XXV IASP World Conference 2008

Chinese University Science Parks - Overview and its operation models

Plenary Session 4:

Cities and their Science Parks - growing local economies

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The Overview and Operational Models of University Science Parks in China

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Table of Contents

Chapter I Background of the Emergence of University Science Parks in China

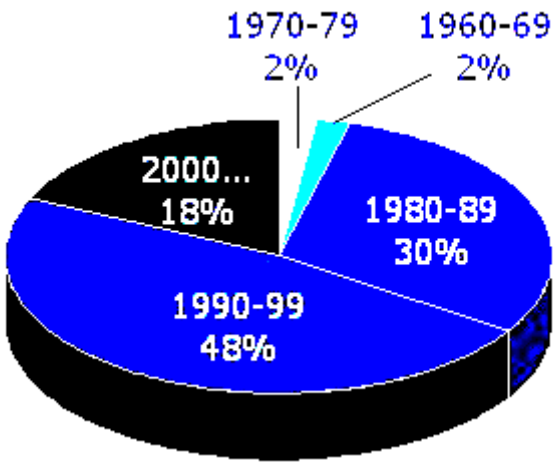
1. Emergence and Development of University Science Parks in Foreign Countries

The emergence and development of university science parks is an objective demand and an inevitable result when social productive forces develop to a certain historical period. Currently, human society is moving from an industrial economy to a knowledge economy. Unlike the industrial economy, the development of the knowledge economy must be human-oriented, relying mainly on human spiritual initiative and creativity and on creative human spiritual activities. The main feature is knowledge and technological innovation. On the other hand, the industrial economy takes human beings as a tool of production and regards various types of production tools as an extension of human organs. While the production of knowledge, information and other intangible products plays the predominant role in a knowledge economy, the production of tangible products or commodities plays the predominant role in an industrial economy. Thanks to their development for centuries, universities have formed dynamic mechanisms for innovation and have become an important source of human knowledge and technological innovation. They are at the forefront of human innovation activities. Establishing university science parks can turn university capacity for knowledge and technological innovation into a motive force for industrial development. This has become an objective law and requirement governing the development of the knowledge economy.

Stanford University in the American state of California was the first to establish a university science park in the 1950s. By relying on the university's strength, the park served as a bridge to link the university's research results with companies and combined teaching and research with production, thus making a tremendous success in industrializing high technologies. So far, a 150-kilometer-long high-tech industrial belt, namely the "Silicon Valley" in America, has been formed, comprising thousands of enterprises and employing millions of people. With Stanford University being in its central area, the Silicon Valley attributes more than 50% of its annual sales to the university-related companies. The Silicon Valley has cultivated and promoted the new economy around the globe. As a result of the success of Stanford University and the Silicon Valley, the model closely combining university teaching and research with economy has been fast popularized to various parts of the world. In

1956, a triangle research park was established in the state of North Carolina. Beginning in the 1970s, dozens of universities in Britain established science parks around them. In 1970, the Cambridge Science Park came into being. Since then, university science parks have mushroomed across the world, including those in the American region of Los Angels, the Indian region of Bangalore and the British region of Cambridge.

As indicated by the diagram below, the development of university science parks became faster around the world after 1982.



Time of Science Park Establishment (by November 2002)

2. Background of the Emergence of University Science Parks in China

(1) External Environment for the Emergence of University Science Parks in China

University science parks began to appear in China in the 1980s. Since China began reform and opening up in 1978, the world has witnessed a rapid development of science and technology and a closer combination of science and technology with economy and society. In this course, building the nation through science and education became a basic policy of China. The country began to comprehensively promote the establishment of high-tech industrial development zones in 1987 and boasted of 120 high-tech zones in 2002, of which 53 were national ones. The establishment of high-tech industrial development zones stimulated and promoted the emergence and development of university science parks.

From 1983 on, Southeast University, Huazhong University of Science and Technology, Northeast University and a host of other universities began creating their university science

parks in various ways*. In 1989, Northeast University officially launched its university science park, the first of its kind in China. Later on, Harbin Institute of Technology, Shanghai University of Technology, Southeast University and Tsinghua University also formally established their university science parks and made fairly good achievements. The roles and significance of university science parks gradually won social recognition and support. By 1999, China had more than 40 university science parks in various forms. In August 1999, the Ministry of Science and Technology and the Ministry of Education selected 15 different types of university science parks, including those established by Peking University and Tsinghua University, for the experiment on national university science parks. Based on this experiment, more national university science parks were formally established during the 10th five-year plan period. Some provinces and municipalities also established their provincial and municipal university science parks.

(2) Internal Environment for the Emergence of University Science Parks in China

The emergence of university science parks in China was mainly designed to meet the need of converting research results. It was an inevitable result of the development of university functions. They had to conduct teaching and research and to serve society. At the same time, it was also designed to meet the need of building a national innovation system, so as to pursue a transition from being "made-in-China" to being "created-in-China".

Being a carrier of the development of the knowledge economy, university science parks are the places where innovation activities are most active. Therefore, they are the incubators of research results and enterprises, and can fully integrate diverse factors required for the development of the knowledge economy and can form powerful innovation capacities. University science parks play the following main functions:

A. Incubator function. The incubator function is the basic function of university science parks. Incubators, which can be classified into general and special types, can provide a suitable growth environment and full-range and diverse services for the sci-tech personnel and for the conversion and industrialization of their research results and projects so that the enterprises can reduce their initial investment and minimize their growth risks.

B. Accelerator function. The key accelerator function is to provide blood transfusion and recharging for the development of enterprises. University science parks have created a mechanism for the marriage between capital and technology so as to produce an effect of involution. University science parks can establish frameworks that can best attract the risk

* China Business: China to Promote the Construction of University Science Parks, 2000-05-10.

capital from institutional investors, put various types of capital together, invest it in the seedling high-tech enterprises in the form of risk investment, and accelerate the growth of enterprises. Diverse investment and financing systems featuring risk investment can be established in university science parks. By cooperating with the financial and investment institutions, venture capital markets can be established, which feature the risk investment fund, the business incubation fund and the high-tech industrialization financing security fund. Meanwhile, the domestic and foreign stock and option markets can be utilized to diversify the investment and financing channels and to serve the incubation and cultivation of high-tech enterprises.

C. Server function. With complete support service systems, science parks can integrate service resources and build business creation platforms that can promote the development of enterprises. The server systems of science parks include law firms, accounting firms, appraisal firms, patent firms, consulting companies, planning companies, certification institutions, test centers, training centers and network centers and can undertake conferences, business talks, academic reports, result exchanges, project appraisal, technical exchanges and residential services. In short, they can provide full-range services for enterprise incubation.

The key reason why university science parks can perform the above functions is that these parks can gather and fully integrate all innovation factors to form regional innovation networks.

Chapter II Current State of the Development of University Science Parks in China

The systems of education and science and technology in China underwent great changes in the 1980s. Breaking away with the traditional school-running models, active efforts were made to explore new ways to combine science and technology with economy. Many universities established their own university science parks with different characteristics by drawing on the successful experience of foreign university science parks, making use of local advantages and taking advantage of their own human, financial and materials resources and research results.

For example, Northeast University became the first to establish a university science park in 1989.

Take-off period (before the mid-1990s)

In the early 1990s, some technology corporations sponsored by key universities played more and more important roles in developing a market economy. With these corporations working as the backbone force, some university science parks gradually emerged on some university campuses and in their surrounding areas.

In 1990, Northeast University established its science park in Nanhu, Shenyang. In 1992, Shanghai University of Technology, Harbin Institute of Technology and Peking University began building their own science parks. In 1993, Tsinghua University, Southwest Jiaotong University, Nanjing University, Shenyang Institute of Technology and Huazhong University of Science and Technology established their science parks.

Growth period (the middle and later 1990s)

In July 1999, the Ministry of Science and Technology and the Ministry of Education jointly held a symposium in Beijing to discuss strategies for the development of university science parks, at which a national guiding committee on the work of university science parks was set up with two vice ministers from the two ministries serving as its leaders. In September 1999, the two ministries jointly issued the Notice on Organizing the Experiment on the Construction of University Science Parks. This move received enthusiastic response from universities and high attention from local governments. In December 1999, the two ministries finally designated 15 university science parks, including the TusPark and the Peking University Science Park, as the national pilot units for the experiment on the construction of university science parks.

Expansion period (after 2000)

In May 2001, the Ministry of Science and Technology and the Ministry of Education jointly issued the Notice on Confirming the First Group of National University Science Parks, in which the two ministries confirmed 22 university science parks, including the TusPark, as the first group of “national university science parks”.

Preliminary statistical data about these university science parks are as follows:

They were sponsored by 67 universities and involved a total investment of 17.065 billion yuan. In 2000, their domestic enterprises realized a combined sales revenue of 25.7 billion yuan, which was 92% higher than the 13.4 billion yuan in 1999. By then, the experiment on the construction of national university science parks had scored preliminary results.

The following are the latest data available up to December 2006:

- China had established 62 national university science parks, sponsored by 122 universities;
- They had attracted a total social investment of 30 billion yuan;
- They had established more than 1,200 research and development institutions;
- They had 5,600 park-based enterprises and 2,900 incubated enterprises, with 56 of them being publicly listed;
- They had attracted more than 6,000 returned Chinese who had pursued studies abroad;
- The park-incubated enterprises converted a total of 2,660 provincial or higher

research results;

- A total of 3,923 patents had been approved and a total of 5,116 new products developed;
- The incubated enterprises employed more than 128,000 people;
- They had created about 200,000 jobs.

In addition, these university science parks had also formed a fine interaction with the national high-tech industrial development zones and established close upstream, midstream and downstream cooperation with them. Of the 62 national university science parks, 30 were located in the national high-tech zones and two more were partially located in these zones.

Chapter III Strategies for the Development of University Science Parks in China

1. Roles of University Science Parks in China's Economic Development

(1) Prerequisite for Building First-Rate Universities

Most of China's existing university science parks are sponsored by the country's first-rate universities. This is the most striking feature of university science parks when compared to other science parks in the country. By incubating high-tech enterprises or in other ways, the sponsor universities transfer their research results to enterprises, thus effectively promoting the combination of university research activities with markets and realizing a virtuous circle between university teaching and research and social economic development. This is not only an important direction for the reform and development of China's universities, but also an indispensable condition for turning China's research-oriented universities into world-class universities.

In short, the establishment of university science parks can provide a strong funding, technological and human support for the development of China's universities.

(2) Important Way to Promote Research Result Industrialization

The conversion of university research results is generally divided into four steps. First, innovative ideas come up on campus and become research results as a result of intensive explorations. Second, research results are combined with social capital and incubated into technology enterprises through park-based incubation bases. Third, incubated enterprises enter the park-based industrialization bases or other industrial parks for further development. Fourth, technology enterprises grow through capital operations and become competitors in market economy. Apparently, university science parks play a key role in converting university

research results. They integrate technological, intellectual and capital resources and complete the preliminary technology-to-product transformation.

(3) Important Force for Regional Economic Development

First, they provide intellectual resources for regional economic development by integrating all regional innovation factors.

Second, they provide entirely new experience for regional economic development by establishing radiating parks.

Third, they make direct contributions to regional economic development by incubating enterprises. On the one hand, university science parks boast of the most competitive research projects in their regions and can help attract investment. On the other, the incubated and growing high-tech enterprises generally select nearby places as their production bases and for scale operations, and gradually grow into an important source of new businesses and a new growth point of the high-tech industrial development zones in various regions.

2. Roles of University Science Parks in China's Economic Development

(1) Laying Material Foundation for Developing New Economy and Forming Growth Pole

The basic momentum for the development of the new economy is human creativity. An important element of the development strategy of the new economy is to form a growth pole. But this growth pole is essentially different from that of the traditional economy. The growth pole of the new economy is a "pole of science and technology". He who takes the "pole of science and technology" takes the initiative in social and economic development. University science parks are established with a view to forming a "pole of science and technology" and possessing the strategic commanding height for the development of the new economy.

(2) Promoting Industrial Restructuring and Upgrading Industrial Structure

The Chinese economy is in a crucial historical period characterized mainly by strategic economic structuring and industrial upgrading. Therefore, it faces grave challenges from economic competition both at home and abroad. In this situation, China should make full use of the universities' strength in knowledge and technological innovation and establish university science parks so as to promote the combination of science, technology and education with the economy, to cultivate new economic growth points, and to promote the conversion of research results and the industrialization of high technologies. This is a logical strategic choice for enhancing the country's high-tech innovation capacity and its international competitiveness.

(3) Boosting Staying Power of High-Tech Zones and Promoting Their Further Development

China has 53 national high-tech zones and more than 400 regional high-tech zones, which have made major contributions to the development of China's high-tech industries. However, as these high-tech zones are separated from their technological sources, they are very weak in technological strength and have fairly few technologies and products with proprietary intellectual properties. Therefore, the Ministry of Science and Technology and the Ministry of Education emphasized after the 1999 national conference on technological innovation that national university science parks should be established, mainly to further boost the staying power of the development of the high-tech zones and to push forward the further development of these zones.

(4) Pushing forward the Development of China's Universities in 21st Century

Universities constitute an important force for China to implement its strategy of building the nation through science and education. One of the development goals of China's universities is to build a group of world-class or world-famous universities in conformity with the requirements of the country's modernization drive. Despite different definitions, all world-famous universities have a striking common feature: they must make contributions to the economic and social development of the countries and regions where they are located, and especially to the development of the local economies. Therefore, building university science parks and improving the industrialization of universities' high technologies and the conversion of their research results represent a logic road for China's universities to enter the ranks of high-standard famous universities.

Chapter IV Operational Models of University Science Parks in China

The operational models of China's university science parks can be classified into the "one school, one park" model and the "multiple schools, one park" model according to the correlation between universities and parks. Specifically, 52 parks have adopted the "one school, one park" model, and 10 the "multiple schools, one park" model. If classified according to different leading factors, the operational models can be classified into the government-led, school-led and market-led.

1. "One School, One Park" Model and "Multiple Schools, One Park" Model

The "one school, one park" operational model refers to the fact that a science park is sponsored by one university and whose management body is led by the sponsor university and

joined by other forces (mostly in the form of a shareholding company)

Examples: The science parks established by Tsinghua University, Peking University and Xi'an Jiaotong University adopt this operational model.

For example, the Peking University Science Park is sponsored by Peking University and enjoys diverse development advantages. The strength of Peking University's high-tech industries provides a solid foundation for the construction and development of the science park. The electronic information technology of the Founder Group and the Jade Bird Group, the bio-pharmaceutical technology of the Sinobioway Group and the Beijing Peking University WBL Biotech Group, a group of other key university enterprises and lots of research results with market prospects will all go to society through the university science park.

The "one school, one park" operational model enjoys the following advantages:

1. The park is directly created by the university, has sound basic resources such as land, fund, technology, personnel and hardware facilities. It requires small initial investment and is easy to launch.

2. As its human, financial and material resources come mainly from the school, the park involves few departments and its relations with various social circles are fairly simple. Therefore, coordination and management are easier.

3. As the park's research results come mainly from the school, the management and technical personnel are fairly familiar with these results, which helps reduce intermediary links, shorten the cycle of conversion, deepen research and development, form serial products, and reduce investment risks.

4. Being led by the university can fully mobilize the initiative of university teachers and students and can promote university's curricula development and serve local economy through research result conversion.

Case: Tsinghua Science Park

In keeping with its general goal of becoming a world-class university, Tsinghua University decided in 1993 to build a TusPark. Park construction formally began in 1994. It is a 690,000-square-meter complex, comprising more than 20 buildings. Thanks to the efforts for more than a decade, the park has developed into a high-end nationwide park network, boasting of one million square meters of floor space and clusters of high-tech enterprises. It has formed an environment promoting research result conversion and a culture encouraging innovation and business creation. Many of the park-based enterprises have proprietary intellectual properties and world-leading technologies. As China's only A-class national university science park, TusPark is playing a growing role in the field of science parks around the world.

The park today has several new clusters: a cluster of the R&D institutions of the world top

500 multinational companies, a cluster of large Chinese technology enterprises, and a cluster of small and medium-sized venture enterprises. The park is noted for a growing ability for innovation and business creation, a growing ability for radiating development, and a growing international competitiveness.

In recent years, TusPark has established branches in China's key development regions, such as the Yangtze River Delta, the Pearl River Delta, the Bohai Rim, the northeast region and the northwest region. Combining the soft radiation mode of "management export" with the hard radiation mode of "development and operation", the park has successfully popularized its environmental solutions for technological innovation and business creation in various parts of the country and built a powerful platform for spatial radiation networks.

The park has established a series of incubators, including the business park, the business park for returned Chinese students, the specialized incubators and the technological transfer platform. These establishments have provided growing spaces for the development of Chinese and foreign enterprises engaged in technological innovation and made outstanding contributions to combining production with teaching and research and to exploring a Chinese-style approach to independent innovation.

The park boasts of diverse innovation resources: university resources, government resources and social resources. These resources constitute a solid foundation for the development of the park-based enterprises. The exchanges in the "innovation field" between enterprises and universities, between enterprises and intermediary institutions and between enterprises can produce sparkles of wisdom and innovation and release a huge polymerizing power. It has produced and will continue to produce "diamond" enterprises that possess world-class core technologies.

The park has created comprehensive innovation service systems, including the business and property service system, the HR service system, the corporate support service system and the capital and technical service systems.

The exchange and integration between Chinese and Western cultures have further optimized the park's cultural environment for innovation and business creation. The park advocates cooperation, pioneering spirit, defeat tolerance, daring to practice, competition and entrepreneurship.

TusPark has developed three major development strategies: the internationalization strategy, the support platform strategy and the radiating development strategy. It has also formed four modes of development: assembly, cohesion, focusing and fusion. It has become a zone noted for rich innovation and business resources, a zone noted for specialized innovation and business services, and a zone noted for primordial innovation and business cultures. The

employees at the park-based enterprises regard their work and living in the park as a happy journey.

As the park builder, TusPark Co., Ltd. upholds the Tsinghua University spirit: "Self-Discipline", "Social Commitment" and "Actions Speak Louder than Words". Its corporate culture emphasizes a grateful mindset, a down-to-earth work-style and a forward-looking approach. The park aims to become an industrial leader in developing, managing and operating university science parks and also a world-class giant in the science park sector.

The "multiple schools, one park" operational model refers to the fact that a university science park is sponsored by several key universities and is formed in a region as a result of government coordination.

Cases:

- Nanjing University-Gulou National University Science Park
- Hefei National University Science Park
- Yuelushan National University Science Park
- Yunnan National University Science Park
- Donghu High-Tech Zone National University Science Park

The "multiple schools, one park" operational model enjoys the following advantages:

1. It helps integrate technological resources. Pooling the strength of several universities makes it easier for those in the park to conduct technological and information exchanges and equipment sharing, which can boost the park's overall technological strength and provide the park with powerful technological support.

2. It helps integrate human resources. The mutual complementarity between different disciplines and the possession of various types of professional personnel can provide human resources support for the park's development.

3. It helps attract social capital. As the park is sponsored by several universities, it has abundant financial and material resources. Added with diverse technological projects, the park can attract a great amount of social investment to provide incubation funding for high-tech enterprises.

Case: Henan National University Science Park

Operational carrier: Henan University Science Park Development Co., Ltd.

Shareholding: 60% by the Zhengzhou High-Tech Zone, 30% by Zhengzhou University, and 10% by Henan University of Technology, Henan Agricultural University and Zhengzhou Institute of Light Industry

The park, established in 2003, was confirmed in 2004 as a national university science park. It has a 30,000-square-meter incubation space and a 600-mu industrial base. By 2005, the park

had 117 registered enterprises, 22 high-tech enterprises, applied for 38 patents (26 were approved), employed more than 2,800 people and generated a total income of 230 million yuan. It mainly covered the disciplines of electronic information, optic-electronic integration, new materials, bio-pharmacy, and high-efficiency agriculture. It provided incubator service, intermediary service, training and other professional services for the commercialization and industrialization of research results.

2. Government-Led, University-Led and Market-Led Models

Seven government-led parks (government participates in operation): For example, the Yuelushan University Science Park is sponsored by four universities and four research institutes. They are Zhongnan University, Hunan University, Hunan Normal University, National University of Defense Technology, Changsha Institute of Mining Research, Changsha Research Institute of Mining and Metallurgy, Hunan Institute of Traditional Chinese Medicine and Ministry of Construction Changsha Institute of Construction Machinery.

The provincial party committee and government have attached great importance to the park. The provincial party leader and provincial governor made repeated instructions and convened party standing committee meetings to discuss the issue. Two vice provincial governors who were in charge of education and science and technology were ordered to exercise coordination and supervision over the soft and hard conditions required for park construction. This has been taken as one of the targets to evaluate the performance of the two vice provincial governors during their tenure of office.

10 university-led parks (universities' affiliated institutions):

The Southeast University Science Park has established a park management committee, which was placed under the university industrial section. It has a registered platform company. With 46 major university research results worth 75.95 million yuan, the park has established 24 high-tech enterprises by attracting social capital. The park has a total registered capital of 775 million yuan, of which 75.24 million yuan is school capital. With the Southeast University-participated enterprises serving as its nucleus, the park has formed a high-tech industrial cluster that integrates upstream, midstream and downstream enterprises.

45 market-led parks (platform companies established for operation):

The operational carrier of the Fudan University Science Park: Shanghai Fudan Science Park Co., Ltd. established in 1999.

Operational model:

Park management committee (school functional department) + Fudan Science Park companies (respectively in charge of internal and external exchanges and cooperation)

Shareholding:

25% by Fudan University, 25% by Yangpu District, and 25% each by two enterprises

Park features:

Capital operation, with the school participating with intangible assets (the park can be named after Fudan); three parties integrate and interact for development (three parties: school, park and community. Yangpu District places its incubator under Fudan's management)

The park plans to construct about 300,000 square meters of floor space. So far, it has constructed about 200,000 square meters and has more than 450 park-based enterprises. The park generates 2.4 billion yuan of technological, industrial and commercial venue and employs more than 10,000 people.

Case analysis: Development of the University Science Park in the Donghu High-Tech Zone

The national university science park in the Donghu High-Tech Zone in Wuhan was established by more than 20 universities and more than 50 research institutions. They include the Huazhong University of Science and Technology, Wuhan University, Wuhan University of Technology, and Wuhan Research Institute of Post and Telecommunications. The park comprises six specialized parks, including the Huagong University Science Park and the Wuhan University Science Park. Construction began in December 1999, and was expected to be largely completed in the 10th five-year plan period. As the Donghu University Science Park is an important functional module of the Donghu High-Tech Zone and the Wuhan National Optic-Electronic Information Industrial Base (Wuhan·China Optical Valley), its layout and industrial planning are coordinated with those of the Donghu High-Tech Zone.

The park planned to build five major bases: the base for technological innovation, the base for incubating high-tech enterprises, the base for attracting and training innovation and business personnel, the base for combining production with teaching and research, and the base for radiating high-tech industries.

The park planned to develop six major industries: the optic-electronic information industry, the biotechnology and new pharmaceutical industry, the optic-machinery-electric integration industry, the new materials industry, the environmental high-tech industry and the high-tech agricultural industry.

The Donghu University Science Park operates in the following ways:

(1) Establish Management System and Operational Mechanism in Conformity with the Characteristics of Science Park Development

Management system: A. A leading group for the Donghu University Science Park was established, comprising the leaders of the provincial and municipal governments and the university. Meanwhile, a development plan was formulated for the park in light of the

requirements of the Ministry of Science and Technology and the Ministry of Education on university science parks. The group offers macro guidance to the park. B. An advisory committee of experts was established to primarily offer advice and appraisal over the construction and development of the park and the key directions of the development of the park's high-tech industries and also conduct appraisal and evaluation of the feasibility of major projects.

Operational mechanism: A market-oriented and ownership-based operational model was adopted, which featured government support, owner development and corporate operation. The park established six park-owner companies, including the Huazhong University of Technology Science Park Development. These companies were both park builders and park operators and managers. They were mainly responsible for the infrastructure construction, project incubation and innovative personnel training of their respective sub-parks.

(2) The University Introduces Support Policies to Encourage Teachers and Students to Create Businesses

A. An award for the advance of technology enterprises and a fund for the development of technology industries were established to encourage and fund teachers to participate in research result conversion. B. Measures were taken to encourage teachers to bring their research results to the science park to create businesses. While so doing, their positions were retained and their medical and housing benefits and their professional title evaluation remained unchanged though their salaries were no longer paid by the university. C. Under the precondition of doing their own jobs well, the sci-tech personnel were allowed to do part time in other units, mainly engaged in the activities of research and development and result conversion. D. If individuals provided their duty-related research results in the form of technological transfer to other people for implementation, the school would sign transfer contracts with other people and would give 50% of the net income of technological transfer to these individuals as bonus and give 40% of this income to the school departments where these results were achieved as their start-up funds for new research projects. E. The school stipulated that 60%~70% of the profit handed over to the school by the school-run enterprises should be returned to the school departments where the enterprises were to support their research and development activities. F. Where conditions permitted, the annuity systems should be introduced to the chairmen of the Board of Directors and the general managers of the enterprises. Besides, the promissory share system was introduced for the key technical, management and operational staff to encourage the teachers to create businesses with their own research results.

(3) Government Offers Tax and Financial Support.

A. The Donghu High-Tech Zone invested 20 million yuan in each university science park. In all, 120 million yuan was invested in the capital construction of these parks. B. The Donghu High-Tech Zone invested 30 million yuan in the industrial development fund in 2000 for these parks, to support the development of high-tech industries. The fund investment would increase annually as the scale of these industries expanded. C. The provincial and municipal governments offered financial discount to the funds required for the preliminary development and construction of these parks. D. The provincial and municipal governments gave priority treatment to the park-based enterprises in arranging risk investment funds and recommending them for public listing. In addition, they also offered financial awards.

(4) Government Support in Park Infrastructure Construction

A. The land used to build university science parks was exempted from paying the regionally-retained portion of the land compensation fee. The government finance arranged special funds to subsidize the reclamation fee for the land used for the research and production activities of the park-based enterprises. B. The provincial and municipal governments completely waived the capital construction fee for the parks within their administrative jurisdictions. C. The governments planned to invest 3 billion yuan in the construction of water, power, road, sewage treatment and other infrastructures in the 10th five-year plan period in light of the development requirements of the parks. In addition, the relevant departments also gave priority treatment to the park-based enterprises in opening broadband Internet connections and in offering preferential user-fee treatment.

(5) Establish Sound Investment and Financing Systems

A risk investment and financing institution has been established for the university science parks to provide full-range services such as consulting, legal, accounting and asset appraisal to the enterprises when they conducted mergers and acquisitions and when they went for public listing. In the meantime, the parks also actively recommended best incubated enterprises to various funds, risk investors and listed companies so that these start-up enterprises could receive timely capital support and grow faster.

(6) Establish and Improve Support Systems and Social Intermediary Service Systems

These university science parks have various support service systems, such as those for industrial and commercial administration, financial, tax, social security, technical supervision, public security and environmental protection. They also have venture investment guild, technological property exchange, consulting company, law firm, financial audit company, asset appraisal firm and other intermediary institutions. These intermediary institutions have all kinds of professionals and rich management experience. Their professional operations can make up the knowledge and ability deficiencies of the business starters in technology,

management and legal affairs. As soon as the incubated enterprises are created, they can operate according to the standards of the modern enterprise system in equity structure, stimulation mechanism and management. This can increase their chance of success.

In addition, these parks have also worked out policies on intellectual properties and personnel stimulation.

Chapter V Target for the Development of University Science Parks in China

The priority target is to build about 100 university science parks, whose service functions are sound and whose management and operations are standard. In particular, about half of them will become the national university science parks that can play exemplary roles and about 20 of them will become the first-rate university science parks in China that have distinctive features and outstanding competitiveness. Besides, several of them will have major international influence.

University science parks are an important carrier for the development of the knowledge economy. They are also the places where innovation activities are most active. To accelerate the construction of university science parks, the universities should reform their existing management systems and encourage their teachers and students to create businesses in these parks. The capital market should be cultivated to solve the financing problem. The park-based enterprises should establish modern enterprise systems and pursue sustainable development. The government should actively participate and create a fine external environment.

1. Reform University Management System, Encourage Teachers and Students to Create Park-Based Businesses, and Create Social Environment to Encourage Students to Create Businesses

The teaching system of the universities should conform to the requirements of science park construction and development. In order to meet the requirement of student business creation, the universities should further liberalize their restrictions on the length of school leaving and introduce a flexible schooling system.

While in school, the students should be allowed to retain their student status for several years so that they can enter the university science parks to create technology businesses or to export technological service. If the teachers enter the science parks to create technology businesses, they may retain their teaching positions without salary for a certain length of time or may undertake the relevant management work concurrently.

The universities should formulate management regulations or policies to encourage the teachers and students to create businesses with their research results. In particular, they

should liberalize the restrictions on the entry of teachers and students into the university science parks for creating technology businesses or for exporting technological service.

In addition, the universities should gradually create a social environment and atmosphere to encourage their students to create businesses.

2. Accelerate Capital Market Cultivation to Solve Financing Difficulties

In developing university science parks, it is imperative to gradually form an effective financing system, to accelerate the cultivation of the capital market, and to actively encourage private and other capital to enter the field of technological innovation in diverse forms such as venture investment and risk fund. By so doing, the financing channels can be diversified, the situation in which past research and development activities were mainly funded by government investment can be changed, the process of technological capitalization can be faster and the threshold for business creation can be lowered.

First, China growth enterprise board should be developed. The growth of university science parks calls for the development of a growth enterprise board, for this board can provide more flexible, more convenient and more effective financing arrangements than those provided through the commercial banks and the traditional stock markets. First, the emergence of the growth enterprise board market can enable an effective capital supply to the numerous small and medium-sized growing high-tech enterprises and especially to the enterprises with long-term development prospects. Second, the growth enterprise board market, with its unique stimulation mechanism, can speed up the process of enterprises growing from start-up to maturity, enable many enterprises to rapidly transform themselves from the elementary form of family or partnership enterprises into the standard form of modern enterprises and can help rapidly improve the structure of corporate governance. Third, the growth enterprise board market can greatly boost the social recognition of growth companies and provide broad opportunities for corporate investment, merger and acquisition so that the high-tech enterprises can pursue supernormal development and a large number of super-large enterprises can be created. Fourth, the growth enterprise board market can serve as a hub to gather scientists, entrepreneurs and millions of small and medium-sized investors and further stimulate the innovativeness and entrepreneurship of the Chinese nation. This innovativeness and entrepreneurship are precisely the soul for the development of the new economy and the inexhaustible source for the thriving of a nation.

To millions of small and medium-sized technology enterprises, the growth enterprise board and main board markets are still nothing but a “single-plank bridge”. In order to provide a more liberal financing environment for these enterprises, the two markets must be backed up by a third board market and an over-the-counter trading. Regional capital markets must be

established in some places which have many universities and have good basis for the development of science parks.

3. Establish Modern Enterprise System and Lay Foundation for Sustainable Development

Using the modern enterprise system to guide the construction and operation of science parks is an important content of building and developing university science parks. The university science parks should not be managed as public institutions. Instead, they should be managed as modern enterprises. To these enterprises, the schools are only shareholders. In the start-up period, the park-based enterprises may operate as the limited liability companies or limited companies. In principle, the universities participate with technologies. The past practices that schools were the exclusive investors in technological or product development or that enterprises established must wholly owned by schools should be rejected. In this way, investment can be larger, the enterprises can be separated from public institutions, and the schools do not have to exclusively bear the risks.

The university science parks should be constructed, operated and managed as enterprises according to the market rules. Science park development companies can be established to undertake owner development and be in charge of the specific infrastructure construction, project incubation and innovation personnel training for these parks.

4. Government Should Actively Create Favorable External Environment

The central government should take the construction of university science parks as a major strategic policy measure for building a national innovation system and for pursuing a leapfrog development of high-tech enterprises. It should build a group of national university science parks in a planned way and should work out the relevant support policies and regulations.

The active participation of the regional governments also constitutes an important guarantee for the construction of university science parks. The regional governments should first of all optimize the social and economic environment for park construction. They should incorporate the water, power, road and communications facilities required for park construction into their municipal construction plans. While the national taxes must be paid for the land slated for park construction, the provincial and municipal fees should be reduced or exempted. Besides, the regional governments should also improve the soft environment and establish the relevant support service systems. They mainly include:

(1) The intellectual property protection system. Intellectual properties constitute a core factor for the development of university science parks. The government should pay adequate attention to the protection of intellectual properties and gradually work out a series of laws and regulations on the creation, utilization and protection of intellectual properties so that a

legal system is formed to protect intellectual properties, stimulate corporate enthusiasm for research and development, and turn research results into real productive forces.

(2) The human resources system. A fine policy environment and a find service environment should be created to vigorously attract business creation personnel to these parks, including the overseas Chinese students and the domestic well-qualified innovation personnel.

(3) The business incubation system. The science parks should vigorously develop both general and specialized incubators so as to gradually form a complete incubation system. They should attract social forces to run investment-oriented incubators and should also improve the functions of various types of incubators so as to provide full and complete incubation services to business starters.

(4) The intermediary system. Effective contacts and selections should be established between capital owners and technology owners. The associations and intermediary systems that cover various sectors and are basically in conformity with international service standards should be established. In addition, professional organizations should also be developed.

Recently, the Chinese government has introduced a series of policies to encourage and support the rapid development of university science parks. They include:

Strengthen the construction of national high-tech industrial development zones. These zones must promote the start of new undertakings, deepen the reform of the management system and strengthen the improvement of the soft environment. By so doing, they can become an important carrier for promoting technological advance and increasing the capacity for independent innovation, a powerful engine for driving the restructuring of the regional economies and the transformation of the mode of economic growth, a service platform for the high-tech enterprises to “go abroad” and participate in international competition, and a forward position for conquering the commanding height of the world’s high-tech industry.

Drastically increase sci-tech inputs. A diversified, multi-channel sci-tech input system should be established so that the ratio of the country’s R&D input to its GDP can rise annually and its sci-tech input can match the requirement for the country to enter the ranks of innovative countries.

The pre-tax deduction from the income tax should be increased for the corporate input in independent innovation. The enterprises should be allowed to use 150% of the technological development spending actually incurred in a year to offset their taxable income in the same year. If such spending cannot be offset in the same year, the remaining can be offset in the following five years. If the employee education spending allocated by the enterprises is below 2.5% of their total taxable wage, it may be deducted from their corporate income tax. Besides, the government should formulate tax policies to promote the combination of production with

teaching and research.

Intensify the support of policy-oriented finance for independent innovation. The policy-oriented financial institutions should give priority loan support for the major national sci-tech projects, for the scale financing and research result conversion projects of the major national sci-tech industrialization projects, for the high-tech industrialization projects, for the imported technology digestion projects and for the high-tech products export projects.

The China Development Bank should, within its soft loan scale approved by the State Council, grant soft loans to high-tech enterprises as its equity investment in these enterprises. The Export-Import Bank of China should establish a special financing account to provide financing support, where policies permit, for the import and export of the core technologies and key equipment required for the development of high-tech enterprises. The Agricultural Development Bank of China should introduce a policy in support of the conversion and industrialization of agricultural research results.

The universities should be fully allowed to play important roles in independent innovation. While the reform of higher education should be deepened, the structure of higher education should be adjusted and the development of key curricula should be strengthened. The universities should actively meet the demand for all types of specialized personnel required for economic and social development, optimize their curricula distribution, promote disciplinary crossing and integration, and train the personnel in short supply. They should make earnest efforts to raise their innovation capacities and social service capacities and some of them should become world-class universities and research-oriented universities. They should innovate their graduate training mechanisms and emphasize the cultivation of innovative spirit and practical ability. Combining production with reaching and research, the universities should be encouraged to establish a close, multi-channel relationship with enterprises and research institutions so that they can jointly train innovative personnel and carry out innovation activities. More graduates should be sent abroad and the selection methods should be improved so as to enhance international cooperation in training sci-tech personnel and senior personnel.

We have reasons to believe that the university science parks in China have played and will continue to play important roles in China’s efforts to become an innovative country.