

A Tentative Analysis in Symbiotic Mechanism of Industry-university-research Institute Alliance

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Abstract

At present, industry-university-research institute alliance is centered by the economic entity generated in the form of technology investment. This sort of alliance plays a symbiotic effect in the aspects of convergence of elements of innovation, development and transfer of achievements of innovation, etc. In order to further bring the symbiotic effect of industry-university-research institute alliance in practice, we have to make a good choice in cooperative partners, so that we can make the top-level design and create an innovative team. The government ought to give support and guidance to industry-university-research institute alliance and promote healthy development of industry-university-research institute alliance.

Keywords: Industry-university-research institute, Alliance, Mode, Symbiosis

Industry-university-research institute alliance refers to a new economic symbiont generated by convergence of advantage elements of an enterprise and a university or research institution (including inventors of achievements in these units and owners of their patent rights) through their mutual cooperation. The symbiotic mode of industry-university-research institute alliance, its symbiotic effect and the route of the symbiotic effect altogether have extremely important and positive significance to promotion of cooperation of industry-university-research institute.

1. Symbiotic modes of industry-university-research institute alliance

Compared with technology development, technology consulting, technology transfer, technology service and industry-university-research institute alliance, industry-university-research institute alliance is the highest pattern for cooperation of industry-university-research institute. From the perspective of organizational pattern, industry-university-research institute alliance is an economic entity, whereas other cooperative means are a sort of loose non-cooperative relationship; from the perspective of cooperative time, industry-university-research institute alliance is aimed at sustainable development, in pursuit of long term cooperation, whereas other cooperative means are a sort of temporary, aperiodic cooperation; from the angle of cooperative effect, scientific research, development, production and sales within industry-university-research institute alliance are closely linked, whereas other cooperative means tend to be out of line with each other in terms of scientific research, development, production and sales. Thus, industry-university-research institute alliance is faster in speed and more effective in terms of profit in the aspect of development and transfer of scientific and research achievements.

Symbiosis is an important characteristic of industry-university-research institute alliance. As a symbiotic economic organization, the primary generation form of industry-university-research institute alliance is point-to-point, which can not only be binary, but can also be diverse. The so-called binary generation form means that a single enterprise builds an industry-university-research institute alliance together with a single university or research institute. The so-called diverse generation form means that a single enterprise builds an industry-university-research institute alliance together with several universities or research institutes according to the technology chain, or that a single university (research institute) builds an industry-university-research institute alliance with several enterprises. That is to say, one point to multiple points. Thus, we can think in such a way that, the so-called industry-university-research institute alliance, refers to a for-profit economic entity organized by a production enterprise and a university or research institute to realize a common prospect by means of combining their own resource advantages, complementing each other's advantages, sharing interests and burdening risks. At present, there are mainly the following primary patterns for industry-university-research institute alliance.

1.1 To build an economic entity

To build an economic entity refers to technology innovation and development and industrialized legal entity registered in the Industrial and Commercial Bureau and Tax Bureau by two or more industry-university-research institutes by means of centralizing part of their human resources, material resources and financial resources to plan as a whole, manage with centralization and use with unification, in which these units burden responsibilities together, fulfill obligations together, share interests together and take risks together. There are two forms to build an economic entity, one sort of economic entity set up by technology investment. A university or research institute can set up an industry-university-research institute alliance with an enterprise through technology investment based on pre-existing mature technology. An industry-university-research institute alliance formed by means of technology investment can not only be attached to the original enterprise, but can also be used to build a new economic entity. The second sort of economic entity is formed by means of whole packaging investment. According to its own actual situation, the scientific enterprise of a university or a research institute can package as a whole, invest by pricing of shares and build a new economic entity. Its characteristics are as follows: closely connected scientific research, development, production and sales, adaptation of innovative achievements to demands of the market, short cycle of achievement transfer and fast effect yielding. This sort of closely connected industry-university-research institute cooperative mode is helpful for long-term cooperation between a university and research institute, helpful to generate advantages of economy of scale and to obtain better returns.

1.2 To build a research institute

According to characteristics of scientific innovation products, a university and research institute seeks for large and medium-sized enterprises as a partner that have high technical level, strong economic strength, wide marketing channels and good management level, and binds interests of itself and the enterprises together by means of close integration, regarding the development center, project research center and laboratory as the backup force of the enterprises. They jointly develop new products and make pilot plant test, centralize research achievements obtains into one enterprise, integrate research and development, production and market into a whole organization form, and look for “an interface” for combination of the research institute and enterprises, which become a fast “passage” for industrialization of scientific achievements.

1.3 Cooperative development of a project

A definite technology cooperation field and cooperation relationship exists between an enterprise and a university as well as a research institute. Although they do not separately register a new economic entity, the university, research institute and enterprise together set up a neutral combination form to carry out one or more product (technology) development, transformation of scientific and technological achievements. Each party prescribes their own right and obligation with the method of contract, which is a sort of contract integration with project as the bond. During this cooperation, the enterprise is still the subject of cooperation, because the enterprise is usually provider of research and development funds and the ultimate user of the project achievement. However, this sort of cooperative relation is often established with establishment of relationship of contract and is removed with removal of the relationship of contract of the project, so this method is mostly applied to temporary and dynamic industry-university-research institute cooperation.

The mode of industry-university-research institute alliance is not necessarily invariable, so a university, research institute and enterprise can select appropriate industry-university-research institute alliance mode according to their own practical needs and innovate this mode continuously in practice. It is a good mode as long as this mode can make full use of the human resource, intelligence and knowledge resource in a university and research institute, continuously accelerate the pace of scientific and technological innovation of the enterprise and promote optimization of product structure of the enterprise and improvement of the economic profit.

2. Symbiotic effect of industry-university-research institute alliance

Different economic organizations are integrated into a symbiont in order to realize sharing of resources or complementation of resources so as to promote optimization and improvement of resource allocative efficiency, which is termed as “symbiotic effect”. “Symbiotic effect” is similar to the “symbiotic phenomenon” in the biological world. The members rationally distribute such resources as technology and capital and generate a symbiont of “you in me and me in you”, that is, industry-university-research institute alliance, in which they are interdependent and develop hand in hand, which is called “symbiotic effect”. This sort of “symbiotic effect” of industry-university-research institute alliance is mainly embodied in the following several aspects:

2.1 Convergent effect

Convergence of innovative elements is the precondition of symbiotic effect. Industry-university-research institute alliance fulfills coordination and centralization of different social division of labor of scientific research, education and production in terms of function and resource superiority, and is connection and coupling of the upstream, middle and downstream of technological innovation. This sort of close cooperation goes beyond delimitation of a region and a country, and converges a lot of innovative elements, such as talents, market, technology and information, etc. Thus, the “agglomeration economy” of industry-university-research institute is formed, and scientific resources get optimization distribution, which is in accordance with development of the market economy and the general rule of technology innovation, and is the effective fulfillment form and approach for an enterprise to improve its independent innovation capacity.

2.2 Holistic effect

The holistic function is the foundation of symbiotic effect. All parties of an industry-university-research institute alliance offer their own productivity elements, and the process of mutual cooperation is, as a matter of fact, new and effective combination of all productivity elements, which enables the organizational resources provided by all parties for innovative activities to become a new entity. Therefore, we have to set up a unified organizational leadership in order to make sure working of the holistic function of the alliance, establish a common development target, speed up integration of all elements, bring into full play advantages of all parties, bring put the best in each other, form a new binding force and bring the holistic effect of the alliance into sufficient play.

2.3 Interactive effect

Benign interaction is the catalytic agent for symbiotic effect. There exists an interactive effect between all elements within the alliance and between the alliance and the parent, that is, to help each other forward and stimulate each other. The alliance provides a good environment for learning new technology. Members can not only learn at short range, experience personal apperception, exchange information mutually, make up for each other's deficiency, but can stimulate each other and bring innovative inspiration. The interactive effect based on this sort of common interests can promote close cooperation between members, generate a benign interactive mechanism, speed up innovation and development of symbiotic units and their parent, and improve the ability of subsistence and competition.

2.4 Innovative effect

To hasten innovative achievements is the direct presentation of the symbiotic effect. Technical innovation is a complicated system. It is difficult for a single enterprise, university and research institute to fulfill innovation and develop new products merely on their own as a result of different status and constraints of their own conditions in the chain of technical innovation, and it is also difficult for them to finish the whole process from technical development and achievement transfer. All parties of the industry-university-research institute alliance should select direction for breakthrough pursuant to the principle of “interest sharing, risk bearing, advantage complementation and development side by side” and according to the demand of the market, converge advantages of all parties involved, conduct effectively scientific development and achievement transfer, fulfill innovation of products, and especially develop products with propriety intellectual property rights.

2.5 Scale effect

To realize economy of scale is the primary target of symbiotic effect. What an industry-university-research institute alliance pursues is not simply addition of elements, but is to realize the amplification effect of $1+1>2$. to set up an industry-university-research institute alliance can reduce input of research and development, improve the capacity utilization of equipment and service efficiency of personnel, and largely economize cost of production. Besides, to set up an industry-university-research institute alliance can also enlarge scale of production, widen the market influence of products and improve the market occupancy of products.

3. Routes of fulfillment of the symbiotic effect of industry-university-research institute alliance

Complementation of advantages is the premise of generation of the alliance, common interest is the foundation for existence of the alliance and scientific management is the guarantee for deepening and development of the alliance. In order to bring the symbiotic effect of the alliance into better play, we have to abide by the economic rule of the market, establish and make sound the symbiotic mechanism in the whole process of the industry-university-research institute cooperation according to the requirement of the integration of science, technology and economy.

3.1 Careful selection of cooperative partners

Industry-university-research institute alliance is cooperation between different stakeholders. Thus, selection of cooperative partners is the premise of success of a project. Selection of cooperative partners mainly takes into consideration the following several aspects: one is that operation or research field of the two parties should be consistent, the second is strength of cooperation, and the third is good faith. An enterprise has to have good social image, strong economic strength and extensive marketing channel. The scientific research party should be equipped with strong research and development capacity; scientific achievement should be advanced and have market value; research personnel should have time for guidance at the scene, spirit of coordination and the quality of bearing hardships and standing hard work. Faith is the moral criterion for all parties involved in industry-university-research institute cooperation. All parties involved in cooperation should abide by the principle of faith in performing the protocol of cooperation, show consideration for interests of the other party and social public interests, prohibit regarding legal behaviors as a cover of illegality, or prevent the illegal behavior to deceive the other party by concealing the truth. All the above is extremely critical for research and development and for successful transformation of innovative achievements.

3.2 Careful top-level design

The top-level design of industry-university-research institute alliance is to make an overall plan and design at the highest level for development of the alliance, to set up a new mechanism filled with vigor, to lay "a blueprint" between the target and practice, to confirm developmental procedures and measures for development of the alliance, to unite all parties involved and to make efforts for fulfillment of the common target.

In terms of management system, since the industry-university-research institute alliance is a new economic entity established together by all parties involved, they have to set up a leading organ that can represent their common interests according to requirements of corporate governance structure, so as to realize unified leadership, strengthen cooperation and share resources. The alliance ought to set up perfect management regulations, divide labors rationally, make clear respective responsibilities, act according to the rules and lay good foundation for long term higher level cooperation.

The developmental strategic plan should be made meticulously for the alliance. Establishment of the alliance is conducted at different stages, each stage with different development target and focus, different mutual trust and degree of dependence and different degree of stability. The management level of the alliance ought to work out a strategy that can ensure its sustainable development by taking into consideration the entire situation of the industry and its development trend, put forward a series of development plans, improve the strategic management and performance ability and guarantee successful implementation of the strategic plan.

3.3 To build an innovative team with high level

Innovative team is a research collective formed on the basis of cooperation. In the industry-university-research institute alliance, we have to eliminate such a misunderstanding that innovation is what the scientific research party should do and production is what an enterprise should do. However, it is not the case. The scientific research party has to cooperate with the enterprise according to demand of the market and issues in production of the enterprise in terms of confirmation of the technical innovation direction and development of innovative products. In order to accelerate scientific innovation, the enterprise can build a project innovation team together with a university or a research institute, and combine effectively the excellent talents in an effective way. Establishment of a project innovation team is based on good selection of pioneers, and should absorb employees into the team with relevant professional knowledge and innovation capacity. We have to strengthen leadership to the team, shorten the chain of command, guarantee directness and fastness of information transmission, make clear the target of the team, conduct independent management, strengthen internal solidarity and coordination, establish performance appraisal system, intensify responsibility of members in the team and stimulate their enthusiasm in innovation. In addition, the alliance should attempt to demand of the project innovation team on human resource, financial resource and material resource. In one word, by means of establishment of the project innovation team, we should let members of the team collide out spark of intelligence through communication on this innovative platform of the team, bring more innovation inspiration, obtain greater innovation incentive and bring into full play the join forces of the team and advantages of the team.

3.4 Establishment of rational profit distribution mechanism

Distribution of interests is the most critical issue in running of an industry-university-research institute alliance, and plays a crucial role in development course of the alliance. Both of the two cooperative parties should, based on the principle of obligation, right and interest, deal with relationship between immediate interests and long

term interests, between local interests and holistic interests and between tangible interests and intangible interests, and set up a rational profit distribution mechanism, so as to promote development of innovative activities up to the hilt and motivate enthusiasm and creativeness of innovators to the greatest degree.

Property relation is the core to set up profit distribution mechanism. The structure of interests of the alliance is enslaved to arrangement of the property relation. And institutional arrangement of structure of the property right and structure of the interests then restricts distribution means of innovation profits of the alliance. In the joint-stock system alliance, usually an enterprise makes investment in the alliance with its own equipment, capital and labor force, whereas a university and research institute makes investment in the alliance with its own licensed technology. In whichever sort of alliance, the following issues have to be clearly prescribed: the issue of pricing of shares for investment of scientific research achievements, the issue of investment proportion and interest distribution of all parties involved, and the issue of the right of belonging of achievements. Especially, the intellectual property should be regarded as the central aspect to resolve the issue of profit distribution mechanism. Centering with creation, application and protection of intellectual property, parties involved should make clear obligation, right and interest of each party, guarantee interests of all parties in the alliance, and fulfill risk taking and interest sharing.

Remuneration system is the foundation for establishment of the profit distribution mechanism. The alliance should set up a effective remuneration distribution system with an effect of long term stimulation based on establishment of a modern enterprise system with clear property relations, diverse subjects of property right and perfect corporate governance structure, and give long term and effective stimulation to operation management personnel and technical backbones who participate in innovation by means of employee stock ownership, technology investment and stock option, etc.

Risk system is the key to set up profit distribution mechanism. Risks in industry-university-research institute cooperation mainly come from two aspects: one technical risk brought about by uncertainty of maturity of technical achievement and the other marketing risk brought about by inaccuracy of product market forecast. In the mode of industry-university-research institute alliance, the enterprise, university and research institute become the diverse investment subjects, and all parties involved in cooperation should altogether bear risk responsibility through negotiation and generate an industry-university-research institute cooperation mechanism in which interest and risk are burdened together.

Financial system is the guarantee to set up profit distribution mechanism. An independent finance calculation system should be established for industry-university-research institute alliance. In financial management, financial accounts should be public to subject of investment, and should be supervised automatically by relevant departments, calculating carefully, budgeting strictly, and cutting down expenses. Remuneration of the scientific research party should be linked up with economic benefit of the alliance, and it should not share benefits with the method of one time settlement, which is helpful for sustainable development of industry-university-research institute cooperation and innovation.

Stimulation by the government is an indispensable external condition for healthy development of industry-university-research institute alliance. The government should give focal guidance and support to this close type of cooperation of industry-university-research institute alliance by making a policy, building up the environment, and establishing a platform, innovate management and resource allocation means, continue to make perfect policies and measures, and lead the industry-university-research institute alliance into a deeper direction.

References

- Chen, Fangliu & Chen, Liping. (2007). Comparative Study on Industry-University-Research Institute at Home and Abroad and Its Enlightenment. *Coastal Enterprises and Science & Technology*, (2): 161-165.
- Li, Lianshui. (1997). Approaches to Cooperation and Innovation of Industry-university-research Institute in China. *Studies in Science of Science*, (9): 42-44.
- Xin, Aifang. (2004). On Selection of Cooperative Modes in Industry-University-Research Institute Cooperation. *ENTERPRISE ECONOMY*, (9): 62-63.