Preliminary Study of the Construction And Development of University Research Parks During the Economy Transition Period in China

Zhujun Zhang
Zemin Niu
Fei Xiong
Beihang University, P. R. China

Abstract

The construction of university research parks has played a leading role in the incubation and industrialization of hi-tech achievements of the university and the development of the regional economy. This paper studies the successful experience of foreign university research parks, and presents the lessons for the systems of university research parks in China aiming at the problems encountered during the economy transition period in China.

Key Words

university research park (URP), the construction system, commercialization of science and technology.

1 Correspondence to:

Zhujun Zhang
Beihang University
100083 Beijing
Peoples Republic of China

Email: zhangz3@alum.rpi.edu
Almost all the countries in the world attach importance to the role of URPs in the development of regional economy, and regard the establishment of URPs as an effective approach to expedite the construction of innovative engineering, to enhance the innovative ability of university science and technology, and to shorten the period of industrialization of hi-tech achievements. America has set up over 120 URPs since the establishment of Stanford University Research Park in 1951, and formed many world-class URPs, such as Silicon Valley, which has become the roll model of American technological development.

In order to effectively transfer the hi-tech achievements of the university, China is also attempting the construction of URPs. Since the Northeastern University established the first URP in China in 1989, China has set up many state, provincial and civic URPs, forming a multi-fold system by now, which includes 43 state URPs supported by 104 universities and research institutions and occupying the area of 9,500 acres. The area of incubation that has been put into service reaches 2,270,000 square meters, and the number of research and development institutions, incubating enterprises and employees respectively reaches 1,200, 2,276 and 72,800. The incubating enterprises in URPs have transferred 1,860 hi-tech achievements, applied 1,923 patents, developed 4,116 new products and incubated 923 enterprises including 29 public ones. By the year of 2001, 5,500 enterprises have entered URPs, and reached the sale revenue of 5,73 billion RMB¥ and the profit of 536 million RMB¥ in 2001.

Meanwhile, the construction of provincial and civic URPs has also made great progress. Take Beijing City for example. In order to promote the construction and development of URPs, Beijing Education Committee and Science and Technology Committee have taken effective measures, such as establishing communication channels to evaluate the exchanging of experience, and assisting with construction
and keeping daily communications. In 1999, Peking URP and Tsinghua URP were first approved civic ones, and in 2000 and 2001, 6 and 2 other URPs were respectively approved. A multi-fold system has been gradually formed.

With the rapid development of URPs, the systems of finance, science and technology, and education have not kept pace. Therefore, how to construct a highly efficient URP during the economy transition period in China has become an urgent problem. Most of URPs in China, which originated in traditional science and technology industry and university incubators, are in reality of real state developments, and do not clearly manifest the difference between university-owned industries and URPs. The exceptions are Tsinghua and Northeast URPs which have established comparatively perfect systems of operation. Therefore, this paper studies the construction of foreign and domestic URPs, and presents some proposals in order to contribute for the development of URPs in China during the economy transition period.

**Part I The Construction and Development of URP in China**

**A. The Relationship between URP and Universities**

Since China began the Reform and Open Policy in 1978, two kinds of development areas have appeared. One is the Economic Technology Development Area (ETDA). From 1984 to 2001, China has formed a network of ETDAS, led by 47 state ETDAS approved by State Department and supported by thousands of provincial and civic ETDAS. The other one is the Hi-tech Industry Development Area (HIDA). From 1988 to 2002, China has set up 120 HIDAS of all levels, including 53 state ones.

Under the circumstances of two kinds of research parks existing, the main reasons for the Ministry of Education and the Ministry of Science and Technology preferring to promote the construction of URPs lie in:

a. The necessity of the commercialization of university hi-tech achievements

The university is the technological talents pool in China. By the year of 2001, the universities possessed 5,090 research and development institutions, established 106 state key laboratories and 48 state engineering research centers, and hosted 286,000 technological employees and 213,000 graduate students in the field of science, agriculture and medicine. In 2001, the universities took on 76% of the state science fund projects and 56% of the state key projects, published many SCI and EI papers respectively accounting for nearly 70% and over 75% of the papers collected by SCI and EI, applied for 4,185 patents including 2,684 original inventions, gained 1,850 patent licenses including 680 invention patents. However, universities in China with such ample resources have only 10% of hi-tech achievements to be transferred.

b. The necessity of expanding the functions of universities regarding URPs

The functions of universities have been subject to ongoing evolution. The primary universities had only one function, which was to cultivate the advanced talents demanded by the society. In 1810, Wilhelm Von Humboldt, a famous education reformer of Germany, presented the principle of unifying education with scientific research, and thus scientific research became another important function of the universities. Meanwhile, a large number of research based universities appeared. Stanford URP, established in 1951, played a fundamental role in developing Silicon Valley, which represented a further stage in the functions of universities. Universities can not only cultivate talents and make hi-tech achievements to service the society, but also foster a large number of hi-tech enterprises to promote the economic development of the country. In January of 2000, the Ministry of Education of China formally indicated that the transfer of hi-tech achievements and the industrialization of hi-tech should be given the same important status as the education and scientific research.
B. The Construction and Operation Mechanism of URP

It will not only depend on the intellect resources, information resources and conditions of research and development, but will also take a long time and a large amount of money to construct the hardware and software circumstances in favor of technological innovation and incubation, if the aim is to develop a cluster of innovative enterprises gathered and filled with the atmosphere of scientific research and pioneering culture. A successful URP takes quite a long time to finish the construction of hardware and software; for example, Stanford URP took 30 years, Triangle URP took 38 years, and Utah URP took 27 years. The URPs in China which are at the stage of original construction should have enough knowledge of this, and construct the hardware and software circumstances according to the principles of development step-by-step, detailed programming, and gradual operation.

It is necessary for URPs of China, which are running short of funds from the educational budget, to attract social participation from private investors. For example, Arizona URP had expected that it would have taken 31 years to reach the break-even point, and even though the park had adopted a lot of operational projects, it also took 8 years. On the other hand, most of American URPs have handed the rights to development of the real estate in the park and its infrastructure management to the social market place, so the universities are participating the management of URPs as stockholders, and guiding the direction of development. This mode is worth using for reference in China.

During the economy transition period, the construction of URPs in China cannot be separated from the support of the government, which also provides guidance and policies for further development.
At present, most of the URPs in China adopt the operation mode of single-venture or holding-venture by universities to plan and establish the parks, while the participation of social funds has not been significant. Under the reality of inadequate education funding and comparatively long operation period, there is a need to combine the operation management and marketing development of the URP with the social capitals, to adopt the marketing operation mode, and to adhere to the principles of impartiality and efficiency to effectively promote the construction of URPS. Shandong URP and Tsinghua URP have made use of the private capital market to construct their parks, which provides us with beneficial models.

C. The Development Modes of URPs

During the initiation of URPs, various establishing modes appeared, such as URPs established by only one university or several universities or universities and local governments or universities and social enterprises. It can be summed up as follows:

a. There are URPs established by only one university or several universities in terms of the establishing form. Take the 43 state URPs for example. The former managed mainly by universities accounts for 32, and the latter managed by both universities and local governments accounts for 11.

b. In terms of the regional relationship between the parks and the universities, there are URPs near or far from the universities. However, some URPS have several sections, some of them near and the others far from the universities. For example, Beijing Chemical Technology URP has 3 sections outside the campus: one is located in Lishui Bridge of Changping District, occupying 33 acres; one is in Miyun Industry Park, occupying 23 acres; and one is in Fangshan Industry Park, occupying 31 acres. \(^7\)
c. In terms of the subjects of investment, among the 43 state URPs, most of the URPs established by only one university are invested by the university or both the university and the society, where the university plays a leading role. However, most of the URPs established by several universities are invested by both the local government and universities, and some URPs are invested only by several universities.

Take Beijing City for example. By the end of the year of 2002, 7 and 10 URPs had been respectively under the construction of state or civic URPs, and 100 million RMB¥ had been invested, 95% of which came from the university and the society.⁷

Part II  The Difference and Relationship between URPs, Common Industry Parks and Business Incubators

A. The URP and the Hi-tech Development Area

The primary characteristic of the URP is to rely directly on the university to become the social bridge linking teaching and scientific research, the base of the incubating hi-tech enterprises, the practice base of cultivating pioneering talents, and the center of innovative resources, but not to become the manufacturing base of massive production. The URP, connected close with the hi-tech area, should be a vital part of the local hi-tech area. The innovative achievements of the enterprises in the URP should be first spread into the hi-tech area, and make full use of the innovative resources. However, the URP cannot be equated to the hi-tech development area.

B. The URP and the Common Industry Park

Generally speaking, the industry park is the manufacturing base of massive production, and the innovative achievements of the URP can be transferred and incubated in the industry park. The reason why the URP cannot be transformed into
the industry park is that the latter needs to occupy a large number of area, which is not fit for the construction near the campus. The local government takes charge of the construction of the industry park, and also constitutes some preferential policies to encourage the URP to set up product lines in the industry park. Furthermore, the URP can also establish sections in it. Take Beijing City for example. The government of Miyun District built the Miyun Industry Park, and also encouraged the URP to establish sections in it, which greatly promoted the development of Miyun Industry Park.

C. The URP and the Business Incubator

The URP has the function of being the incubator of hi-tech startups, but cannot be equaled to the business incubator. The URP takes the technology researched in the universities as their main objects of incubation; however, incubating the innovative startups and enterprises is merely one of the functions of the URP. The incubating startups entering the incubator have only a limited time span, and once the time is up, they must go out of the incubator, but they cannot leave the research park. There can be many incubators of different specialty in one URP, for example, Beihang URP possesses the incubators of new materials, software, and returned oversea students business incubator.

A business incubator can provide integrated services for the development of new startups, with the aim of bringing up a set of successful new startups and enterprisers. While, for those new startups which are at the concept stage and seed stage, the incubator can provide them timely and orderly nourishing services in order to promote their development.⁸

By the end of the year of 2002, there are 58 business incubators in Beijing, encompassing 560,520 square meters for incubation, with the investment up to 1,5 billion RMB¥. The total funds for incubation reached nearly 76 million RMB¥. In the
year of 2002, there were 856 enterprises and 570 projects entering incubators while 124 enterprises graduated from them.\(^9\)

At the end of the year of 1999, according to the document *Decisions on Enhancing Technological Innovation, Developing High Technology, and Realizing Industrialization* released by the State Department, the Ministry of Science and Technology and the Ministry of Education pointed out that the universities, especially the research orientated universities, should take the responsibility to promote the construction of URPs in order to develop high technology, realize its industrialization, and cultivate multi-disciplinary talents. Under such context, the URPs 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 with 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.

By the end of the year of 2002, 8 civic URPs had been established in Beijing and 100 million RMB¥ was invested to the construction, 95% of which came from the university and the society. The building area and the number of new startups and employees entering the URPs had respectively reached 910,000 square meters, 498, and over 8,000, including 92 oversea returned students. In 2002, the revenue of the enterprises in the URPs was 404 million RMB¥.\(^7\)
Part III   Lessons from Experience to Improve the Operation

Systems of URPs

The aims of developing URPs lie in the incubation of hi-tech enterprises and the training of pioneering talents in order to promote the industrialization of scientific technology, and so as to promote the transformation of R&D systems of universities. The necessary prerequisites to make clear the functional orientation and constructional mission of the URP are to distinguish the difference between URPs and traditional school-run industries, hi-tech industry parks, to hand the functions not belonging to ones of URPs to the society, and to operate URPs referring to the market rules. For this reason, we put forward the following lessons.

A. Arranging the construction and development mode of URPs according to the market rules

Marketing operation mode should be adopted to promote the construction of URPs. The American Association of Electronics published a investigative report, which said that there were four reasons connected with educational systems for America to lead in the high technology, that is, encouraging the spirit of venture and allowing for failure, gaining enough rewards for innovation, hi-tech enterprises emerging facilitated by the mechanism of venture capital, and enterprises operation without the intervention from the government, which were all outcomes of the system of a market based economy. This beneficial experience should be used for reference in the construction and development of URPs in China. For example, the management of real state and logistics should be handed to the society, and social service agencies should be introduced to reduce the direct intervention from the government and universities.
B. Expediting the reform of investment and finance systems in order to provide more financing channels for the construction of URPs and the incubating enterprises

The construction and development of URPs needs a great deal of money, therefore, it is difficult to meet the need of funds unless there are appropriate sources of market finance. For example, if there is no adequate venture capital, it is difficult for the incubating enterprises to go through the steps to self reliance. Consequently, it is necessary to establish the exit channel for venture capital in order to ensure that the venture capital can be withdrawn when the enterprises finish the incubation. Additionally, new financing means can become another channel for URPs, such as the secondary stock offering market, negotiable securities of local government, exchange market of shareholder’s right of non-government enterprises. Therefore, during the economy transition period, it is imperative to expedite the financing of innovation, and to introduce more financing products in order to safeguard the funds channel of the construction and development of URPs.

C. Establishing the entrepreneurship platform of integrated services and building the entrepreneurial atmosphere for URPs

In order to develop steadily, the URP should establish an entrepreneurship platform of integrated services grouped by the universities, research parks, incubators, local governments, industrial associations, and students’ organizations to build the entrepreneurial atmosphere, encourage more and more people to create their business inside the URP, provide entrepreneurship education and training for staff of enterprise, and help them organize effective and powerful entrepreneurial teams that can operate high performance enterprises.
D. Constituting relevant policies to encourage teachers, researchers and students to begin their business in the URP

The enterprises in the URP should be considered as the affiliated units of the universities, and all the facilities of services within the university should be open to the employees working in the URP. Furthermore, the URP can also undertake part of the teaching assignments; for example, the URP can provide internships, projects and part-time jobs for the students, and the successful entrepreneurs in the URP can become the entrepreneurship project supervisors of the students. The universities should institute practical policies to encourage the students and teachers to develop their business in the URP.

To sum up, during the economy transition period of China, the construction and development of URPs is a process related to the education system, the R&D system, the macro-policy environment, the marketing level of national economy and the industry policy.
ENDNOTES


5 http://www.uatechpark.org/ the university of research park


7 2003 Annual Report on Beijing High-Tech Business Incubator Industry,13-16

8 JunHai iing etc, (1998), “Scientific Enterprise Develop and Business Incubator”, Northwestern Polytechnical University Press, Xi’an China

9 2003 Annual Report on Beijing High-Tech Business Incubator Industry,6-11