempted from income taxes for the first two years. But in 1994 and 1996 several of these preferential policies were withdrawn or limited in order to prepare for WTO access (Webber et al, 2002). When domestic high- and new tech firms are considered successful, they are allowed to run foreign trade businesses.
And high- and new tech firms are allowed to have bonded warehouses and factories in the Hi tech zones. Each Hi tech zone may also set up their own import/export agency (Webber et al, 2002). Another preferential policy is the fast “one-stop” processing of requirements and forms by the government (Walcott, 2003).

The performance of these state-level Hi tech zones is, in general, considered to be rather poor; only four Hi-tech zones were considered to have a good performance in attracting foreign Hi-tech firms and facilitating technology transfer (Wang and Meng, 2003). Some causes making technology transfer to China difficult, are fear of misappropriation and loss of technology, failure to meet international standards in quality control, weak enforcement of intellectual property rights, and shortage of personnel with the right management and Hi-tech experience (Wang and Meng, 2003).

However, with respect to domestic economic development, it is interesting to know that almost 50 % of Chinese research institutes (in Manufacturing, medicine, transport and telecommunication) have started up companies in these Hi tech zones (Webber et al, 2002), which is a hopeful given.

2.4 The emergence of USP’s in China
The Hi tech industrial zones were initially intended to realize domestic high technology development, leaning on Chinese R&D and capabilities. But the rapid development of technology made this unobtainable and emphasis was put more and more on foreign joint ventures and investment for technical collaboration. More recently, however, MNC’s recognize the R&D potential China has, shown by increasing investment in R&D centres in the Hi tech zones and also by the fact that international Hi tech firms are locating in science parks and not just in the export processing zones anymore (Webber et al, 2002).

Many of the newly formed policies were aimed at attracting FDI, but the Chinese government also started to realize that the lack of transfer and utilization of technology and knowledge was a major weakness within China. Even though China has a strong academic history with a strong technology and science base, the R&D potential was not fully realized into economic development (Zhao and Grier, 1991;
Huang et al., 2004). The separation between research institutions and industry formed the basis for this problem.

Due to this separation universities were having trouble meeting industrial needs and demand and could not meet the needs for sustained economic growth (Zhao and Grier, 1991). Being unaware of the relevant technological issues, the produced results often were not applicable for industry and consumer demand (Zhao and Grier, 1991). It has been estimated that during the early eighties not more than between 20 to 30% of all research results have actually been utilized (Zhao and Grier, 1991). During the 1990’s this was not much better, according to Webber et al. (2002) only 30 percent of all research findings in institutions of higher learning during the early 1990’s found practical application and just 10 percent created a measurable economic advantage. These low percentages with respect to valuable application of scientific research findings, form a likely rationale for developing the Chinese science parks and USP’s.

Technology and research were basically seen as a free public source, which consequently was transferred at no cost whatsoever. As a result during the first decade of the economic opening up, no incentive was provided to universities to market technology and research (Zhao and Grier, 1991). And only during the early nineties was technology and research slowly starting to be considered as a commodity. In response to this issue, the Chinese government started out from 1983 onwards to create a technology market (Zhao and Grier, 1991) and develop appropriate policies and tools for stimulating the transfer of academic achievements and commercialising technology.

Within China, much attention has been given to the role of science parks in regional development. Which is not so surprising considering the pressure the Chinese Government feels in solving regional income inequality (UNDP, 2005; Huang, Kuo and Kao, 2003; OECD, 2002a). Ways of achieving regional economic development are, for example, attracting Foreign Direct Investment and creating more start-up companies. FDI can offer major advantages for a host economy, like that of China. Because, proven know-how and scarce resources will become available to the host country and thus speed up the economic growth (Hayter and Han, 1998). In practice, however, most MNC’s are reluctant to share key proprietary knowledge (Hayter and
Han, 1998). This is certainly the case in China, where intellectual property rights are not easily enforced due to its weak judicial system.

In order to promote high-technology development, the government focuses more and more on start-up companies and SME’s. To facilitate start-up companies and speed up high-tech development the ministries of Education and Science & Technology have been promoting the construction of University science parks (People’s daily, 2000). In the Western world the concept of an University Research Park or Science Park may be well known, but within China the development of these parks still is a relatively unknown concept (Zhang et al, 2003).

In 1983, the first University based parks were founded by Southeast university and North eastern University (People’s daily, 2000; Tang, 2002) although these activities were not formally recognized until 1989. And in 1999 Peking USP and Tsinghua USP were the first parks to be fully approved by the government to be state level USP’s, in the years after that more University science parks were acknowledged by the Ministry of education (Zhang et al, 2003). Up to now there are 50 State-level university science parks (Cuspa, 2006), see appendix 1 for the list of Chinese USP’s. The geographical dispersion of all these state USP’s can be seen in table 1.

<table>
<thead>
<tr>
<th>The geographical dispersion of USP’s over China</th>
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<tr>
<td><strong>North China</strong></td>
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<td><strong>Northeast China</strong></td>
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<td><strong>East China</strong></td>
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Table 1. Source: CUSPA.

The main objective for constructing the Chinese USP’s from state point of view is to commercialise Hi tech scientific achievements from the university and incubate these to new firms (Zhang et al, 2003). In addition to that the government feels that the functions of the Universities should be expanded in order to better cater to knowledge transfer and industry.
In practice university based science parks are, often part of the larger Hi-tech zones, the university science parks of Tsinghua and Beijing University, for example, are largely located within Beijing Zhongguancun Science park (Tan, 2006). The concepts of Hi-tech zones and science parks can be considered somewhat fluid and not always clearly defined. According to Webber et al (2002), all concepts of special zones and science and industrial parks, within China, are “blurred” and it is often seen that one big open economic area consists of several intertwined sub zones. The main objective of the Hi tech industrial parks is to incubate “new forms of industrial production” (Webber et al, 2002).

Contrary to the main objective of these Hi tech industrial zones, the primary purposes of a (Chinese) USP are to “bridge scientific achievements and teaching at the university with incubating high-tech enterprises, be a practice base for cultivating young entrepreneurs, provide innovative resources, but not to become a manufacturing base” (Zhang et al, 2003). Incubation is an important function of the USP, but in addition to this start up phase, the USP provides further support between incubation and “maturity”, the USP sometimes also has several different specialised incubators (Zhang et al, 2003; Tang, 2002). After a successful start up and “nurturing” the firm is supposed to move to the industry park which functions as a manufacturing base and is better equipped for massive production. The USP, in most cases, simply doesn’t have enough space for large scale production, because they are often located on the University campus or on a nearby location (Zhang et al, 2003; Kang, 2004).

This is the narrowest definition of a USP from a Chinese academic publication. For the purpose of this study this description, of a Chinese USP will be used:

A University Science Park is the “bridge between scientific achievements, teaching and incubating high-tech enterprises. The USP functions as a practice base for cultivating young entrepreneurs, is to provide innovative resources, but is not a manufacturing base”.

The CUSPA; the Chinese University science parks association, mentions roughly the same characteristics of a USP. A “university science and technology garden” differs from the Hi-tech development zones on proximity to the university, the specific
incubation services, materializing the scientific achievements of the university and faster innovation with a constant stream of new impulses (Cuspa, 2006). The members of CUSPA have all been acknowledged as University based science parks by the Chinese government and have satisfied a number of conditions. Unfortunately these conditions are not public information, but for the purposes of this study the members of CUSPA will be considered USP’s, see appendix 1 for all CUSPA members.

The recognition of the first Chinese USP’s in 1999 was supported by a government directive, which was released by the State Department, the Ministry of Science and Technology and the Ministry of Education. This text “Decisions on Enhancing Technological Innovation, Developing High Technology, and Realizing Industrialization” (as quoted by Zhang et al, 2003) emphasises that:

“universities, especially the research orientated universities, should take the responsibility to promote the construction of USPs in order to develop high technology, realize its industrialization, and cultivate multi-disciplinary talents. Under such context, the USPs of China have been developed, whose aims are to help the universities change their philosophy and open their resources and facilities to the society, including talents, technology, information, and laboratory equipments so as to transfer the integrated intellect into productivity by means of combining various innovative elements in the society, and to develop the hi-tech industry in order to promote the regional or even national development of economy and Hi-tech industry”.

Zhang et al (2003), explains that because the development of all these forms of science parks have been rapid, several supporting structures have not been able to keep up with these developments. For example, the financial and educational system are not able to fully support the science parks. The question of how to construct efficient university science parks is an important one within the Chinese government and academic institutions. Because, according to Zhang et al (2003) a lot of the Chinese USP’s are in reality real estate development projects, and are not really distinctive from university owned industries.

To develop Chinese USP’s further, government support seems to be an important factor according to Zhang et al (2003). Also because the participation of private venture capital is still quite low and most USP’s only have the host university as
owner (Zang et al, 2003). In order to increase effectiveness and efficiency, the private sector should participate more according to these authors. This is supported by the view of Tang (2002) who argues that the Chinese USP’s would be an ideal meeting ground for venture capital, institutional investors and various other funds to accelerate the growth of new enterprises. The growth of firms should also be supported by the service system of the USP, specifically mentioned are; accounting, assessment and patenting office, consultancy and planning, “authentication agency”, testing centre, trade and communication services, network centre and a multitude of other services (Tang, 2002).

From the perspective of MNC’s the conclusion of Li et al (2000) is a very important one, it implicates that MNC’s pursuing a capital and technology-intensive strategy in China, have a significantly better performance than MNC’s pursuing a labor-intensive strategy. They explain that the Chinese government has introduced Hi-tech zones and university based science parks in response to difficulties transferring technology from MNC’s to China, in order to facilitate technology transfer and indigenous technology development (Wang and Meng, 2003). This underlines the value added of USP’s in China and their potential for foreign and domestic companies in China.

Further research being done on science parks in China is, for example, that of Tan (2005), his study of a singular science park\(^8\) implies that science parks can be compared to industry clusters. Industry clusters are advocated by Porter (1998a) as a source of strategic competitive advantage, producing similar incentives for firms to participate in USP’s. For example, complementarities and specialized inputs. Because of low entry barriers new business formation is easier. Porter (1998a) and Tan (2006) argue that productivity and innovation is thus enhanced.

Access to an informal network is also a positive aspect of participating in a USP (Tan, 2006; Löfsten and Lindelöf, 2002). USP’s are similar to industry clusters, considering that the tenant firms on the USP are geographically concentrated, interconnected with each other and the university (institutions), and are mostly active in linked industries (Porter, 1998b). In this thesis a clear distinction is made, however, between a cluster

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\(^8\) Beijing Zhongguancun Technology Park; the greatest cluster of semiconductor, computer and telecommunications firms in China.
and a USP, a USP may represent a cluster, but the term cluster also applies to many other phenomena like for example the Hi tech industrial parks in China. The USP is a much narrower described concept here.

2.5 Gaps in Literature and Research

Science parks in general are often used as tools for promoting technology transfer, innovation and regional development, because these parks often lead to fast-growing geographically clustered firms within certain industries (Tan, 2006). However despite the apparent implications for theory and practice, this phenomenon has been largely ignored (Siegel et al, 2003a), although researchers from the field of industrial economics and economic geography have given some attention to the topic (Tan, 2006).

Within the literature a gap exists when it comes to understanding the facilitation of technology transfer and innovation through USP’s, even more so in the context of transitional economies (Tan, 2006). With respect to China, even descriptive studies about the development and motivation for building university based science parks are lacking. Most of the studies investigating science parks were conducted in the US and Western Europe (UK and Sweden).

The studies covering Chinese research parks are frequently single case studies or they discuss the larger Hi tech industrial parks, and not a lot of research has been done evaluating the USP’s and their development. By putting the construction of these USP’s within a political framework, more insight can be gained in the special environment that these USP’s operate in.

This is why further study of the development of university research parks in China is of great importance for companies considering entry, or who already have entered, in the Chinese market, for Chinese entrepreneurs this development is perhaps of even greater importance. In addition to that it is stated by Tan (2006) that the development of technology parks in China is closely followed by other transitional economies, but that this development has been largely ignored by organizational research.
USP’s represent an opportunity for companies wanting to expand their presence within China. Tan (2005) also states that these USP’s in China have clear implications for strategic management and entrepreneurship. Considering the value of R&D and knowledge transfer for companies operating within China, further understanding and insight would be most appropriate. Adding to the already existing literature on USP’s and knowledge transfer will be necessary, with specific focus on the development of Chinese USP’s.
3. Methodology

In this chapter a review is provided of the course of action taken during this research. The goal is to give a realistic description of the development of University Science and Technology parks within China.

3.1 Research Method

The research method employed in this thesis, is that of a multiple case study design, where the University based Science Park itself is the unit of analysis. Within this design a combination of archival research (websites) and collection of primary data through questionnaires was used.

The case studies were selected from the list of CUSPA members, who can be considered to be the University science parks recognized by the Chinese government (CUSPA, 2006). The parks were selected from different geographic regions within China.

The choice for a multiple case study design is motivated by the fact that this study attempts to examine, a contemporary phenomenon in its real life context (Eisenhardt, 1989; Yin, 2003). The shortage of prior evidence, relating to USP’s in China, and the appropriateness of case studies in earlier stages of research also supported this choice (Eisenhardt, 1989). In addition to that most Chinese USP’s have just recently been formed and are still evolving, so theory building is more appropriate then hypothesis testing (Markman et al, 2005).

3.2 Data Collection

The topic at hand calls for rather unconventional research techniques (Krug and Hendrischke, 2006). Since, many local business systems find their explanation in informal institutions and unpublished local implementation procedures (Krug and Hendrischke, 2006). The transitional nature of China and its vast geographical size also calls for a different approach in research technique. In this thesis the different policy measures, characteristics, changes and available “toolkit” of the parks, will be

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9 Appendix 1
described partly based on internet websites, as a document source (von Zedtwitz and Grimaldi, 2006; Radford, Barnes and Barr, 2002).

Initially an orientation was conducted through an online search, several international organisations were found which are active in the field of (University) Science Parks. For example the International Association of Science Parks (IASP) Park 1 is a full member of this organization, but availability of specific Chinese science park data was very limited and often aggregated to global level. In addition it did not apply to the specific university science parks, in fact the IASP members proved to be very broadly defined. IASP did, however, provide a literature list.

Further search brought me in contact with the Dutch chamber of commerce, TNO, the Spice group and the UKSPA, this led me to one of UKSPA’s retired employees, mister John Allen, who gave me some general information about the definition of the Chinese USP and introduced me to the CUSPA, where much information was found on the Chinese definition of a USP and their members. The Chinese national bureau of statistics responded on my request, for data, with the message that no data was available on Park level or even for USP’s as a group. But some general statistics were available on the subject of Science and Technology.

The Asian Technology Information Program (ATIP) provided me with some general information on technology development in Asia, while some other organizations provided information which was less relevant, mostly applying to the Hi-tech industrial Parks. Other organizations like, Castip (Torch programme) and several Chinese government institutions did not respond to specific request for information, but did provide information through their websites. The non response to personal requests could be due to the fact that my emails were considered to be Spam, or that they were written in English. This made me realize that assistance of a Chinese translator was necessary.

Desktop research was then started with online research, through Google scholar, limited to the business and economics field. See appendix 2 for the specific results. Other websites and articles, were found through references in articles, general non
restrictive search on Google and help from organisations like UKSPA\textsuperscript{10} and IASP. More articles were found through a university database search and references from other articles. In total a number of approximately 249 relevant articles and documents were found, complemented by several books on the subject.

Since all parks have differences in the quality and quantity of data made available online, the collection of data was complemented and validated with direct data from the Chinese parks in question. For this purpose five parks have been approached by telephone, and gave an indication to be willing to participate. A written questionnaire was then send out per email. The data collection was ultimately limited to the three parks which responded and filled out the questionnaire, leading to a response rate of 60%. This response rate was attained after several follow up calls.

Depending on the quality of the websites, the questionnaires were slightly customized for each park and accompanied by an introduction to the motive behind the research and to the researcher. The questionnaire contained both closed and open ended questions. For an example of the questionnaire please see appendix 3.

The specific reason for sending the questionnaire was to create a completer and more accurate picture, for example, some of the parks don’t have their founding year placed online or the number of companies was not available or outdated, this missing info was obtained with help of the questionnaire. The first questions related to several socio-demographic features of the parks, like age, no of jobs, no of companies etc. The respondents were selected from the management of the parks, these people were contacted by telephone before sending out the questionnaires. Their functions are respectively Vice General Manager Service Centre, Administration (contact), and commercial and incubation recruitment Manager. In the case of one park an employee from the administration has been so kind to gather all information from different staff members.

\textsuperscript{10} www.ukspa.org.uk
3.3 Data Analysis
A study that has been partly replicated for the purpose of this study is that of Link and Link (2003). Here a comparison is made using variables such as age, number of employees and companies, and growth rates. These variables have been partly derived from the websites and were completed and validated with the questionnaires. The OECD (1987) also acknowledges the use of indicators like, employment and number of new enterprises opened as a measure of success with respect to regional development. By adding questions relating to the motivation for founding the parks and types of industries, a narrow factual description was provided of these case studies. Relating to the research questions about policy, online documentation from government sources and the OECD was reviewed, in a similar fashion as has been done in the article of Storey and Tether (1998). Then a comparison was made between literature and data from UK and USA organizations with the case results, see table 2 for an overview.

3.4 Research limitations
A limitation this research has is the fact that it is focused specifically on China and thus is not generalizable. In addition to that, only three case studies were researched in a strict population of 49 state level USP's. Because, data collection has been strictly limited to the members of CUSPA, other USP’s on provincial and local level are not included. This leads to a lower external validity of this research.

Within Chinese policy different programme’s are active, with respect to technology transfer, and it is easy to confuse the different kinds of parks and zones with each other. In addition to that there’s the fact that some of the science parks are very well covered in literature and in news articles, while some of the more remote parks are under exposed in the media. Some of the parks have been very recently built or acknowledged by the government, which also results in a lack of data. Another limitation is the language; information was mostly gathered in English while a lot of websites are only available in Chinese.

The data collected here lacks statistical generalizability, but can be considered acceptable because the primary goal was theory building rather than testing. Because, the information gathering was done by email, the feeling remains that with face to
face interviews, the information would have been richer. This research was also limited in the sense that only three of the fifty CUSPA members were described.

Another limitation, or better said bias, can be found in the information gathered from the websites, even though the official websites of the USP’s were used, it must not be forgotten that these websites are primarily designed for drawing business and not to assist in research, and may thus describe a more positive picture than reality (Radford et al, 2002).
4. Results

In this chapter the empirical results will be discussed, first an overview of Chinese Science and Technology policy is provided, then the three cases are described.

4.1 China’s Policy on Science & Technology

China intends to strengthen its competitiveness through a coordinated and extensive Science and Technology and innovation policy. Innovation policy is defined here as “a set of policy actions intended to raise the quantity and efficiency of innovative activities, which are defined as the creation, adaptation and adoption of new or improved products, processes or services” (Huang et al, 2004). In this chapter the national level of innovation policy will be discussed.

The highest ranking coordination body in China, at this time, on the subject of innovation policy was created in 1998 as part of the State Council, and operates under the name “the State Steering Committee of S&T and Education”. But the ministry of Science and Technology (MOST) is considered to be the most competent party in the design and implementation of innovation policy. Another influential institute is the Chinese Academy of sciences (CAS), this institute has historically been an important stakeholder in innovation policy and CAS is still a major recipient of state funding (Huang et al, 2004).

The basis for improving the S&T policy was formed by some general policies, similar to other transitional economies. These general policies are; increasing government funding on R&D, developing basic research, and improving collaboration between research institutes, universities and industry, the development of USP’s falls in the latter category. Within China, reforming state institutions is also an important aspect of the road to a better innovation climate, this latest reform (since 1999) has not been discussed much in literature (Huang et al, 2004).

To demonstrate how serious the Chinese government is in promoting the Science and Technology “campaign”, one can look at the rapid growth of science parks, but also to government expenditure on S&T in general. Statistics show that while in 1978 expenditure on S&T was 52.890 million Yuan it rose to 1.168.610 million Yuan in
2004, over 22 times as much as in 1978 (NBS, 2006). Most of these funds went into the special programs initiated by MOST. In relation to universities a rapid rise in applications for patents is seen during 1990 – 2004, which could be attributed to the rise in funding, improved IPR regulation and the implementation of new S&T policies. In 1990 the total amount of patent applications amounted to just 1.333, this grew to 19.921 patent applications in 2005 (NBS, 2006).

These efforts to stimulate the development of science and technology were guided by several different programmes. The Chinese government launched its first national level program for capital injection into technologically promising companies on March 1986. Hence its name the “863 program”. This program supports applied research aimed at military projects as well as on projects improving people’s livelihood. Focus was put on high technology projects, mainly derived from, commercially viable, ideas of university scientists. Several areas of research were identified benefiting from this program: Automation, biotechnology, energy, IT, lasers, new materials and space technology (Webber et al, 2002; Walcott, 2003). The main draw back within this program turned out to be the bureaucratic rigidities in the state owned enterprises. New projects, absorbing high technology did not succeed within these large organizations (Walcott, 2003).

A new approach was started with the Torch program which was intended, by the government, to serve as a bridge between academics and business activity and was initiated in 1988 by the ministry of Science & Technology. The focus shifted with this program more to small and medium enterprises, lowering the barriers for access to this program. This program was accessible to a broader base of applicants. Still most venture capital was reserved for high technology projects. From 1988 until 2001 over 25,000 projects were supported. Main sectors targeted were: Bio-engineering, IT, materials science and environmental protection. The incentives vary from tax breaks, grants and easier licensing regulations. Within this program intellectual property protection remained a weak link (Walcott, 2003). Another pitfall was that successful firms continued their links with the “parent” organizations, R&D centres and universities, even though the mass production stage was already reached and relocation should have occurred.
An extension of the Torch program was the growth of incubators developed by many universities, in 1994 there were 73 incubators increasing to 131 in 2000 (Walcott, 2003). The development of the Hi-tech zones was part of the Torch program.

The 973 plan followed the 863 program in March 1997 and started nine technology projects in six, so called “Key Pillar” areas; which included electronics, new materials, telecommunication, biotechnology and environmental protection. New in these Key pillar areas was the sector services, added to respond to China’s maturing economy (Walcott, 2003).

In order to provide incentives for investing in high technology industries and underdeveloped regions of China, the government introduced several new policies. Most of these preferential policies were applicable in the special economic zones. Between 1996 and 1999 a number of policies were introduced which are beneficial for firms investing in high technology and/or in underdeveloped regions (mostly central and western China) (Luo, 2001). With respect to obtaining basic infrastructure and services, priority treatment was given to these firms in addition to lowering land fees, import-export duties and major income tax reductions on a national and local level (Luo, 2001).

Foreign investors can receive several tax benefits, for example an extra refund of taxes paid (of 40 %) on their income, if they reinvest their profits for at least five years. When foreign investors reinvest in the designated high technology or export oriented industries a complete refund of income taxes is their reward. This policy has been a great influence on strategic plans of foreign companies, leading to reinvestments for growth and profitability (Luo, 2001).

Before the 1990’s Chinese colleges and universities mainly did theoretical research, while applied research projects were executed by branches of the Chinese Academy of Sciences, or by special governmental schools (Walcott, 2003). In the late 1990’s consolidation and merging took place between academic institutions and departmental institutions. Leading to applied research and developing spin-out companies by universities encouraged by the government. This was further supported by a new innovation fund for small technology-based firms also called “Seed Fund for Small
Businesses” where up to 100,000,- US dollar can be collected in grants for applicants (Walcott, 2003). In addition to grants, firms may receive loan interest subsidy and equity investment\textsuperscript{11}. A large part of the funding went to areas like Beijing (14.6\%) and Guangdong (8.3\%) where parks 1 and 2 are located. This fund gives priority to start up ventures created by students returning from abroad and explicitly propagates cooperation with universities (MOST, 2006).

Many of these policies were formulated during the 1995 National Science and Technology Conference. This conference laid out the “Strategy of rejuvenating (or revitalizing) the nation by relying on science and education” (CIIC, 2000). The transfer of scientific achievements in the field of high technology and attaining an internationally competitive position, were among the key objectives of this strategy (CIIC, 2000).

\textsuperscript{11} www.innofind.gov.cn
4.2 Cases
From the five parks approached three responded to the questionnaires, resulting in the following three case studies. The parks are located in different geographic regions of China, see fig 2.

Fig 2: Locations of USP 1,2,3.

4.3 Case 1
The first University Science Park to be discussed here, is located in North China. Information stated here was derived from the official park website and from a respondent employed by the USP, unless otherwise stated.

4.3.1 Park features and motivations
This science park was founded in 1994 by the host university and at the founding date was fully owned by the university. The university is however a state university and controlled by the Chinese Ministry of Education\(^\text{12}\).

\(^{12}\) www.moe.edu.cn
When asked to elaborate on the motivation for constructing the USP, the respondent explained that the foremost and important motivation is the promotion of science and technology transfer from the university to firms. It was emphasised, by the respondent, that this USP functions as a cooperation platform between the university and enterprises. Some other objectives were also mentioned, like complying with the government “long term strategy for revitalizing China through Science and Technology”. The respondent from Park 1 also specifically chose the development and training of young talents and entrepreneurs as a strong motive for operating the USP.

Since Park 1 is located in an area that has benefited early on from being in an Open Economic Zone, motivations like regional development and creating jobs were not deemed relevant by the respondent.

When looking at ownership of the USP an interesting development took place within the structure of Park 1. Although starting out as wholly owned by the university, the USP opened up to private and other investors in July 2000, when it became a Share holding Co. Ltd. A joint venture between university, local state government holdings and private investors. The nearby Hi-tech industrial Zone being one of the investors. Even though the capital comes from different parties, the respondent emphasised that the university has remained in full control within this joint undertaking.

The participation of the nearby Hi-tech industrial zone is a very interesting fact, and seems to stress the mutual relationship these parks have. The USP forms a source of new firms, which in a later stage can transfer the actual production to the Industrial park (Zhang et al, 2003), while the USP remains available for new University Spin offs, R&D alliances and Corporate Spin off’s. By the end of 2006, Park 1 has about 400 firms on its park as estimated by the respondent, of which over one hundred have a foreign origin, this means that over 25 % percent of all tenant firms of park 1 are a result of FDI, see fig 3.
The physical structure of park 1 is a combination of different sub parks on the main location, there are sites near the university as well as farther away, and several satellite parks in other provinces. On the premier site in Beijing there is the “main area”, a specific innovation Park and a special sub park for returned students called the “Returned Students Pioneer Park”. The satellite parks are located in Zhuhai City, Nanchang City, Xianyang City, Hebei and Kunshan.

By the end of 2006, there were 15,000 people employed on Park 1, considering the fact that there are 400 firms present, the average number of employees per firm, in 2006, was approximately 37.5 employees.

There are several different industries represented by the tenant firms located on USP 1, but there’s a very strong focus on IT related firms (68 %), see figure 4, on the next page, for a breakdown of the different industries as estimated by the respondent.
Similar to the other two USP’s, Park 1 provides an extensive range of services to its tenants see table 2 for an overview. Many of these services are similar to services provided on western USP’s. The availability of these services is often described extensively in the individual park’s policies. The facilitation of government relations seems to be very typical for Chinese USP’s.

4.3.2 Park Policies of USP 1

Park 1 sets its own tenant criteria and park policies, which apply in addition to government policies. State policies have not been altered in the past 5 years with respect to Park 1, and the respondent explained that the local government has not set any distinctive policies relating to the park. But, the local government did set some general preferential policies applying to Science and Technology development within Beijing. In addition to general government policies, Park 1 has developed its own tenant criteria in accordance with the university.

With respect to these tenant criteria the respondent mentioned three main criteria for firms to become tenants on this University Science Park:

1. The firms have to be considered a High-tech enterprise.
2. The enterprise has to have merit with respect to its technology, the firms management and market potential, these three aspects are evaluated by the Park management.
3. Commercial merit, per tenant negotiations are open and can be very detailed.

The general nature of the park policy is to promote and support self innovative firms as explained by the respondent. This general tendency for self innovation is specifically aimed at domestic firms.

The Park authorities have the right to independently invite foreign staff in the areas of economic affairs, trade, science and technology to come to China. In the same manner they are allowed to let domestic personnel travel abroad on official business, up to 180 days per stay abroad. The travel applications are handled on the USP itself (thsp, 2006).

USP 1 provides much of the information about policies and regulations, on all levels, in English online. In this respect the environment is much friendlier to foreign firms, and information is easily accessible.

4.3.3 Government Policies specific to USP 1

All general government policies on preferential taxes and Hi tech development, apply within this park.

The Beijing Municipal Commission on Science & Technology has developed several policies in order to encourage Hi-tech industries and economic growth in Beijing. These relate to several items and can be found on the USP website (thsp, 2006) together with all other relevant policies, namely:

- Latest Policy 4 items
- National Policy 38 items
- Beijing City Policy 20 items
- Zhongguancun Policy 21 items
- Haiding district policy 17 items
- Policy for Software companies 3 items
- Start Business policy for Returned oversea people 3 items
- Beijing Talent Policy 2 items
These policies all apply to the firms on the USP, but some are specifically designed for, student entrepreneurs, students returning from abroad to start a company and software companies.

In order to stimulate business development, Beijing municipality has established a system for incubation in order to conform to the state Decision of “the Central Committee of the Chinese Communist Party” and the “State Council” to speed up Hi technology development and innovation, and to realize commercialization of scientific research results. Parallel to the state policy the Beijing Party committee has also issued an: “Opinion of the Beijing Party Committee”, regarding technology innovation, Hi tech development and the commercialization of scientific achievements, development of incubator services, stimulation of the venture capital market, intermediary services and other resources, which have to be realized (BMCoS&T, 2006).

In the text of these policies emphasis is put on building specialized incubators to restructure the major industries. The developmental goals are very specific, for example, one goal is to incubate at least 5000 projects per year of which at least 800 Hi tech firms should be in a position to compete with their foreign counterparts. The training and development of new innovative entrepreneurs is also an important goal (BMCoS&T, 2006). For a more detailed description of the primary goals of the Beijing Incubation system, see appendix 5.

In order to encourage participation in S&T development, several measures and incentives are provided by the local government. Support will be given for the construction of a number of incubators, although no specific figures are given in terms of funding. Various “social forces” are encouraged to establish science-based business incubators of different types. Specialized technology incubators including software, internet, integrated circuit design, biomedicine, new material and other fields are given priority (BMCoS&T, 2006).
SOE’s\textsuperscript{13} and research institutes are given support to build science-based business incubators so that their idle resources can be activated. Thus, new science-based firms can be started up at a relatively low cost. Universities and colleges are encouraged to form science-based business incubators and university science parks. The establishment of overseas returned student pioneering parks is encouraged too. In addition to these outspoken objectives, the local government also emphasizes the importance of following the market, and has built in incentive mechanisms, with respect to incubator management. All this has to be evaluated by the local government to qualify for certification (BMCoS&T, 2006).

Potential funding for tenants of incubators and USP’s is made available through a government-sponsored investment fund. Wherever possible, incubators are to set up seed money funds. All incubators need to make the most of the existing channels, such as a funding guarantee system, a venture capital fund, bank loans, science-based SME’s innovation funds and specialized funds of the State and Beijing City to lend support to firms in their effort to raise funding. Incubators are expected to make an active effort to utilize available venture capital (BMCoS&T, 2006).

Another, objective is to build a strong network including job-related (recruitment) and information partners. Extending the network to international partners, by cooperation and exchange is also encouraged. Through international relations, more venture capital can be attracted (BMCoS&T, 2006). In addition, special support is needed for the tenants in terms of property rights trade-off, transfer of technology, common equipment and facilities, SME e-commerce service, IPR, human resources, firm evaluation, further policies on this subject are developed (BMCoS&T, 2006).

Returned students pioneering parks and other science based business incubators equipped with necessary conditions should provide targeted services that could attract student-entrepreneurs returning from overseas (BMCoS&T, 2006). For this category of entrepreneurs a whole separate policy is available online, strong emphasis is put on getting well educated young Chinese to return to China and start up businesses.

\textsuperscript{13} State Owned Enterprise.
From these policies drafted by the municipality of Beijing, it can be seen that much attention is given to realizing a healthy financial system in order to support the creation of new ventures.

4.3.4 Measurement of USP success

Park 1 measures its success in terms of Profit, this is logical when considering its legal form of a Shareholding company, and in terms of the growth of the number of tenant firms. When asked if the park has been successful over the past years, the respondent said the Park has been very successful both in terms of profit and firm growth. In terms of growth of the number of tenant firms we can see that it has grown to 400 in 13 years (1994-2006), constituting an average growth of 30.8 firms per year. In terms of job growth this comes down to an average of 1154 jobs per year.

When asked to state the key success factors of Park 1, the respondent emphasised that his University can considered to be a “brand”. The University is the best known University of China, also internationally and this provides a major advantage to the USP and its tenants. Good access to all the universities resources was mentioned in addition to this. Another major benefit is the location within Beijing, which has a well developed infrastructure, due to its early open status. Interesting is that the respondent also claims that Park 1 provides a better support policy for its tenants compared to its competitors, which could be due to its position on state level, or simply due to the fact that more experience is available, since the park already has had 13 years to develop.

Park 1 is also very internationally oriented, it has a number of joint projects in the form of co-development and enterprise exchange communication. When asked about the future, the respondent explained that many more projects with international partners are planned with respect to science park development and project cooperation. On the park’s official website international networks are mentioned with, Australia, Finland, Germany, Japan, Korea, Thailand, the United Kingdom and the USA, encompassing 14 organizations. Another category is formed by

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14 Following the assumption of Link and Link (2003), the first year of construction, the number of firms is considered to be zero.
15 www.thsp.com
International Partner Organisations which cooperate with Park 1, see appendix 4 for a detailed outline.

4.4 Case 2
The second University Science Park to be discussed here, is located in Guangzhou. Information stated here was derived from the official park website and from a respondent employed by the USP, unless otherwise stated.

4.4.1 Park features and motivations
This USP came into existence in the year 2000. The initiative for founding this USP came from the state government, although ownership lies with the University. No change in ownership has taken place, so the university remains full owner of this USP.

The fact that it was the state who took the initiative for creating the science park, might suggest that the state government has had much influence on its development. State involvement also often results in more financial support.

When asked after the motivation for constructing the University Science Park, the respondent mentioned the transfer of knowledge and scientific achievements for the commercialisation and utilization of university resources as the most important motivation for construction, similar to the respondent from Park 1. In addition to that the realization of the “Government’s long term Strategy for revitalizing China through Science and Technology” was mentioned. These two points seem to be intertwined with each other.

The development and training of young talents and entrepreneurs was also emphasised to be an important motive, much like Park 1. But, contrary Park 1, two other motivations were given, the first being the promotion and creation of Hi-tech firms and secondly the creation of jobs. In this case more emphasis lies on economic development of the region. Since the opening of this Park, these motivations remained important and did not alter. The total number of tenant firms on USP 2, by the end of 2006, was 94 two of which have a foreign origin. So, the vast majority of firms is domestic, also see fig 5.
Fig 5: The origin of the tenant firms of USP 2.

The physical structure of this USP consists of one main location on the University campus. Park 2 has no satellite parks. Measuring USP size in terms of employees, Park 2 turns out to be much smaller than Park 1, the total number of people employed at this USP is 3,300 as estimated by the respondent. In terms of firm size this comes down to an average of 35,2 employees per firm. Which is about the same size as the firms on Park 1 (37,5).

The respondent of Park 2, explained that 8 different industries are represented on this USP. No detailed breakdown of the industries was given but the industries present are; IT, Biosciences, Agricultural and Forest, Electronics and Telecom, Services, Automotive, New materials and Energy. The universities leading disciplines are visible in these categories of industry. These are:

- Pulp making (Forest/Agriculture)
- IT
- Engineering
- Environmental protection

The services provided are the same as the services provided by park 1, all services are there to support the tenant firms on site, see table 2, for a detailed description of these services.
4.4.2 Park Policies of USP 2

Park 2 sets its own tenant criteria and park policies in addition to the general government policies. Over the past five years these policies did not change significantly. Although, the respondent did emphasise that the actual power of the USP itself to set policy increased with respect to the transferring of technology and firm incubation. The USP is more allowed to make its own decisions in this respect.

Setting the criteria for potential tenants happens in accordance with the university, the USP develops these criteria, but the university has to agree. The criteria mentioned by the respondent are mainly of a financial nature and not very limiting otherwise.

For incoming firms the Park has some beneficial policies in place (nspscut, 2006a), in order to attract as many talents of “all kinds” as possible. The USP provides a proof (certificate) to the incoming firm that it is located on the USP in order to facilitate operations. When the tenant firm can be considered as a “university company” costs for telecommunication and IT are reduced. Full access is given to the library and all other resources. Cooperation with the university staff is encouraged in research activities (nspscut, 2006a). Special arrangements are made for tenant firm employees, with respect to child care and education; the USP provides places in university affiliated schools in addition to housing for employees.

The USP also provides help with applying for the special Hi-tech status and evaluation, when accepted for this status these firms are entitled to special benefits with respect to taxation and lower import and export duties. Additional help is provided in dealing with the Chinese government and bureaucracy, for example with applying for local and state government project funding. For the other services provided, also see table 2, (nspscut, 2006a).

Some differences in policies for foreign and domestic firms exist in the policies of Park 2. The foreign firms receive more tax benefits than domestic firms, for example (nspscut, 2006b). See the next paragraph for an oversight of Government policies.
4.4.3 Government Policy specific to USP 2

Contrary to USP’s 1 and 3, state policy has changed with respect to this USP. Rules on tax exemption became more favourable. And the government has increased the technology innovation fund for this USP, as explained by the respondent.

The local Government of Guangzhou, has set some distinctive policies and regulations regarding the technology achievement share of Intellectual Property Rights, e.g. a certain percentage of patents has to be of technological value. Over the past 5 years these distinctive policies of local government have remained the same.

Foreign firms, which are located on the USP, don’t have to pay income taxes during the first two years of making profit, after those two years a 50 % discount, on income tax, is given during three years, effective tax rate then becomes 15 % instead of 30 %. This applies to Hi-tech and production oriented firms (nspscut, 2006b). These benefits are derived from national policy, but the state still decides to which areas and zones they apply.

When a foreign invested firm decides to reinvest its profits or set up another new firm, up to 40 % of paid income tax can be reimbursed. For exporting goods some extra beneficial measures apply. If a firm exports over 70 % of its production, for example, then an income tax reduction of between 10 or 50 % can be appointed. Additionally, some advantages exist for fast payment of taxes, in that case a reimbursement of part of the taxes can be expected, for national registered Hi tech firms this period is three years, for provincial registered Hi tech firms two years.

Locally, the value added tax (VAT) which has to be paid to the local government, can be returned up to 100 %, local VAT is 25 % percent of total national VAT (nspscut, 2006b). While Hi tech firms can get up to 50 % reimbursed within a period of three years. For newly formed foreign invested firms, the paid VAT and sales tax can be reimbursed, from the first sales made, 50 % reimbursement during the first year, 30 % during the second year and 20 % for the third year (nspscut, 2006b). When foreign invested firms increase their investment in R&D for at least 10 % each year, only 50 % of the invested capital will be taxable. In special cases when a Hi tech firm makes sales based on university patented technology, the firm doesn’t have to pay any sales
tax and the income taxes are free up to the first 500.000,- RMB. Foreign Hi tech firms are free to start any joint ventures they want on the USP and don’t have to limit the share of local sales (nspscut, 2006b).

For domestic firms other rules and policies apply. Only part of the foreign firm policy is the same. Domestic Hi tech firms located on the USP, don’t have to pay income taxes during the first two years of making profit, after those two years a 50 % discount, on income tax, is given during three years, similar to foreign firms. However, when a domestic Hi tech firm makes sales based on university patented technology, the firm doesn’t have to pay any sales tax, same as with foreign firms, but the income taxes is only free up to the first 300.000,- RMB, in stead of 500.000,- RMB for the foreign firms (nspscut, 2006b). Rules with respect to local VAT, and fast payment of taxes, are the same for foreign and domestic firms.

An interesting measure for domestic firms is that domestic Hi tech firms are entitled to help from customs, when there is need for importing sample machines, instruments and other critical samples or components which are not available in China (nspscut, 2006b). Domestic Hi-tech firms also don’t have to pay any taxes on capital needed for constructing new buildings meant for R&D, production or sales. When employees of domestic Hi tech firms need to travel abroad for business, a simplified procedure applies in order to simplify and facilitate doing business.

Domestic Software firms can also apply for partial tax reimbursements, provided that the software is developed by the company itself. In the case of software production and sales, the value added tax is 6% and 4% for the sale of software (nspscut, 2006b).

A lot of these policies are derived form national policies, but in the case of Park 2 an active role of the local government can be recognized.

### 4.4.4 Measurement of USP success

Park 2 measures the relative success of its Park, not by profit, but by the growth of tenant firms and employees a year. In this respect it can be seen that the average growth of companies is 13,4 per year, while the number of jobs increased, on average, with 471,4 jobs a year. And regional economic growth is mentioned as an important
measure for success. More literally, success is also measured by counting the number of technology transfers, the number of companies leaving the park successfully, and the amount of investment in firm incubation. With respect to the number of technology transfers (commercialisation of scientific achievements) the respondent considers the park to be quite successful. And also emphasises that this is a very distinctive characteristic which the state Hi-tech industrial Parks don’t have.

Other distinctive characteristics this USP has, are its leading role in the Forest/Agricultural industry and the emphasis that is put on environmental protection. This makes USP 2 unique compared to the other two cases discussed in this thesis.

Internationally, Park 2 has cooperated with several other science park organizations like; the Rose Hulman Institute of Technology (USA), the UKSPA (UK), the OSEO Anvar (France) and the incubator facility of the Singapore National University. Future plans exist to expand the international network for further park development, knowledge transfer, entrepreneurial training and extension to the European Union.

4.5 Case 3
The third University Science Park to be discussed here is located in Gansu province in Northwest China. Information stated here was derived from the official park website and from a respondent employed by the USP, unless otherwise stated.

4.5.1 Park features and motivations
This is the newest USP to be discussed in this thesis. Park three was recently constructed in the year 2002. The initiative to construct this USP was taken by the university itself and the university also fully owns the park. This situation has remained the same over the past five years and no change in ownership has taken place.

With regard to the motivations for constructing the University Science Park, several similarities with the other two parks can be seen. The motivation of transferring knowledge and academic achievements to commercial applications in firms remains the foremost important motivation. But Park three gives equal importance to the promotion and development of Hi tech firms and the development and training of
young talents and entrepreneurs. The respondent emphasises the importance of all three motivations.

These “most important” motivations are followed by three other somewhat less important objectives, the first is the compliance with the governments “long term Strategy for revitalizing China through science and technology”, secondly the motivation for creating jobs is mentioned. Lastly the respondent very honestly answered that creating extra income for the university also is a motivation for operating the science park. These motivations have not changed during the life time of this University Science park.

Park 3 has a total of 72 firms on its premises, all of these firms have a domestic origin and no foreign invested firms are present. The structure of the USP consists of several different sites within the local municipality, this University science park has no satellite parks in other regions, like Park 1 has.

There were 569 employees in total on this park, by the end of 2006. This means that the firm size, in terms of employees, is on average 7,9 employee per firm, which is much smaller than the average sizes of the other two USP’s.

The industries present on the USP are; IT, Biosciences, Agriculture and Forest, Electronics and Telecom, Services, New Materials and Energy. The dominant industry is that of IT with a total of 42 firms (57 %), followed by Biosciences (14 %), see fig 6 for a breakdown of all industries present on Park 3.
The services provided are very similar to the services provided by park 1, see table 2, for a detailed overview. The availability of such services is often part of the USP policy for attracting and supporting tenant firms.

4.5.2 Park Policies of USP 3

Park 3 sets its own tenant criteria and park policies, which apply in addition to the general government policies. Since this Park is still very much in its developing stage, university policies have been expanded (9 extra issues) over the past five years to keep up with its development.

The tenant criteria are set by the park itself, and these relate mostly to economic criteria, Hi tech potential of the firm and its potential for the market. Costs for student and university staff tenants are very much negotiable and also depend on the potential for success, when expectations are high, free space is even offered. From the policies of this USP it can be seen that the focus is very much on USO’s as opposed to CSO’s. The University staff and students are very much encouraged to start their own businesses.

The USP policy is specifically designed to encourage university staff and students to start innovative activities and new businesses in the USP, access is provided to all university resources including recruitment, advice, equipment and information.
services (library) (USP, 2003). The USP management also actively supports the
development of service firms set up by university staff and students with consultancy
purposes for other starting firms, these service firms may become a “Science Park
Member Company”. These Science Park Member Companies play a role in the
incubation of new firms. All research projects which have merit for practical
application are supported by the university to be incubated in the USP (USP, 2003).
And the USP is fully committed to commercialising scientific achievements of the
university and represents the university in this matter.

The university also actively encourages its staff and students to work part-time in the
USP or its member companies, this can take several different forms like; R&D,
Marketing, Project evaluation and the setting up of a firm. These part time jobs have
to be approved by the university, but the university then also commits to supporting
the part time activities. In the case of staff members, there’s even the provision that
salary from the university remains at the same level if the staff member is fully
functional in his job, and all extra income from the part time job also falls to the staff
member in question. When the project is affiliated with the universities name
(credited to) all associated work hours are considered to be “normal“ university work
hours (USP, 2003).

In addition to that, university staff is also encouraged to start up their business full
time with support from the university, for example, help with procedures is provided
by the university. The USO’s will then be evaluated yearly by the USP management
and the performance of the former staff member is reported back to the university. It
is expected that the staff member finishes starting his or her business within three
years, during this period the “former” staff member keeps his or her status as a
university staff member and the option remains to be hired back by the university
(USP, 2003).

There are also some specific policies for students of the university. Providing that all
study activities are fulfilled, students are encouraged to participate in USP activities
after getting permission from their supervisor. Bachelor students in their third and
fourth year and second year master students are permitted to temporarily quit their
study for the purpose of starting a business. In addition several activities are organized
together with the USP, like writing a business plan and all kinds of science competitions.

All tenants have access to university resources, fees collected are the same as the internal university fees. Access is available to the library, lab, research institute, publisher, engineering centre, network centre and test centre. All mentioned facilities are also actively encouraged by the university to set up joint projects with the science park firms. The same goes for all faculties with applicable research projects and patents.

4.5.3 Government Policy specific to USP 3
State policy with regard to this university science park has not changed since its opening in 2002. The local government has set some special policies with respect to university staff and students who want to set up a new firm and there are also some special provisions for Chinese entrepreneurs returning from abroad. The respondent explained that these policies have been altered several times over the past years. She explained that the reason for these changes was the development of the park, since the park has evolved, supporting policies had to be adapted to the changing needs of the USP.

On a provincial level there are differences in policies for domestic and foreign firms, the respondent explained that all policies for foreign firms, are the same as the policies applying to the nearby Hi tech industrial park and thus apply to the USP.

4.5.4 Measurement of USP success
The relative success of USP three is measured by five different aspects, first by actual profit and since generating income for the university is a motivation for operating the USP this seems quite logical. Secondly and thirdly the growth of new tenant firms and jobs are considered to be indicators for success which corresponds with contribution to local economic growth as an indicator for success. The firm growth was on average 14.4 firms a year and job growth was 113.8 jobs per year.

Similar to park 2, the actual number of knowledge and scientific achievements transfers and amount of invested capital are used as indicators for success. The
respondent describes the USP as being moderately successful with much room for improvement. She explained that in comparison with other USP’s there is still a significant gap with the best performing USP’s. In order to improve results policies are reviewed and improved regularly, as discussed in the previous paragraph. She also indicated that to identify “best practices” university science parks abroad are also being studied.

When asked to identify a unique characteristic of the USP, the respondent emphasised that tenant firms can complete all procedures for getting business and industrial services in “one stop” at the same office. Cutting back “red tape” can be considered a best practice here.

With respect to international cooperation, Park three does not have such an extensive range of alliances as the other two parks. But close cooperation exists with several Korean universities. This cooperation form, mostly benefits students and is not specifically aiming at business development. Plans do exist to extend the international network in the future, as the respondent explains “cooperation and its effectiveness are also an important measurement of success for our University Science Park”.
5. Features of Chinese University Science Parks

In this chapter the findings of the case studies will be discussed and evaluated in light of the research questions formulated earlier in this thesis.

5.1 Taking initiative; the founders and owners of Chinese USP’s

Within these three cases there are some interesting developments with respect to the founding of the USP’s and its ownership. Two parks were founded by their host universities while in the case of Park 2 the state government took the initiative for founding their USP. At the time of foundation all universities had ownership of their respective science parks. But in the first case, an interesting development took place in 2000, the type of ownership changed to a mutual shareholding existing of different shareholders making the owners a diverse group of university, state and local government and private investors. The university, however, stays in full control.

This university seems to have better access to funding than the other two universities. This USP is also closest to “Beijing’s powerful and intrusive political organs and attracts the offices of companies needing to be close to networks of power” (Walcott, 2003). This seems to indicate that the state government has a lot of influence on USP 1, but on the other hand there’s the fact that there have been no changes in state policy over the past five years, while the USP became financially more independent, because of its new legal form. In the case of municipal influence the USP also seems to be quite independent, this could be contributed to its state level position. Through the university, state control still seems to be quite high, contrary to local government influence.

In the case of USP 2, there seems to be a more active involvement of state government, but mostly in a supporting fashion; the extension of favorable tax policies is mentioned and funding was increased. But the fact that the government initiated construction, leads instinctively to the feeling that state influence is high, although it seems to have lessened in the past five years. Local government did impose some conditions for operating the park. So, local government does seem to have some control over the USP.
USP 3 seems to be more in control with respect to the state government, but has to adhere to more conditions imposed by local government. Here the university plays a strong leading role and an emphasis is put on the development of students and USP use for the university.

Within nations like the UK and the USA, the initiative for founding and operating a USP seem to be much more diverse. See table 2 on page 59. Here a major role is played by not only the different levels of government and the university, but also by development agencies and private investors. In the USA there are also foundations involved in development of USP’s (Luger and Goldstein, 1991). More diversity can also be seen in the use of joint ventures for operating USP’s.

5.2 Motives for the construction of the Chinese USP’s

All three Chinese USP’s emphasised that the main goal for operating their USP was the transfer of knowledge and scientific achievements for commercialisation. This motivation basically comes directly from the Ministries of Science and Technology (MOST) and Education16 (Zhang et al, 2003). All three USP’s also responded that they consider the construction of University science parks to be part of the governments “long term Strategy for revitalizing China through science and technology”.

So the main motivation appears to be instigated by state government objectives. Surprisingly the development of Western China was not acknowledged by the third USP, even though it is located in a region which is considered to be “underdeveloped” economically (OECD, 2002b) and the state government sees regional income disparity as a major issue.

The two youngest parks, also specifically mention the promotion and creation of new Hi tech firms, unlike USP 1, which is perhaps attributable to the difference in size of the three Parks. Park 1 already has over 400 firms on its premises and has experienced an enormous growth over the past thirteen years. Park 1 also puts much more emphasis on cooperation with, and drawing foreign firms to its premises, which are

16 www.most.gov.cn & www.moe.edu.cn
mostly existing firms. The fact that the youngest two parks also emphasise the creation of jobs seems to support the motivation for growth and development. Park three is located in the poorest region of these three cases, and the division of regional R&D expenditure (OECD, 2002b) is likely to effect its amount of funding received. This supports the motivation of Park 3 to create more jobs and Hi tech firms. And in addition to that to create extra income. Also see fig 7, for the R&D expenditure per region.

The development and training of young talents and entrepreneurs was also emphasised by all three USP’s, which could be inherently linked to being an educational institution, and reflects the interest of the host university.

Within the United Kingdom and USA, USP’s the creation of income for the university is often mentioned in addition to regional development, through the creation of jobs and firms. In both nations the creation of an “innovative milieu” is also mentioned as a motive and focus for research. In the literature more emphasis is also placed on responding to industry needs. The UK parks specifically voice the motivation for attracting leading edge firms to their parks. And in American literature the need to show a tangible return to society is mentioned as a motivation, contrary to the Chinese parks.
5.3 The “Toolkit” of USP’s and room for negotiation

What should potential tenant firms look for when they are considering to locate on a Chinese university science park? First of all firms should get familiar with all relevant preferential state policies and find out if they apply to the particular USP they want to locate on. Because only when the state has acknowledged the USP, these policies apply. In some cases the state has made some extra provisions for S&T development, like for example the extra innovation funding for USP 2.

Provincial and local governments, may provide extra preferential policies often in the form of reimbursements of VAT and lowering taxes on sales or construction of buildings. These policies can differ per region and are worth looking into. Local governments can also impose some restrictions on the parks as to tenant criteria for example, like mandating a minimum percentage of Hi tech firms within the park. As to giving consent for forming joint ventures between foreign and domestic firms, the Ministry of commerce (formerly Ministry of Foreign Trade and Economic Cooperation) has the final say in giving permission for these. But lately the state is delegating power to allow JV’s more and more to local Approval authorities, which often can be found in the local USP or Hi tech industrial park (Marson, McGinn and Huang, 2002).

Park policies tend to be reasonably the same and mostly apply to available services and resources. Some special policies may apply to university staff and students. Furthermore, there are special policies for entrepreneurs returning from abroad, mainly aiming at students studying abroad. But what firms should understand from these USP’s is that they have a lot to negotiate about. First there is the lease of the space of course; the Parks often have different tariffs for different groups of firms. In the case of Park 2 the tariffs seemed quite fixed, but both Parks 1 and 3 explained that there’s much negotiation room in the price for lease and services.

Firms, especially foreign firms, should also realize that currency is not the only resource they can use to trade with. When a firm has Hi tech knowledge, wants to conduct joint research or can help with creating jobs (Park 2 and 3), this also gives them bargaining power.
With respect to available services, the Chinese USP’s provide a very similar array of supporting services. Most of these services are also very similar to the services provided on Western USP’s. But Chinese USP’s put some extra emphasis on training, they often have training centers, and the facilitation of government relations. The latter corresponds to the suggestion of Ralph Jennings (2002) who already implicated that the support of park and government officials is an important factor within some of the Chinese science parks.

In the case of UK and American USP’s, the importance of the university reputation for newly formed firms is discussed within the literature together with the role of the USP’s in providing access to funding. Tenant criteria are less imposed by government regulation and in the American parks set by either the university, the park management itself or the park board.

5.4 Comparison to Western USP’s
When further, comparing these Chinese USP’s to British USP’s it can be seen that the development of British USP’s already started in 1972 (Siegel et al, 2003b), in 1999 there were 46 fully operational USP’s growing to 66 in 2005. The goal of the majority of tenant firms on site is to commercialise leading edge technologies, mostly in the field of biotechnology, materials, telecommunications, computers and technology applying to environment and energy (Siegel et al, 2003b). Similar to most Chinese parks the largest product sector within British USP’s is IT (UKSPA, 2006). According to the UKSPA some local regions were indeed able to retain more university graduates, thanks to jobs on USP’s.

Between 1987 and 2005, 37 USP’s were established, the total number of tenant firms grew with 2399 and the number of jobs increased with 60,670 (UKSPA, 2006). This indicates that the average firm size in terms of jobs grew from 11,9 in 1987 to 22,6 in 2005 which is still much lower than the average firms size of Parks 1 and 2. Despite the older age of most parks. In 2005 British USP’s housed on average 45,5 firm per park (UKSPA, 2006), which is also much lower than the average number of firms on Chinese USP’s. Even a relatively small Chinese USP like Park 3, is already twice the size of an average British USP.
Job growth in the three cases varied between 113,8 and 1154 on average since establishment. When comparing this to for example the American University Research Park of Charlotte (Link and Link, 2003) up till 1998, then we see an average growth of 600 jobs a year, in the case of Stanford research Park 553,2 and up to 1500 jobs a year for the largest USP in America (Metro Tech). These are the largest USP’s within America and growth rates in terms of jobs are relatively similar for the Chinese Parks 1 and 2, on average the Chinese Parks seem to be much larger. Another similarity with USP’s in the USA is the leading and supporting role of both universities and federal government (Link, 2003). In the USA over fifty percent of all USP’s have been founded with use of public funding (Link, 2003).

With respect to USA research parks, a large diversity in development strategies and policies can be recognized, these differences usually reflect the differences in the specific objectives that the respective investors have (Luger and Goldstein, 1991). In the USA some parks address specific R&D needs of local firms, while other parks may focus on generating innovative start ups with local entrepreneurs (Luger and Goldstein, 1991).

Another difference can be found in the access to funding. Western USP’s have an advantage over Chinese USP’s when it comes to access to funding. In China a large financial dependency has existed on the government over the years. But lately the Chinese government has set the goal to establish a better functioning financial system, with emphasis on venture capital (Huang et al, 2004). This way technology based firms should be better supported in new Hi tech development and R&D. In order to build such a functional financial system the legal framework has to be improved, particularly with respect to venture capital (Huang et al, 2003).

Building a better functioning financial system would lead to Chinese USP tenant firms, having a similar position to Western USP tenants. So, is the playing field leveling already? To answer this, data of the NBS (2006) was reviewed. And it can be seen that total S&T funding was 234670 million Yuan in 2000 and increased, with almost 124 %, to 525080 million Yuan in 2005. Interestingly is that in 2000 the “self raised” funding was already larger than the amount of funding coming from the government.
In order to create a better access to venture capital, it should be easier to get a loan for new businesses, the amount of money going into Science and Technology through regular financial institutions is quite low compared to self raised and government funding. The development of increasing self raised funds seems to be a quite positive development, and is already taking a more important position than government funding. Currently, Western start up companies seem to have better access to finance than Chinese start up companies have.

In September 2001, the Chinese state government has released, the “Venture Capital Regulations” with the intention to establish and perfect China’s venture capital market (Marson et al, 2002). By doing this the existence of the venture capital market was acknowledged by the Chinese government (Marson et al, 2002). Nowadays, there are several different venture funds available for Chinese entrepreneurs; these range from foreign Venture capital funds, to funds from local and state government to Venture funds linked to Hi tech zones and Universities (Marson et al, 2002). Indicating an increasing role played by private investors.

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2005</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government funds</strong></td>
<td>59340</td>
<td>121310</td>
<td>104 %</td>
</tr>
<tr>
<td><strong>Self raised funds by firms</strong></td>
<td>129640</td>
<td>344030</td>
<td>165 %</td>
</tr>
<tr>
<td><strong>Loans from Finance institutions</strong></td>
<td>19620</td>
<td>27680</td>
<td>41 %</td>
</tr>
</tbody>
</table>

Table 3; Source NBS, 2006; All S&T activity funding in million Yuan.

With regard to USP’s, I have to be careful though, this data is very much aggregated and I can only assume that it is somewhat comparable to the financial position of tenant firms in USP’s. Although I would expect that the amount of government funding is still comparably higher than in the figures states in table 3 above. When looking for example at funding for S&T activities within all (state) research institutes a different picture is shown, see table 4. Tentatively I assume that part of the funding here goes to some of the USP’s, since the earlier discussed, “innovation fund” is part of state S&T funding and the Parks described in this thesis receive a portion of this fund and are still owned mostly by the university. Then it can be seen that within research institutes only a very small part of funding comes from actual venture
capital. But again this is mainly an assumption, since no breakdown of this data is available.

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2005</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Government funds</strong></td>
<td>43490</td>
<td>76340</td>
<td>76%</td>
</tr>
<tr>
<td><strong>Self raised funds by firms</strong></td>
<td>2540</td>
<td>5620</td>
<td>121%</td>
</tr>
<tr>
<td><strong>Loans from Finance institutions</strong></td>
<td>860</td>
<td>1270</td>
<td>48%</td>
</tr>
</tbody>
</table>

Table 4; Source NBS, 2006; All S&T activity, in state research institutions, funding in million Yuan.

It can be seen that funding from self raised funds is growing faster in comparison with the funding from all S&T activities. This could indicate towards venture capital becoming better accessible for research institutes including the USP’s.

Another distinct difference between Chinese and Western USP’s is the special place returning students from abroad have taken in. Many USP’s have special sub parks and policies in place for this group of potential entrepreneurs. And state government also has supporting policies in place. In 1978 the state government started with, as a part of its economic opening up, sending young Chinese abroad to study. Starting with 860 students in 1978 this number increased to 118,515 students in 2005 (NBS, 2006). Now these students form a valuable human resource asset in forming new Hi tech firms, since they bring back capital and technology (Huang et al, 2004).

The USP conceptual model can be adapted now, with some of the Chinese Characteristics found here in this thesis, see fig 8 below. Many of the elements correspond with the Western USP’s but some differences exist, as discussed above. Resources provided by the university are largely the same, banks play a minor role while the venture capital industry is growing fast. A special group of potential entrepreneurs is formed by the students returning from abroad. The USP has an important role when it comes to facilitating government relations and the Chinese USP has a close relationship with the nearby Hi tech industrial zone. Further there is the large amount of control still exercised by the state and local governments.
This new conceptual model leads to new research questions and propositions, foremost there is the relationship between the University, USP and Hi tech zone which requires further study. An interesting notion here is the fact that these USP’s seem to have initiated after the establishment of the Hi tech industrial zones. The Chinese USP’s were a response to the poor performance of the Hi tech industrial parks which were initially constructed to utilize scientific achievements. When comparing this with, for example, the development of Silicon Valley a more gradual development from USP to Industry cluster can be seen.

Fig 8. Concept of a Chinese University Science Park.
Some propositions which can be formulated specifically in relation to Chinese USP’s are:

P1: The USP plays a major role in the facilitation of relations between firms and the government.

P2: A major part of Chinese USP tenant firms consists of returned students from abroad.

P3: Returned students from abroad, bring back venture capital.

P4: Returned students from abroad, bring back Knowledge and Technology.

P5: Venture Capital is rarely provided by Chinese financial institutions.

P6: Chinese entrepreneurs on USP’s have access to Venture Capital, through various venture capital funds.

5.5 Recommendations for future research

This research foremost provides a starting point for future research. The population of state level University Science Parks, shows a diversity in very young and more mature parks, potentially giving an excellent opportunity to gain an in depth insight into the development of these USP’s. For future research of this subject full cooperation of the Chinese government and the CUSPA would be desirable, because then, better access to detailed data, including financial values can be attained.

After conducting more qualitative research, the theory then could be quantitatively tested by sending out questionnaires to all 49 state level USP’s. And in a later stage expanded to USP’s on other levels. The relationship and interaction between University, USP and Hi tech Industrial zones is a very promising new field of research.
Conclusion

This thesis has provided an exploratory investigation into the development of Chinese University Science parks. It investigates and discusses some of the similarities and differences between Chinese and Western USP’s.

The concept of a University science park or science park may be well known within the US and the Western world. Especially a USP like ‘Silicon Valley’, affiliated to Stanford University, speaks to the imagination. But in reality it is not always easy to build a good working USP beneficial to all parties involved. And within China this subject is of major interest to different parties, like the state government who has outspoken its interest in technology transfer quite clearly. But also local governments, universities, entrepreneurs, domestic and foreign firms, Hi tech zones and the upcoming venture capital funds are stakeholders in this development. Even other transitional and developing economies could benefit from more insight into the development of these Chinese USP’s.
Literature


Lanzhou USP, 2003. *Lanzhou University policy on Science park development and encouragement of university staff and students to start businesses*. [on line, 31-12-2006] [www.lzusp.cn](http://www.lzusp.cn)


Wang, M. Y., Meng, X., (2003) Building nests to attract birds; China’s hi-tech zones and their impacts on transition from low-skill to high-value added process.


Websites:

http://www.atip.org; Asian Technology Information Program

www.aurp.net; Association of University Research Parks

www.cuspa.org.cn; Chinese University science parks association.

www.cadz.org.cn; CADZ

www.china.org.cn; China Internet Information Center

www.iasp.ws/publico/intro.jsp; International Association of Science Parks

www.innofund.gov.cn; Innovation fund for small technology based firms

www.lzusp.cn; Lanzhou national university science park

www.moe.edu.cn; Ministry of Education

http://english.mofcom.gov.cn/; Ministry of Commerce

www.most.gov.cn; Ministry of Science and Technology

www.nspscut.com; South China University of Technology Science Park

www.stats.gov.cn; National Bureau of statistics of China

www.thsp.com; Tsinghua science park

www.ukspa.org.uk; UK science park association
Appendix 1 State-level University-based science parks

1. Huanan University science and technology park
2. Shenzen University science and technology park
3. Wuhan East lake University science and technology park
4. Yuelu Shan University science and technology park
5. Henan Province University science and technology park
6. Sichuan University science and technology park
7. Qinghua University science and technology park
8. Beijing University science and technology park
9. Fudan University science and technology park
10. Shanghai Jiatong University science and technology park
11. Shanghai University science and technology park
12. Xian Jiatong University science and technology park
13. Southeast University science and technology park
14. Zhejiang University Country University science and technology park
15. Harbin Industrial University science and technology park
16. Nanjing University University science and technology park
17. Chongqing University science and technology park
18. Northwestern Polytechnical University University science and technology park
19. Shandong University science and technology park
20. Northeast University science and technology park
21. Tianjin University science and technology park
22. Yunnan Province University science and technology park
23. Hefei University science and technology park
24. Tongji University science and technology park
25. East Chinese University science and technology park
26. Beijing Institute of Technology University science and technology park
27. Beijing Normal University three schools union University science and technology park
28. Mt. yanshan University science and technology park
29. Nanjing University of Science and Technology University science and technology park
30. Jilin University science and technology park
31. Nankai University Country University science and technology park
32. Beijing Chemical industry University science and technology park
33. Nanchang University science and technology park
34. Lanzhou University science and technology park
35. Chongqing Beibei University science and technology park
36. Dalian University of Science and Technology science and technology park
37. Qingdao University science and technology park
38. Beijing Scientific and technical University science and technology park
39. Beijing Industrial Country University science and technology park
40. Xinjiang University science and technology park
41. Petroleum University science and technology park
42. East China University of Science and Technology University science and technology park
43. Zhejiang Province University science and technology park
44. Xiamen University science and technology park
45. Southwest Jiaotong University science and technology park
46. Electronics scientific and technical university science and technology park
46. Northwest farming and forestry scientific and technical university science and technology park
47. Beijing Posts and telecommunications University science and technology park
48. Beijing Aerospace University science and technology park
49. Harbin Engineering University science and technology park
### Appendix 2: Search results in Google scholar

<table>
<thead>
<tr>
<th>Search term</th>
<th>Initial hits</th>
<th>“exact phrase” term</th>
<th>After removing, non relevant hits*</th>
</tr>
</thead>
<tbody>
<tr>
<td>“university science park”</td>
<td>58,000</td>
<td>69 hits</td>
<td>22</td>
</tr>
<tr>
<td>“university-industry links”</td>
<td>1,910</td>
<td>221 hits</td>
<td>13</td>
</tr>
<tr>
<td>“university research park”</td>
<td>98,800</td>
<td>64 hits</td>
<td>7</td>
</tr>
<tr>
<td>“China Innovation Policy”</td>
<td>30,400</td>
<td>2 hits</td>
<td>0</td>
</tr>
<tr>
<td>“Chinese innovation policy”</td>
<td>15,900</td>
<td>10 hits</td>
<td>4</td>
</tr>
<tr>
<td>“China venture Capital”</td>
<td>17,300</td>
<td>90 hits * *18</td>
<td>2</td>
</tr>
</tbody>
</table>

*Not available, other subjects, not articles, double (previous searches) etc.

table: Search terms Google Scholar.
Appendix 3: Questionnaire

Questionnaire:

Name : 
Function : 
Contact data : 
Address : 
Telephone : 
E-mail :

*Please click on the relevant boxes, when applicable you can click more then one option.*

1. In which year was your University Science and Technology park founded?

2. Who took the initiative, founding the University science and technology park?
   
   Was this :
   
   i. The state Government
   ii. The Local Government
   iii. The University
   iv. Other, please explain

3. Who had ownership of the park when the park was founded?

*Please click on the relevant boxes, when applicable you can click more then one option.*

i. The state Government
ii. The Local Government
iii. The University
iv. Private Company
v. Other, please explain
4. Has the ownership of the park ever changed?
   a. No ☐
   b. Yes ☐

   If the answer is yes, could you please explain the change of ownership?

5. What were the motivations for setting up this university science park?
   Please click on the relevant boxes, when applicable you can click more then one option.
   a. Realizing the government’s long term Strategy of Revitalizing China through Science and Technology. ☐
   b. Realizing the state governmental strategy of developing western/ north eastern regions. ☐
   c. Knowledge transfer (Scientific achievement transfer) and exploiting university resources. ☐
   d. Promotion and creation of Hi-tech enterprises. ☐
   e. Development and training of young talents and entrepreneurs. ☐
   f. Creation of jobs. ☐
   g. Create income for the university ☐
   h. Other, please specify

6. What do you consider to be the most important motivation, for founding the University science park? Please elaborate:

7. Has the main reason, or motive, for operating the University Science Park ever changed? Please explain if this is the case:

8. How many companies are there on the park, at this moment?

9. How many are foreign?

10. How many employees are there on the park?
11. What are the main industries, your science park, focuses on? *More than one answer is possible.*

   i. IT
   ii. Life sciences
   iii. Biosciences
   iv. Agriculture/forest
   v. Aerospace
   vi. Electronics/Telecommunications
   vii. Services
   viii. Automotive/(ground transportation)
   ix. New materials/Nano-materials
   x. Energy/new energy
   xi. Other, please specify

There are several influential policies having an impact on the University science parks, the following questions concern these policies.

12. Has State government policy changed in the past 5 years, concerning the University science park? *If Yes, please explain and elaborate:*

13. Please explain the most distinctive aspects of the policy set by the local government, concerning your University science park.

14. Did, the local policy change significantly over the past five years? *If Yes please explain and elaborate:*

15. Did, the University policy, concerning the science park, change significantly over the past five years? *If Yes please explain and elaborate:*

16. Has the university or the science park gained more power to set its own policy over the past years? *If Yes, please provide an example:*

17. Does the university science park set its own tenant criteria? If not who does?
18. Could you please describe the tenant criteria?

19. Does the policy for the local companies differ from the policy for foreign companies? If yes, what are the major differences?

20. How does the park measure its success? More than one answer is possible.
   i. By profit
   ii. Growth of number of companies
   iii. Growth of number of jobs
   iv. Contribution to local economic growth
   v. Other, please explain;

21. How successful has the park been in relation to your answer of question 20? Please explain and elaborate.

22. What do you think makes your park distinctive or unique from other university parks, in China? Give, for example up to three unique top features.

23. Does your university science park have a form of cooperation with foreign universities or science parks? Please give an example if that is the case.

24. Does your university science park have future plans for cooperation with foreign universities or science parks, in the coming five years? Please explain.

Thank you very much for your time and effort!
If you have any questions or additional comments, please use the space below.
Appendix 4: Park 1, International cooperation

International Networks

Australia
  • Monash Science Technology Research & Innovation Precinct
  • Melbourne University

Finland
  • Technology Center Teknia

Germany
  • Technologiepark Heidelberg GmbH

Japan
  • Kanagawa Science Park
  • Kansai Science City

Korea
  • Ansan Technopark
  • Songdo Techno Park

Thailand
  • Thailand Science Park

United Kingdom
  • Manchester Science Park
  • The Oxford Science Park
  • Aston Science Park
  • York Science Park

USA
  • Rose Hulman Institute of Technology

International organizations in cooperation with Tsinghua Science Park:

  • Australian Chamber of Commerce in China
  • British Chamber of Commerce in China
  • Forum Francophone des Affaires (FFA)
  • International Association of Science Parks (IASP)
  • Japan Chamber of Commerce and Industry in China
  • Japan Science and Technology Agency, Beijing Office
  • Japan-China Economic Association, Beijing Office
  • JETRO (Japan External Trade Organization), Beijing Office
  • JETRO (Japan External Trade Organization), Guangzhou Office
  • JETRO (Japan External Trade Organization), Qingdao Office
  • Korea International Trade Association, Beijing Branch
  • Singapore Economic Development Board (EDB)
  • Swedish Chamber of Commerce in China
  • The Norinchukin Bank, Beijing Office
  • The United Kingdom Science Park Association (UKSPA)
Appendix 5: Municipal Goals concerning Park 1

Primary goals in the incubation system building of Beijing. Derived from: http://www.incubator.com.cn/En/Policies&Regulations2.htm

1. To speed up the development of specialized incubators, university science parks, overseas returned student business development parks, SOE incubators and other types of incubators.

2. To actively carry out the reform of operative and management mechanism. Efforts should be made to explore the possibility of having such a management that fits in with the economic development of socialist market economy, and the development trend of business incubation service and form an in-house motivation mechanism so that incubation efficiency and service quality will be improved. In government-oriented incubators, a system of director responsibility under the supervision of the governing council should gradually be set up to standardize the management.

3. To perfect the incubational service. In terms of start-up training, fund-raising, market exploration, and international cooperation, effective steps should be taken to have more diversified service available to incubators when it comes to business management, marketing, technology, information, human resources, fiscal affairs, financial and legal service.

4. To improve the fund-raising function. Efforts should also be invested to intensify the funding service to firms by assisting them in soliciting various types of funding channels. Seed money and loan guarantee fund as well as other types of funding service should be rendered steadily. Firms will be assisted to obtain financial support from the specialized government funds. Active measures should also be envisaged to attract to the incubators private investment and various funds that support innovation. No effort should be spared to solicit joint investments for certain projects and partners with a view to drawing more venture capital to incubators.

5. To move the incubators in a pluralistic direction. Encouragement should be given to pluralistic investors to set up incubators of various economic nature. SOEs, investment agencies, non-state capital and foreign capital are all welcome to invest in incubators.

6. To build a strong force of personnel servicing the start-ups. Those versatile, high-quality young and bright personnel should be incorporated into the management as reinforcement. The existing management personnel should be trained so that they will measure up to the job requirements.

7. To further create conditions favorable to the growth of incubators, including policy framework, investment and financing system, intermediary service.