

The Study of S&T Resources Allocating Modes in Enterprise Dominant University-Industry Cooperation System

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Abstract: Facing the relative laggard and low efficiency of utilizing science and technology resources at present, china must allocate science and technology resources to enterprises according to market mechanism, and construct an innovative university-industry cooperation system in order to improve independent innovative capability indeed. Based on these, the paper firstly analyses the inner causations of why we construct university-industry cooperation system around the firms. Then the problems of allocating S&T resources in current university-industry cooperation system around enterprises are studied. On the basis of these analyses, the paper proposes several representative modes of allocating S&T resources emerging these years in market economy conditions, which are very meaningful for government and enterprises to improve the efficiency of university-industry cooperation system.

Keywords: Enterprise dominant; university-industry cooperation; S&T resources

I. General Information

International experience shows that a country's scientific and technological(S&T) resources are the basis of constructing S&T innovation capacity, china's S&T innovation capability is very weak, one important reason is that the utilization of S&T resources is laggard and inefficient. Affected by long-term planned economy and the dispersive research mechanism, the abundant S&T resources which main component composed by universities, research institutes, state-owned enterprises, unable to meet the main innovation enterprises' need in various sectors such as research and development, technological innovation, the transformation of technological fruits, the advantage in S&T resources did not transform to the advantage in developing competition, due to the management system and operation mechanism don't meet the need of enterprise's technological innovation, lack of institution design in uniting R & D, and innovative integration[1].From "The tenth five" late to 2020, it's an important strategic opportunity for china's economic and social development, S&T innovation should focus on enhancing enterprises innovation capability as the leading force, improving the capability of independent innovation, pay attention to the effective mobilization and integration of S&T resources, centralize the strength of S&T resources and devote much more to enterprises innovation, improve the

efficiency of utilizing S&T resources, enhance the leading role of market mechanisms in utilizing S&T resources. At present, China's national innovation system must also focus on enhancing the technological capability of independent innovation, and strive to establish a market which not only can play a basic role in allocating resources, but also can stimulate innovation actors' vigor, so that the various parts in new national innovation system could be effectively integrated. Focus on establishing the dominant position of enterprises' innovation , establishing a technology innovation system which regard enterprise as its core, integrate production, education and research. They are sticking point in building a national innovation system. Because enterprises-oriented mechanism is befitting to combine dispersive advantages of enterprises, universities and research institutes, it's an effective way to strengthen currently technical innovation. This paper will analyze the problems and causes of S&T resource allocation from the side of theory and practice of management, which exist in current university-industry cooperation system, analyze the inevitability why enterprises must take the leading role, and on this basis, studies typical resource allocation mode occur in recent years under the market economy, then make management recommendations from the government point of view.

II. Endogenous reason of enterprise-led university-industry cooperation

Enterprises could become the main organization to design new product and commercialization development, the endogenetic reason is that enterprise can plan research and development much better, and obtain a higher market returns [2]. The company as a main innovation organization can successfully carry out research and development activities, and transform achievement into higher profits [3].On the other hand, via study the collaborative innovation projects indicate that if there is no enterprise involved for profit, even if they have considerable organizational capacity to complete the project innovation, they can not obtain the corresponding output effects [4]. From a practical point of view, combining production and research only choose enterprise as dominant force, can achieve sustained innovation under market mechanism, take full advantage of this technology innovation platform, which is a basic conclusions of the new economic revolution. There are two

main reasons that we should choose enterprises-dominant system: First, the management objective of enterprises is profit maximization, this goal could only be achieved in the market competition. Radicate and strengthen the enterprises' dominant position in the university-industry cooperation, it is beneficial to build market mechanisms and achieve market-oriented R & D, consequently ensure continued technological innovation in the system. Second, enterprises possess advantages such as close to the market, understand customer's requirement, so they can catch the present and future market technology need more accurately, correctly catch the research and development direction, rapidly integrate S&T resources in colleges, universities, research institutes, and enterprises, provide the market with profitable products and services, improve the success rate and efficiency of university-industry cooperation. However, under the current situation, china's enterprises is far from being a main body of innovation and investment, lack of motivation, full of the impediments to cooperation. For example, in China only 25% medium and large enterprises have R & D department, only 30% have the R&D activities, R & D investment only accounted for 0.76% of sales, it is difficult to adapt the fierce international competition and the requirements of building a well-off society [5].

III. Problem in allocating S&T resource

Generally speaking, China's regional S&T resources still have problem of close, scattered, low efficiency and so on. In the side of using basic S&T conditions, the old management system make production and research out of joint for a long time, S&T resources waste severely and lack of effective sharing. For instance, the number of utilization rate of instruments and equipment in developed countries almost reach 170% -200%, while China's own the number of scientific instruments and equipment more than the total amount in EU, but most utilization rate are less than 25%, or even lower [6]; In the side of basic S&T conditions management, the technology resources invested by the government mostly held by department, even individuals, not share with the whole society. Various kinds of S&T resources are not fully integrated with the enterprises, government financial input and technical personnel are concentrated in universities and research institutions. The rate of industry utilization stay in low level, result in the transformation of S&T achievements are too scattered, the success rate is too low. For example, in 2002 the R&D investment of one hundred China Electronic Information enterprises is just 2.6 billion U.S. dollars, less than 60% at the same period in IBM, 50% in Microsoft. Conversion rate of new achievements of goods and industrialization rate was only 20% and 6% [7]. In the side of basic S&T conditions for service mode, the current institution held S&T resources provide service with resource-oriented mode, rather than market-oriented mode. In the side of basic S&T conditions for cooperation mode, each institutions are isolated, lack of

cooperation and association. In the side of achievements transformation and industrialization services, we can not effectively integrate useful resources to establish a unique corporation service support system, result in the need of technology companies and social resources can not be effectively linked. All these questions have serious impact on the efficiency of enterprise-oriented innovation in university-industry cooperation, make enterprises difficult to play its role as the main body of innovation.

IV. Operating mode of allocating S&T resources around the university-industry cooperation

Constitute a confederate trading institution consist of technology market, finance, property rights and other organizations

Taking Beijing as an example, first, set up a stage for investment and financing, technology market, municipal S&T promotion association, municipal financial assets and equity exchange agency, form a confederate trading institution, provide enterprises with a variety of options. R&D institution could sell technical achievements to enterprises as intangible assets, enterprises also could sell part of the shares or property right to R&D institution. Secondly, sign a strategic cooperation agreement with other cities' property rights organizations, local entrepreneurs in Beijing, not only can use the money in Beijing, but also can use ecademic money. Third, holding annual conference, forums, project promotion meeting and exhibition for specific project cooperation. In the form of above activities, exploit various approach for the small-medium enterprises to get capital and intellectual property, creating a good environment for cooperation. Fourth, focus on enterprise's patent work, filter key enterprises from the whole city's high-tech enterprises to form a network for enterprise patent work, most of patent applications in the enterprise consign to technical professional to complete.

Regional S&T Platform should emphasize particularly on the enterprise

To provide good S&T conditions and environment for enterprises innovation, we need to share S&T resources with the whole society, promote their innovative motivation. In the specific operation, first make decision about the operating system according to market, that is, market has become the primary means to mobilize and collocate S&T resources, but some strategic resources must led by government, or led by the combined mechanism unite the market and government. Second S&T platform must supervise under the enterprise's regulation, thus avoiding low utilization of S&T resources, repeatedly purchase, and even intended destruction. We should also careful not to emphasis commercial operation too much, or it will make S&T resources become purely commercial tools, then lose sight of public interest, violate the original intention of sharing resources. Third, orient service to the whole society.

That means platform will not only meet the research requirement, but also for the main innovation force in different sectors such as the research, development, industrialization to avoid the technology infrastructure invested by the government are almost held by one department, unit or individual, not for social sharing as before. Fourth, resources should be shared with the whole society. Namely, we should get rid of barriers among owners of science and technology, managers, users, reduce innovation cost, which requires plan to allocate S&T resources as a whole, break the state of split due to the planned economy, share them under rules and regulations.

The government should commission more research project to the enterprise

Scientific research and enterprise innovation are mutually supporting under the effect of the market law, the clients of research projects must be extended from university research institutes to enterprises, the main institutions of applied R&D should also be transferred to enterprises, it is necessary to implement a new management mode to manage previous research projects commissioned by the government. First, S&T project should be closely followed the urgent need for S&T at the present stage of economic and social development. Especially innovation bottlenecks in large enterprises in technological, should treat as important project research focused by S&T institution, and establish decision-making mechanism which elect technical experts in industries and enterprises as the main of the S&T proponent. Second, when implement the project we should attract more departments and agencies involved in S&T work, form the pattern of large enterprises and related small-medium enterprises R&D together. Third, promote the production of S&T research projects obtain property rights, commercialized intellectual property, ensure scientific research units independently hold the license of intellectual property and income. Fourth, when found municipal engineering technology development centers in enterprise, local government should support with fund, and then guide other enterprises cooperate, through the engineering technology center, impulse the technology development of enterprise and entire industry.

Open science and technology resources of university to the enterprise

Due to lack of internal drive mechanism and external economic assistance, social investment mechanism is not expedite enough, a large number of S&T resources and achievements gather in university since long time ago, can not integrated with the enterprise innovation very well, the proportion of authentically actualize the innovation industrialization is very low. Therefore, we must orient university's S&T resources to enterprises. First, universities set up laboratories to share S&T resources, then the company of the university or professional enterprise incubator will set up a special department. They will charge

of the operation of agents and share the lab. The staff who provide experimental support for enterprises offered by the enterprise incubator, they are sent to assist the experiment, undertaken technical guidance and training by the experts in laboratories. Second, the expense of using a shared laboratory is charged by the enterprise incubator. Besides laboratory staff salaries, allowances payable to the University, costs of laboratory equipment paid by enterprise incubator for operation and maintenance, enterprise incubator should gain a reasonable payment for agency. Under the premise of fully ensure the scientific research work in university, based on reflect the interests of the university, in order to achieve the goal that country, universities, enterprises and individuals benefit from the multi-win situation, fully mobilize the enthusiasm and initiative of university research institution, promote university resources open to the society. Lastly, the government invest a small quantity of money, so that laboratory equipment and personnel receive a certain complement, and the existing technology platform open to society, intra-regional high-tech enterprises can enjoy specialized services of analysis and detection. For example, under the guidance of Beijing municipal S&T policy, Tsinghua science park and analysis center of Tsinghua University, is co-building "Tsinghua Science Park shared analysis laboratory", the laboratory create a mechanism for sharing the advantage. With a small amount of incremental inputs, analysis center of Tsinghua liquidize remnant S&T resources, the cooperation will greatly enhance the incubating ability of S&T business incubators in the Tsinghua Science Park, provide small and medium enterprises a S&T research and innovation platform [8].

Industry Technical service center for business and gather industry resources

The primary role of industry technology service center is close cooperating with the universities, research institutes and general enterprises, it provide technical services for small and medium enterprises in product development, designing, testing and personnel training, provide technical support for the development of the industry, play a role to distribute and radiate as an industry technology center. We should play a role in accumulating S&T resources emphatically oriented enterprises, to be specific we should implement the following work. First of all, integrate resources according to common problems in different industries, resort to the leverage of interest to promote the combination of scientific research institutes and industry, so that industry technical service platform can provide services for enterprises, help enterprises to solve the difficulties of inadequate facilities, saving enterprises' inputs funds in single project, help enterprises to improve the efficiency of project development, ensure product quality. Secondly, under the guidance of local government, choose a relevant institution as the leader, break the restrictions of affiliation, unite with other agencies as a leading organization, establish

combined service platform with overall planning, effectively organized the S&T resources scattered in each industry sectors, provide material analysis testing services to the enterprises more rapidly, flexible and efficiently, achieve information exchange and resources sharing. Thirdly, take full advantage of universities, basic research in institutes, human resources and information gathering, speed up the construction of industry technical service center, while actively explore effective mechanisms for university-industry cooperation, seek effective way to establish industry technical services center in accordance with economic laws. Build a business technology service center to form a union of benefit-sharing, risk-sharing. For example, under the lead of Beijing municipal S&T committee, new materials development center in Beijing, Beijing break the constraint of the affiliation, combine with 3 national analytical testing institutions such as national steel materials testing center, national colored metals and electronic materials analysis and testing center, national building materials testing center as a leading organization, establish "Beijing Materials testing services platform," effectively organize test and analysis resources scattered in each industry sectors, seize the characteristics and key field of new materials development, form Beijing Materials Analysis and Testing system, and make full use of computer networks and other information technology, provide material analysis testing services to Beijing and the country in a fast, flexible and efficient way, achieve information exchange and resource sharing [9].

Professional incubator mode of integrate resources oriented to enterprises main body

The role of professional incubator are mainly embodied in a platform for pooling the professional preponderant resources, shorten the distance among social resources, improve utilization rate of social resources, complete the industrialization stage of S&T achievements through effective professional and technical services to support small-medium enterprises, indirectly achieve the goal of enlarging the scale of related industry. The specialized incubator can not only provide a basal and common technical platform, but also can integrate resources. It aggregate the original resource which can not be aggregated before, it assemble resources which are difficult to utilize each other before, so that the original resources which had previously been the waste are fully utilized, and kinds of social resources can complement each other. It increases overall efficiency in the use of social resources. In order to integrate resources within the internal incubator and the external resources, extend and improve the industrial chain, when make the professional integration of the resources, it should implement the following work. First, the industrial enterprises in many areas, their R&D capacity is very weak, they only can do simple migration and imitation. while the main body of scientific research and technological development is dominated directly under the government

research institutions and universities, the relation between industry, research and study is intersected, the transformation rate of research achievement is quite low. Therefore, according to the requirements of industry supply chain, we should effectively integrate domestic and international resources and advantages, combine production, research and education altogether, establish a innovation platform operate efficiently which consist of the government, research institutions, enterprises, financial institutions and so on, establish a united organization of "research - production - market development", operate according to the rule of market, accelerate the process of industrialization. Second, the professional incubator must help enterprises to found their own industrial chain, the incubator must possess a batch of management staff who understand the technology business, so the incubator can offer technological support services, such as filter project, evaluation system, platform construction, equipment operation and management. Thus, they can have good communication with enterprises.

V. Conclusion

At present, facing economic globalization and the rapid development of knowledge-economy, increasingly fierce international competition, China's economic and social development come to an important intersection. Improve independent innovation capability is the central link to regulate economic structure and shift the way of economic growth, we must improve the capability of independent innovation and enhance national competitiveness, make improving independent innovation capability as the primary task of the new era S&T work, spare no effort to promote wave of innovation. In the path of development, we must strengthen the independent innovation, continuously enhance the sustainable capability of technological innovation. In innovative mode, strengthen integrated innovation of major products and new industries, and strive to achieve breakthroughs in the integration of key technologies. In innovation system, we must establish technology innovation system take enterprises as the main body, university-industry cooperation as a breakthrough point, enlarge the entire national innovation system. In order to achieve above objective, we must centering on enterprises as the main innovation body, allocate more technology resources to enterprises innovation system according to market mechanism, form a dynamic and secure university-industry cooperation innovation system, and ultimately upgrade the independent innovation capacity. Accordingly, this paper start with analysis the endogenous reason of corporate-led university-industry cooperation innovation system, analyze the current problems in S&T resource allocation, and discusses in detail several typical allocate S&T resources patterns around corporate-led university-industry cooperation innovation system, these patterns are all appeared in recent years, spontaneous birth under market conditions, need to generalization urgently. This paper will

have positive referring significance to the government departments and all parties in university-industry cooperation.

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