

INDUSTRY-UNIVERSITY-GOVERNMENT COLLABORATION AND THE DEVELOPMENT OF HIGH-TECH INDUSTRIES IN CHINA: THE CASES OF FOUNDER AND NEUSOFT

HUA JIN*

I. *Introduction*

In this study, we explore the role of collaborations between universities and industrial entities in the development of Chinese high-tech industries from the 1980s to the 2000s. For developing countries, the creation and cultivation of high-tech industries can be the key to economic development in a globalized era. Since the 1980s, China has served as an example of one of these developing countries.

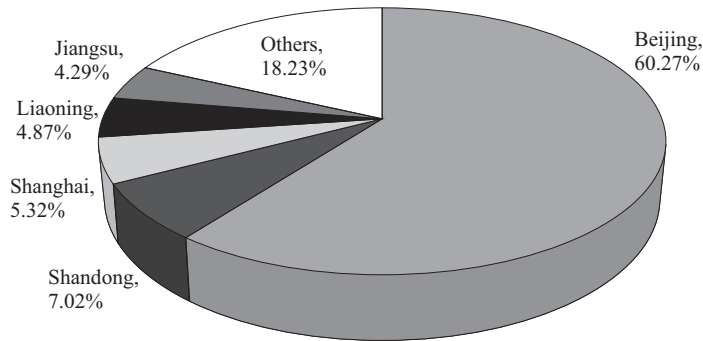
In attempting to create and develop high-tech industries in China, the Chinese government has long promoted university-industry collaboration. Prior to economic liberalization in 1978, however, few companies were capable of generating and contributing to the development of high-tech industries. In response, the Chinese government turned to universities as a driving force for economic development. Given this new emphasis, the government actively encouraged collaboration between universities and industries. As a result, the Chinese government has been widely considered to be the catalyst for the development of university-industry collaboration. However, our analysis demonstrates that many proponents have advocated multiple paths to successful university-industry collaboration in China. Unfortunately, it has proven difficult to capture these paths through empirical investigations from a public policy perspective.

Other research has been undertaken on industry-university-government collaboration in China (e.g., Hashida, 2000; Xue, 2002; Chen (ed.), 2009; Su and He (eds.), 2009). These studies have analyzed structures in China such as university-run enterprises, and University Science Park. On the other hand, Triple Helix theory (Etzkowitz, 2008) that emphasizes the interaction of industry, university, and government, suggests the importance of focusing on each sector individually. In this regard, when analyzing industry-university-government collaboration in China, the previous studies provide an evaluation that is biased from a policy and institutional perspective. Among them, Sunami (2003) and Seki ed. (2007) try to more widely capture the actual circumstances under which industry-university-government collaboration occurs in China. These studies suggest that the absence of suitable businesses to commercialize technological innovations provided market opportunities to universities. However, the mechanism of industry creation is yet to be fully elucidated.

Nevertheless, Beijing has many examples of successful university-industry collaborations that are the result of the government's preferential policies. Interestingly, and despite the absence of similarly substantial government support, comparable university-industry collabora-

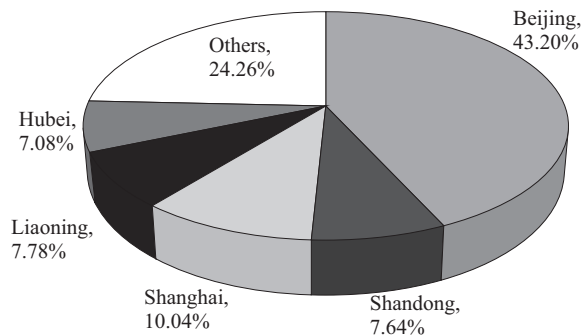
* Adjunct Assistant Professor, Graduate School of Commerce and Management, Hitotsubashi University

FIG. 1. PERCENTAGE OF TOTAL SALES BY UNIVERSITY-RUN ENTERPRISES BY REGION (2011)



Source: Chinese Association of University-Run Industries (eds.). 2012.

FIG. 2. PERCENTAGE OF TOTAL PROFITS BY UNIVERSITY-RUN ENTERPRISES BY REGION (2011)



Source: Chinese Association of University-Run Industries (eds.). 2012.

tions have materialized in the northeastern region of China. Specifically, Northeastern University has successfully collaborated with a Japanese company despite the presence of many obstacles, including scarce management resources.

Therefore, in contrast to the earlier line of research, we focus on specific cases of successful collaborations in order to more closely evaluate the process that leads to their development. The two cases we describe in this study are quite different in their respective backgrounds and details. The first relates to the Founder Group that was created in an environment that was favorable for the development of high-tech industries. For example, the Founder Group was backed by government policies, and located in the Zhong Guan Cun Science Park (informally referred to as “the Silicon Valley of China”). As the Chinese government has adopted the promotion of high-tech industries as a national strategy, Beijing

TABLE 2. RANKING OF UNIVERSITY-RUN ENTERPRISES IN TERMS OF SALES AND PROFITS (2011)

Total Sales		Total Profit		
1	Founder Group (Peking University, Beijing)	581.6	Founder Group (Peking University, Beijing)	15.6
2	Tongfang Co., Ltd. (Tsinghua University, Beijing)	215.3	Tongfang Co., Ltd. (Tsinghua University, Beijing)	10.6
3	Shandong Star Science & Technology Group (China University of Petroleum, Huadong)	81.4	Neusoft Corporation (Northeastern University, Liaoning)	4.9
4	Neusoft Corporation (Northeastern University, Liaoning)	59.8	Shandong Star Science & Technology Group (China University of Petroleum, Huadong)	3
5	PKU Resource Group (Peking University, Beijing)	59.3	Huagongtech Co., Ltd. (Huazhong University of Science & Technology, Hubei)	2.99

Note: Measured in hundreds of millions of Yuan

Source: Chinese Association of University-Run Industries (eds.). 2012.

has received increased support, thereby facilitating the development of successful collaborations between Chinese universities, industries, and government organizations.

Although successful collaborations have begun to materialize in Beijing, there have also been successful collaborations under conditions where a high-tech environment has yet to be established. In this vein, our second case study relates to Neusoft, a company that has achieved substantial growth despite its operation in a region where high-tech industries are difficult to develop.

Figure 1 and Figure 2 show the percentage of total sales and total profits of university-run enterprises by region. Beijing accounts for the greatest percentage of total sales and profits at 60.27% and 43.2% respectively, in 2011. Shenyang Province, where Neusoft is located, accounts for 4.87% of total sales and 7.78% of total profits. Table 1 shows a ranking of university-run enterprises in terms of sales and profits in 2011. Neusoft ranked no.4 in total sales and no.3 in total profits. Founder and Neusoft are both successful university-industry-government collaborations in China, despite being located in different regions.

Given these two cases, the current study's primary objective is to identify the mechanisms that contributed to the development of successful collaborations between universities and industries in their respective environments. The first case (located in Beijing) has been widely touted as a successful example of the national strategy's effectiveness, but the case of Neusoft has also achieved success, despite the lack of overt government support or a favorable business environment. The disparate contexts for these two success stories give rise to an important research question: How did the latter attain collaborative success without the benefits afforded to the former?

By comparing the two cases, the present study attempts to ascertain the industry-academia-government collaboration mechanism, which cannot be explained by policy or institution alone. To understand the background against which industry-academia-government collaboration occurs, we capture the macro picture in Section 2 prior to the case analysis. In Section 3 and Section 4 we present the case analysis, and provide our conclusion in Section 5.

II. *The Background and Development of Industry-University-Government Collaboration*

Industry-university-government collaborations from the 1980s to the 1990s was characterized by a form of direct industrial creation represented by university-run enterprises. The transformation from a “planned economy” to a “market economy” in China began with the liberalization and reforms of 1978. Under the former system, companies simply followed the production plans of high ranking bureaucrats in order to fulfill production goals, and had no management autonomy with respect to the creation of economic profits. Hence, there was none of the pressure inherent to market competition, and likewise there was no requirement to respond to market needs. Universities, with their wealth of talent and the support they received from the government’s scientific research fund, had been singlehandedly fulfilling their roles as the institutions responsible for the nation’s scientific research and technology development.

In the context of the national strategy to “Develop the country through science and education,” universities were presented with opportunities to enter a technology market where companies were absent, and actively concentrate on university-industry collaboration. This initial period of university-industry collaboration was not characterized by a simple partnership between existing companies and universities, but rather by the mainstream establishment of university-run enterprises that relied on university-developed technology. From the beginning of the 1990s, high-tech university-run enterprises expanded rapidly, and entered the mainstream market. University-run enterprises not only transferred technology within the university, but were also directly involved in enterprise management, and cooperated in various funding, technology, and human resource-related areas.

Three factors contributed to university-run enterprises becoming the principal form of university-industry collaboration during this period. First, universities had accumulated research capabilities and positioned themselves as research institutions. During the mid-1980s in China, science and technology prowess was held not by enterprises, but largely by universities and research institutions. Universities were not simply educational establishments, but were put in the crucial position of functioning as research institutions. The external market environment was the second contributing factor. At that time in China, no industries received technology transfers from universities. Consequently, it was more advantageous for university technology experts to create their own enterprises. Companies such as the Founder Group, Tsinghua Tongfang, and Neusoft are representative of university-run enterprises created during this period. The third contributing factor was the preferential policies defined by the government, and their structural flexibility. The government not only outlined a preferential tax policy for the establishment of high-tech enterprises, but also sanctioned concurrent postings for science and technology experts. This made it possible for researchers to start ventures without losing their university jobs. Through these measures, the university researchers’ entrepreneurial desires were roused, and a milieu that was supportive of business start-ups was formed. From the beginning of the 1990s, university-run, high-tech enterprises expanded rapidly, and entered the mainstream market. High-tech universities took on the risk of directly entering the market, and supplemented a portion of industrial creation.

In addition to the origin of university-industry collaboration, subsequent collaboration trends are described next. After the start of the 21st century, university-industry collaboration in

China changed flexibly to accommodate the development of a market economy. Universities distanced themselves from the former university-industry collaboration structure where enterprises had been established by the universities, and began to indirectly manage the university-run enterprises through holding companies. Furthermore, universities changed their earlier tendency to industrialize technologies on their own, and started to seek external sources for technology transfers and the provision of technology-related services. They also shifted the focus of their university-industry collaboration to providing an incubator function through university-founded science parks. Therefore, universities' role changed from commercializing technologies through university-run enterprises to the enhancement of company competitiveness via technology transfers.

III. *Founder's Industry-University-Government Collaborations*

The Founder Group¹ is an enterprise operated by Peking University and located in Zhong Guan Cun. It is currently known as a major player in the information technology industry. Although the company is currently enjoying success in the IT industry, its origins can be traced to its development of the laser photo-typesetter, which many considered to be a revolution within China's print industry. In this section, we will explore and explain the success of the laser photo-typesetter, as well as describing the process of industry-university-government collaboration.

1. **The 748 Project**

Although the inclusion of Chinese characters on computers is now common practice, Chinese computers lacked this basic feature until the 1980s. In relation to this, the Chinese government launched the 748 Project in 1974. This initiative was geared towards developing and industrially producing a laser-electron photo-typesetter. To achieve this goal, the Chinese government performed a nationwide recruitment drive to identify and secure a talented individual to lead the research and development practices associated with a photo-typesetter's realization. As a result of this search, Professor Wang Xuan of the Peking University Institute of Computers proposed a world-class technological development protocol for the development of the photo-typesetter (fourth generation). On account of his proposal, Professor Wang took charge of the project's R&D processes, and his research team received substantial financial support from the state. Between 1976 and 1995, the research team was given 10 million yuan, allowing them to successfully develop a plan for the production of the photo-typesetter.

The central government led the project and created a system for the industrial production of the laser photo-typesetter. More specifically, the government headed the development of a system whereby the laser photo-typesetter could be commercialized. In addition, it established a collaborative framework through which different types of organizations could work together to produce the typesetter. Some of these organizations included Peking University, Weifang

¹ "Founder" was first used in 1992 to represent the "Peking University Founder Group." The company had previously been referred to as "Beijing Like Xinjishu Gongsi" and "Beijing Daxue Xinjinshu Gongsi." In this paper, however, these names have been unified, and the firm is hereafter referred to as "Founder."

Computer Co., Ltd., Wuxi DianbiaoChang, Hangzhou Tongxin ShebeiChang, and Zhongkeyuan Changcun Guangjisuo. Ultimately, the government sought to create an integrated system for industrial production, and establish a structure comprised of domestic companies that could perform production activities. Through its efforts associated with the 748 Project, the government supported the construction of an integrated system that promoted both R&D and industrial production. These efforts proved successful, as in the 10 years following the launch of the 748 project, R&D for the laser photo-typesetting technology was successfully conducted, and the product was developed and commercialized.

2. Computer Sales and Venture Capital in Zhong Guan Cun

In the period immediately following its establishment, Founder was only partially involved in Professor Wang Xuan's project. However, the company was growing independently in Zhong Guan Cun through sales of computers and related products². At that time, there were many enterprises in Zhong Guan Cun selling computer products, and Founder decided to enter the market there, too. To facilitate Founder's respective entry, Peking University provided the company with 400,000 yuan in May 1987. Founder used this capital to fund the launch of its computer sales business. In July 1987, Founder invested 300,000 yuan to establish Beida Keji Fuwubu as its own subsidiary. Thanks in part to the government's preferential treatment for enterprises in Zhong Guan Cun (i.e., three years of tax exemptions), Beida Keji Fuwubu successfully began selling computers.

Founder also expanded its computer sales business by attracting venture capital. While Founder was exploring the possibility of computer sales in the spring of 1987, the company was restricted to small-scale operations due to a shortage of funds. At this time, Yuyuantan Shangye Fuwu Company was seeking opportunities for universities' technological results to be transferred to industry, and industry-university-government collaborations, and company personnel visited Peking University to identify opportunities to this end. Yuyuantan Shangye Fuwu Company had surplus capital and it was interested in investing in companies in high-tech industries in Zhong Guan Cun. Following discussions related to a possible collaboration, Yuyuantan Shangye Fuwu Company provided Founder with 12 million yuan. As part of the collaboration, Founder agreed to evenly split all profits derived from computer sales with Yuyuantan Shangye Fuwu Company. Founder also used this capital to further expand its Beida Keji Fuwubu³ computer sales business.

In addition to the capital that Founder had already acquired, it received another 12 million yuan from the Industrial and Commercial Bank of China (Peking University provided the collateral to secure this funding). Yuyuantan Shangye Fuwu Company also contributed an additional three million yuan, further increasing Founder's financial liquidity. As can be seen by this business expansion, Founder was able to achieve major results for its sales of computers and related products within the environment of Zhong Guan Cun.

² Another of its main operations involved the development of software for Japanese enterprises (e.g., Canon).

³ Founder also performed software development for Japan, which further boosted its revenue.

3. Founder's Foreign and Domestic Collaborations

With Founder successfully selling computers and related products in Zhong Guan Cun, company personnel felt confident of the potential for the production and sale of the photo-typesetter that was being developed by Professor Wang Xuan, based on the national 748 Project. Founder and the Technology Licensing Organization within Peking University, which sought to industrially produce technologies developed by university personnel, could not accept that they were not involved with the typesetter's production and sales. As such, Founder sought to implement a change to the integrated structure that had been developed under the 748 Project for the laser photo-typesetter's production and sales.

Founder initially appealed to the government department that had jurisdiction over the 748 Project, and accordingly secured the rights to produce and sell the typesetter's core parts. However, Founder lacked the production equipment, plants, or labor needed to do so. Therefore, to ensure the quality of the typesetter's parts, Founder looked to procure parts it could not produce from domestic or overseas companies. Moreover, to produce a high-quality controller (one of the laser-typesetter's core parts), Founder collaborated with state institutions with superior technologies capable of developing complicated parts.

The parts that comprise the output equipment for the laser photo-typesetter were also key components of the overall product. Although the government had chosen Hangzhou Tongxin ShebeiChang to industrially produce these parts, the resultant laser printer was inferior in terms of the clarity of its output and stability. Given the laser printer's importance to the typesetter, Hangzhou Tongxin ShebeiChang's inferior laser printer represented a potential obstacle to the typesetter's sales. Therefore, Professor Wang turned his attention to a printer from Canon, a foreign company. By connecting the laser-typesetter to a Canon printer, Professor Wang and the other R&D personnel successfully realized stable laser output.

With respect to the printer, Founder had attempted to construct parts in-house. However, the company experienced notable difficulty securing the equipment necessary to achieve sufficient production capacity. To market a laser photo-typesetter that guaranteed the highest possible level of quality, Founder was forced to go beyond the existing cooperation framework to overcome the problems it was facing. Founder sought to produce a fourth-generation photo-typesetter that would become the leading technology of its time. The company therefore needed to broaden the scope of its collaborative relationships in order to procure parts outside the existing collaboration structure. By expanding its collaborative scope, Founder successfully produced the laser photo-typesetter and strengthened its market competitiveness.

With the Chinese central government retaining a planned-economy mentality, Founder faced pressure to integrate the companies involved with the laser photo-typesetter's development under the umbrella of a state-owned company. However, Peking University resisted the concession of university-run enterprises to the government-controlled umbrella organization. Having finally acquired the rights to the laser photo-typesetter's production and sales, Founder expressed a strong desire to engage in its business activities independently. Ultimately, Peking University and Founder developed separately from the government.

IV. *Neusoft's Industry-University-Government Collaborations*

Although the development of high-tech industry is currently being promoted in the northeast region of China, this region was characterized by heavy industry in the 1980s and 1990s. As a result, this area of China was not a suitable environment for creating or developing high-tech industries at that time. Still, it was within this environment that Northeastern University and Neusoft attempted to cultivate their high-tech industrial enterprise.

1. **Neusoft and Its International Collaboration with Japan's Alpine**

Neusoft traces its roots to a computer networking engineering laboratory started by three young educators at Northeastern University in Shenyang, China, in 1988. The laboratory began with a modest scientific research grant of 30,000 yuan and three 286-computers. As China's first Ph.D. in computer applications, Liu Jiren (current CEO of Neusoft) was appointed as head of the laboratory soon after his arrival at Northeastern University. While studying in the United States, Dr. Liu developed a strong affinity for university and industry collaborations, as well as the industrialization of technology between universities and research institutes. Originally, Northeastern University was renowned for metallurgy. However, a lack of funding rendered it impossible for the university to foster industries that required such large-scale investments. As such, Dr. Liu focused his efforts on software. While he expected his work in software development to make a positive contribution to the university's future, a lack of funding for research and development nonetheless posed a significant challenge. To overcome this, Northeastern University developed a close working relationship with Japanese audio manufacturer Alpine Electronics, Inc.

Toward the end of the 1980s, Alpine Electronics, Inc. was seeking a production location in China to reduce respective costs. While researching the northeastern region of China as a potential location, Alpine visited Northeastern University, where company personnel learned of the computer networking engineering laboratory. This stirred their interest in the research of Dr. Liu and his colleagues, which culminated in Alpine collaborating with Northeastern University in 1989. The two organizations used the university's lab as their shared location, where they engaged in technology exports and software outsourcing. Through the use of \$250,000 provided by Alpine, Dr. Liu was able to continue his research in the software field. Alpine represented Northeastern University's first foreign alliance partner, and was critical to resolving the funding difficulties that plagued the initial phases of research and development.

As the research and development efforts of Dr. Liu and his colleagues began to succeed, the researchers established their own company, called OPENSOFT System Development, in 1991. In the same year, Northeastern University established the Neu-Alpine Software Research Institute (a limited liability company) in coordination with Japan's Alpine. The venture's initial capitalization was \$250,000 dollars, 49% of which was contributed by Alpine. In 1993, OPENSOFT merged with Neu-Alpine to form Shenyang Neu-Alpine Software Co., Ltd. In 1996, the company was listed on the Shanghai securities market, making it the first China-founded software company and the first Sino-Japanese collaborative effort to be listed on the Shanghai exchange. In 2001, Neu-Alpine changed its name to Neusoft Co. Ltd.

2. Opening up the Domestic Market

While outsourcing certain operations to Alpine Electronics, Neusoft had also been opening up its domestic market. In parallel with its sweeping expansion, Neusoft needed to secure human resources that were employable in high-tech industries. To this end, Northeastern University assisted Neusoft by establishing a “Software Strengthening Class” to train potential employees, and address any problems associated with a lack of capable IT human resources. Moreover, Neusoft also dispatched the graduates trained in this class to locations throughout the country. In just a few years, Neusoft had established a nationwide sales network of 35 bases in China’s major cities, including Beijing and Shanghai.

Alpine Electronics President, Kentaro Kutsuzawa, was a strong proponent of active marketing techniques. As such, he had a number of marketing materials prepared in Japan translated into Chinese. He also personally gave lectures related to marketing for Neusoft. By engaging in these activities, President Kutsuzawa provided Neusoft with the expertise necessary to cultivate fruitful markets. Alpine Electronics therefore supported Neusoft not only in terms of management capital, but also in terms of marketing and accounting functions. Kutsuzawa was frequently busy with operations at Alpine Electronics headquarters, and therefore largely entrusted the joint venture’s management to Dr. Liu. This collaboration served to eliminate the shortfalls in management resources that Neusoft experienced during its initial period (i.e., a lack of operating funds and management expertise). Given the complementarity of Alpine’s and Neusoft’s capabilities, the two organizations can be said to have engaged in a strong, comprehensive partnership.

Through its collaboration with Northeastern University, Neusoft leveraged its strengths in the software field to advance into the medical computed tomography (CT) market. In November 1995, the Northeastern University Software Center (a Neusoft subsidiary) merged with the Northeastern University Computer Imaging Center that was experiencing management difficulties. Using this merger as an opportunity for continued growth, Neusoft took its first steps into the medical CT industry.

Specifically, Dr. Liu proposed that Neusoft assume software development and system design operations, with hardware parts to be procured from international manufacturers. Using this business plan as a guideline, Neu-Alpine Digital Medical Systems Co., Ltd. was established in April 1998, when it commenced R&D, and production of CT and other digital medical equipment. Dr. Liu acquired management resources from within China, and actively procured overseas resources. This allowed Neu-Alpine Digital Medical Systems to compete aggressively with industry counterparts in a relatively short period of time.

3. Construction of a Software Park

Neusoft’s continued growth was reinforced through the expansion of its industry-university-government collaborations. An illustration of this was Neusoft pioneering the construction of a software park to function as a business cluster. In addition, the company established the Neusoft Institute of Information. With Neusoft’s involvement, construction of the Northeast Software Park began in Shenyang in 1995, and in May 1988, the Shenyang New High-Tech Industrial Development Zone was established. However, despite the Shenyang City government’s construction of a high-tech industrial development district in the southern part of

the city, the district did not attract as many enterprises as expected. Still, the Shenyang high-tech district's developers believed that if Neusoft were to move to the district, other enterprises would follow suit. Operating under this assumption, developers sought to convince Neusoft to enter the district. As (a) Neusoft had been convinced of the software industry's potential through its collaboration with Alpine Electronics, and (b) company personnel understood the need to cultivate an active business network, relocation to the Shenyang development district was an attractive prospect. Therefore, in 1994, Dr. Liu created a plan to construct the company's own software park within the Shenyang development district.

Substantial investment was nonetheless needed to facilitate the software park's construction. At that time, Neusoft's annual sales totaled less than 50 million yuan, and its profits were less than 10 million yuan. Despite these relatively modest earnings, the company needed to raise 500 million yuan just to cover the construction costs. Following the company's listing in 1996, Neusoft was able to raise 100 million yuan, but this was still far short of the funds required to move the project forward. To make up the shortfall, Dr. Liu and the then-president of Northeastern University visited the Baogang Group, which belonged to the same metallurgy department in the central government as Neusoft. As a result, Dr. Liu was able to secure an additional 240 million yuan in funding. That Neusoft's parent organization was Northeastern University played an integral role in the funding agreement.

As described above, China's first university software park (Neusoft Park) was constructed in Shenyang in 1995 and opened the following year. In addition, Neusoft began construction on the Dalian Software Park in 1998, which opened in 1999. Neusoft has now constructed software parks in Shenyang, Dalian, Nanhai, and Chengdu.

One unique feature of these parks is the close relationships that develop between Neusoft and the other associated enterprises. These relationships offer several benefits to the parties involved, because many of the enterprises share the same objectives. As such, the enterprises within the park are able to build relationships on the basis of complementary resource pools. Thanks to these complementary relationships, Neusoft effectively circumvents competition with other enterprises in the park in which it has invested. Therefore, it is able to avoid duplicating infrastructure construction within the same park, and optimize the use of complementary resources. The construction of these software parks signifies the creation of opportunities for Neusoft's further growth. However, it is also important in the sense that it promotes the development of high-tech industries within the respective region.

4. Establishment of the Neusoft Institute of Information

In addition to the activities outlined above, Neusoft has established and implemented a structure at its institutes for the development of human IT resources required within its software parks. Historically, the biggest problem facing the IT industry has been a shortage of people skilled in relevant technologies. Having anticipated the potential of the software industry (as well as the inherent human resources-related problems), Neusoft trained staff in its own IT vocational school to populate the software industry with capable human resources.

Although the training of human resources provided Neusoft with capable personnel to fill its own ranks, it also enhanced the supply of human resources to other enterprises in the software parks that Neusoft had constructed. Specifically, the company first needed to provide support to its existing business partners in its software parks by enhancing the supply of human

resources they received. Second, by doing so, Neusoft hoped to encourage more enterprises requiring trained IT staff to enter the parks. Third, the company believed that the entry of new tenants would stimulate business activity within the parks, thereby attracting enterprises that could serve as business partners for Neusoft. Hence, Dr. Liu established a mechanism not only for educating potential human resources, but also cultivating a key element for Neusoft's future development. To streamline this process, Dr. Liu and Neusoft established the Neusoft Institute of Information. The Institute's curriculum was customized to meet the needs of various enterprises, and emphasized the training of skilled human resources who could start work immediately following their graduation from the Institute.

Starting at Dalian, Neusoft established branches of the Neusoft Institute of Information in various locations throughout the country. In 2000, the Dalian Neusoft Institute of Information was established in the Dalian Software Park on the strength of financial backing from Neusoft (which provided 60% of the funding), and Dalian Software Parks, Ltd. (40% of the funding). In 2002, new branches of the Institute opened in Nanhai (Guangdong Province), and Chengdu (Sichuan Province). Then in 2004, the Northeastern University Neusoft Institute of Information was established as a faculty of Northeastern University. In 2008, the institute became independent from Northeastern University and began offering four year courses as a private university.

All branches of the Neusoft Institute of Information were established within Neusoft's software parks. Its graduates go on to work not only for Neusoft but also for other enterprises that operate within Neusoft's parks. This supply of human resources promotes collaboration among the enterprises in the software parks through a network of Institute graduates. In addition, by developing human resources, Neusoft contributes to the accumulation of enterprises requiring IT specialists within the software parks. Consequently, Neusoft simultaneously encouraged its own development, and contributed to the supply of human resources to other enterprises.

V. Conclusion

In this paper, we have identified several commonalities and differences associated with collaboration development mechanisms in different regions. Specifically, we have illustrated the nature of the collaborations in which Founder (Beijing), and Neusoft (northeastern China) have engaged.

In both cases, the developments of industry-university-government collaborations was based on mechanisms that achieved growth through an industry-led approach. Although the government's role in the Founder Group's development cannot be ignored, the collaboration shifted such that it was more industry-focused as its development continued. This phenomenon was even more pronounced in the case of Neusoft, which operated in a region that was largely outside the scope of national strategy at the time. As a result of its geographic isolation, Neusoft's collaborations were largely industry-led from the organization's inception; its development was achieved independent of assistance from the Chinese central government.

Despite their similarities, there were also some differences in their respective development processes and collaborations. Founder benefited from an advantageous cluster environment (Zhong Guan Cun) in which it was able to acquire management resources and expertise, and

ascertain market needs during its development stage. However, Founder's international collaborations were limited; the company procured items from Canon in Japan as it was unable to secure parts of necessary quality domestically.

In stark contrast, Neusoft formed a close, collaborative relationship with Alpine Electronics, another Japanese company. As a result, Neusoft was able to supplement its capital, management expertise, and market information, all of which were critical during the company's initial stages. In addition, and owing to the trust of its partner, Neusoft was afforded discretionary power over its own management. As a result, the company was capable of independently addressing a number of challenges, one of which involved the formation of a cluster. Consequently, Neusoft played a central industrial role in a region that had historically focused on heavy industry. For example, because of its collaborations, Neusoft was able to create its own software park, and cultivate its own human resources using internal training programs.

These differences are largely attributable to the regional disparities that characterize the two companies. Whereas Founder is centrally located in an urban center (Beijing), Neusoft is located in a more rural area (the northeastern region of China). Neusoft was able to overcome the disadvantages associated with its environment by cultivating high-tech industries and achieving sustained growth.

In addition, the industry-university-government collaborations in this study's two cases revealed several important relevant facts. As mentioned, since the 2000s, the government has initiated reforms at university-owned enterprises, and industry-university-government collaboration has become industry-led. However, these two cases took place ahead of government reform, and one involved an entrepreneur who played a key leadership role in the creation and development of high-tech industries. Previous studies' analysis was from the perspective of the university system and government policy, and cannot shed sufficient light on the mechanism of industrial creation. Thus, the present study's finding has important implications.

Although this paper has provided a number of contributions to the literature on university-industry-government collaborations, a number of unanswered questions remain. For example, what were the conditions associated with the investment of foreign capital, and to what extent did these conditions affect the respective successes of the companies mentioned above? These questions represent avenues of future research that the author seeks to investigate in greater detail.

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