

On China's Cooperation Patterns and Operational Mechanisms among Industry, Universities and Institutes

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Abstract

As an outcome of market economy, the cooperation among industry, universities and institutes still lies in its preliminary stage. The combination of the three results from technological innovation and transfer of achievements and it is driven by market demands and policy guidance. Since its operational pattern and mechanism serve as the key to the success in the cooperation among industry, universities and institutes, this paper summarizes the typical pattern and mechanism of China's cooperation among industry, universities and institutes, which is followed by further analysis.

Keywords: Industry, Universities and institutes, Cooperation pattern, Operational mechanism

It is extremely critical to choose proper cooperation pattern and mechanism in order to guarantee the sound and rapid development of the cooperation among industry, universities and institutes in China. Only with proper pattern and mechanism will the cooperation process be conducted smoothly and enterprises' core competitiveness be really exerted and the academic strengths of universities and institutes be improved, hence ultimately achieving the great strategic goal of establishing a powerful nation through the development of science and technology.

1. The Concept and Nature of the Cooperation Pattern among Industry, Universities and Institutes

1.1 *The Concept of the Cooperation Pattern among Industry, Universities and Institutes*

The cooperation pattern among industry, universities and institutes refers to an optimized allocation of resources including capital, personnel, facilities and technologies as well as a reasonable distribution of interest under certain institutional circumstances with the purpose of achieving different subjects' value objectives.

1.2 *The Nature of the Cooperation Pattern among Industry, Universities and Institutes*

The whole systematic project involved in the cooperation among industry, universities and institutes is composed of two sub-systems: subject system (consisting subject elements of the cooperation process) and environmental system (consisting environmental elements of the cooperation process). The former includes enterprises, institutes, governments and universities while the latter comprises those elements involved in the conversion of technological achievements into productivity, such as cultural traditions, economic system and so on.

2. The Mechanism of the Cooperation Pattern among Industry, Universities and Institutes

1) The mechanism of the cooperation pattern among industry, universities and institutes refers to the internal combination method and the relationship among different elements in a cooperative innovation organization, which reflects the combination mechanism inside this organization.

2) The relationship between the pattern and the mechanism of the cooperation among industry, universities and institutes

In the complex system composed of many sub-systems, "pattern" serves as the skeleton and "mechanism" the ties connecting different parts. Since every pattern is composed of many interwoven and interrelated mechanisms, the concept of "pattern" is wider than that of "mechanism".

3) There are different mechanisms in the cooperation among industry, universities and institutes.

(1) Motivation mechanism: Motivation mechanism is the cause to promote the combination among industry, universities and institutes. The motivation mechanism here mainly includes the technology-driven cooperation pattern, the market-pulled cooperation pattern, the combined cooperation pattern as well as the government-driven cooperation pattern.

(2) Interest distribution mechanism: Interest distribution mechanism is a manifestation of the interest relations among industry, universities and institutes. Whether interest distribution is reasonable has a direct impact on whether the cooperation process will go smoothly. Common interest distribution methods include installments, lump payment, royalty and sharing for shareholders. Some issues in this aspect, such as interest distribution methods, belonging and utility of technological achievements, pricing of achievements, need to be settled.

(3) Management mechanism: Management mechanism refers to a variety of institutions intended to enhance the management over the cooperation among industry, universities and institutes, with which all manner of relations are formed in and out of the unity of industry, universities and institutes.

(4) Orientation mechanism: Orientation mechanism is intended to lay down corresponding laws, policies and publicity to provide the combination of industry, universities and institutes with a policy basis, to clarify different parties' tasks, to lubricate the relationship among different sides and therefore to guarantee that the cooperation process will go in the right direction in order to achieve the combination of education and production.

(5) Legal mechanism: As a compulsory social regulation, law exerts direct protection, promotion and prevention on different sides of cooperation. Meanwhile, it also helps to adjust the environment for such cooperation.

(6) Adjustment mechanism: This refers to self-adjustment and management adjustment based on basic rules of education and production to be obeyed during the process of combination with the goal of achieving the whole country's macro-control as well as enterprises' inter-encouragement. By solving the conflicts during the cooperation process, this mechanism serves as an important macro and micro control method to guarantee all parties' benefits.

3. Main Cooperation Patterns among Industry, Universities and Institutes

3.1 The Pattern of Technological Transfer

Based on mutual equality, honesty and loyalty and mutual benefit as well as obeying the principle of shared risks and interests as well as policies and laws, technological contracts can be signed to transfer claims of patent application, patent rights, licenses for patent exploitation and non-patent technologies. With ready, complete and mature technologies, universities and institutes don't have to take risks related to the research and development stage. It is market risks that enterprises have to take. Therefore, during the cooperation process, enterprises take the dominant role, whose choices directly influence the conduction of the cooperation process. The technological maturity, complexity and risks related to technological development have direct impacts on enterprises' further production and operation.

3.2 Commissioned Development or Cooperative Development

Commissioned development or cooperative development is a short-term project-oriented cooperation pattern among industry, universities and institutes, which is chosen by enterprises based on their own technological demands and different technological difficulty degrees. Without the ability to develop relevant projects or products, enterprises turn to universities or institutes to have project research and development. In contrast, cooperative development lays down the cooperative relationship among enterprises, universities and institutes in the form of contracts and agreements. With their joint participation, all parties are involved in a part of or the whole development process. However, such cooperation relies on enterprises' certain abilities and conditions in research and development, with which they can come up with some requirements associated with technological cooperation and invest human resources and capital according to production and market demands. It can also be universities or institutes that convert the existing technologies into production. Cooperative development better helps enterprises to accumulate experiences constantly during their cooperation process and improve their technological development ability.

3.3 Joint-Development Pattern

(1) Constructing research and development institutions, engineering centers and institutes with joint efforts

First, universities or institutes establish special colleges with their cooperation with enterprises to have long-term development in complex technologies in order to keep enterprises' advantages in technological competition. Second, the nation or relevant industrial departments have joint investment with enterprises to offer advanced

technologies to promote the integration of technological achievements. For instance, Tongji University and Zhejiang Chery Group jointly established Chery-Tongji Automobile Engineering Research Institute and Beijing University and Founder established Beijing University-Founder Software Technology College and so on. Third, with their combination with universities and institutes, enterprises establish their technological centers and high-level research and development institutes with their resources, such as National Engineering Research Center of Engineering Plastics established by Haier and Chemistry Department of Chinese Academy of Science.

(2) Jointly establishing science parks

This is a large-scale combination among universities, institutes and enterprises, with which university science parks are established in certain areas with concentrated distribution of universities and developed industry. In 1950s, with the joint efforts of Stanford University and Silicon Valley, the first university science park, the "Stanford-Silicon valley Pattern" was established, while in China, the first one is Beijing Zhongguancun Science Park mainly relying on Beijing University and Tsinghua University.

(3) Jointly establishing high-tech enterprises

Universities and research institutes, by relying on their advantages in scientific talents, as well as enterprises as well as taking advantage of their capital, facilities, market and productive strengths, establish high-tech entities. There are two main forms including joint operation and technology appraised as capital stock. This pattern is characterized by maximized complementary advantages, strong anti-risk abilities as well as a combination of development, production, sale and service.

4. Major Operational Mechanism in China's Current Cooperation Pattern among Industry, Universities and Research Institutes

The operational mechanism related to the cooperation among industry, universities and research institutes relies on all sides' joint consultation. As a result, it is critical to the success of such cooperation to reasonably select operational mechanism. In spite of the relation between operational mechanism and cooperation pattern, they have no one-to-one correspondence. There are four main types of operational mechanisms in China at present.

4.1 The Operational Mechanism Based on Single Project or Task

This mechanism is one of the main forms in the preliminary stage of the cooperation among industry, universities and research institutes, in which different parties are responsible for their respective tasks. Generally speaking, this method applies to individual technological development projects, technological service, technological transfer, technological consultation as well as tackling technological problems. In spite of its easiness to handle, this method has relatively poor influence and limited cooperation depth, hence tending to cause disputes.

4.2 The Operational Mechanism Based on Cooperative Construction

This refers to an operational method based on the cooperative construction of bases for research, development, training and production and characterized by shared risks and profits. All parties are combined into an integrity in personnel, capital, technological resources, facilities as well as management. This mechanism shows its strengths in promoting complementary advantages in capital, technology and personnel resources, having perfect management system and highly transparent duties and rights, hence helping to achieve common benefits. Basically, this mechanism relies on cooperation.

4.3 Cooperative Mechanism in the Form of Stock

In this mechanism, all parties' capital is converted into stock shares to establish an operation method with the bond of capital operation in order to achieve specific operative targets. Its advantages are reflected in high transparency in all parties' rights and duties, complete operation and management system, helping to exert the positive elements in all aspects and to achieve the expected goals. It's worth mentioning that this mechanism has to be based on establishing new stock cooperation enterprises through assessing and recombining relevant capital. Due to the significant differences between asset operation and capital operation, all tangible and intangible assets should be strictly evaluated.

4.4 Bridging Cooperation Mechanism

In this mechanism, any party gets combined with its cooperative party in organizational system through reform, transfer or reconstruction and ultimately forms a new operational method of technological economy entity. Completely overcoming the drawbacks of separate technology and economy in the traditional system, this mechanism gives a boost to the development of technology and economy. However, due to departmental barriers and some traditional ideas, there are still great difficulties in implementing this cooperational system.

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