

Content Analysis of Collaborative Innovation Policy between Universities and Industry Clusters——Based on the Comparison of Six Developed Regions in China

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Abstract: the collaborative innovation between universities and industry clusters is instrumental in the sustainable development of industry clusters, and also plays a vital role in local economic development. The effective development of collaborative innovation between universities and industry clusters is inseparable from the policy support of local governments. Based on the content analysis in the related policy in domestic universities and industry clusters of collaborative innovation achievements in six provinces, it is discovered that collaborative innovation policies contents include establishing perfect system, furthering consummate the functions of the government, establishing collaborative and innovative social groups, perfecting the system Mechanism of Cooperative Innovation docking Service, encouraging diversified investment channels, supporting collaborative innovation talented person troop construction and creating an exchange platform for the universities and cooperative innovation of industrial clusters.

Keywords: universities; Industry clusters; Collaborative innovation policies; Content analysis.

1. INTRODUCTION

In modern society, the function of education has changed. It plays an important role in promoting regional economic development and regional service. “The innovation capacity of institutions of higher learning” (The post is referred to as the plan 2011) of the Education Ministry explicitly pointed out that “an urgent need to encourage institutions of higher learning to conduct in-depth cooperation with the companies in the industry and the scientific research institutions, to establish strategic alliance and to promote research institutions by vigorously

promoting collaborative innovation". The teaching and scientific research of institutions of higher learning is supposed to develop coordinately with other local industry clusters, provide talent, disruptive technology and scientific research for the local industry. Thus, playing a driving and leading role in the sustainable development of industry clusters in the talent nurturing, science research, subject clustering, and other key elements[1]. However, the coordinated development and docking of universities with respect to industry clusters needs the policy support from the government departments, to yield better results.

In view of the synergistic innovation between universities and industry clusters, this article deeply analyzes the policy of collaborative innovation between universities and industry clusters in Beijing, Shanghai, also in Guangdong, Zhejiang, Jiangsu and Shandong Province. It explores the achievements of various regions thereby differentiating them, to provide inspiration for other regions. It should be noted that there are several reasons for the selection of provinces: From the geographical location, it is in the northeast, the southeast coast, the central and the western part. In terms of economic development, the GDP of Shandong, Zhejiang, Jiangsu and Shandong Province ranks first, although the GDP of Shaanxi Province is not in the top, there are many higher education resources in Shaanxi Province, which ranks first. Beijing and Shanghai are the political and economic centers, gathered abundantly of high-quality educational resources, which means it is also of great significance to collect the docking policy from these two regions.

2. ESTABLISH A SOUND INSTITUTIONAL SYSTEM

In order to promote the innovation and development of universities and industry clusters in various regions. So as to establish innovative provinces (or cities), governments have introduced a number of relevant systems to form a more competent system and to give full play to the administration function of the government.

The system includes two aspects: basic system and standard system. The basic system puts forward the important role of the coordinated development of universities and industry clusters on regional economic development from the perspective of strategy. For instance, the policy document of <the eleventh five-year plan for the development of Beijing's national economy and social development proposed by Beijing municipal committee of the communist party of China (CPC)>, <Beijing municipal people's government's opinions on enhancing the capacity of independent innovation to build an innovative city>, <A notice on the implementation of the work of the municipal government on deepening the reform of the science and technology system to accelerate the construction of the capital innovation system issued by the general office of the Beijing municipal people's government>, <a number of opinions of the encouragement from The Beijing municipal government on the cooperation between production and research that carried out by enterprises and colleges and universities> in Beijing, <the implementation of a number of supporting policies in the outline (2006-2020) of the medium and long term plan for the development of scientific and technological development in Shanghai announced by The Shanghai municipal people's government> in

Shanghai, <the medium and long term reform and development program of education in Zhejiang Province (2010-2020)>, <the plan of science and technology development in Zhejiang Province> and <a number of opinions in Zhejiang Province on accelerating the improvement of independent innovation capacity to build an innovative province and a strong province in science and technology> in Zhejiang Province. These programmatic and strategic policy documents put forward the importance of the synergistic innovation between universities and industry clusters, as well as the development goals according to the development of science and technology, industry clusters, the development of industrial economy and the higher education that developing the social economic.

The system of the normative class is mainly about how to carry out the system and norms of the cooperation between universities and the industry clusters in the region, including high-tech industrialization, the commercialization of research findings, Construction of high-tech industrial park and High-tech property rights. For instance, <the regulations to develop high-tech in Jiangsu Province> and <Some provisions on further promoting the transformation of scientific and technological achievements and industrialization of high and new technology> issued by Jiangsu Province.

3. IMPROVE GOVERNMENT FUNCTIONS

Provincial government departments enhance the functions of government. Taking Jiangsu Province for example, the government set up a high-tech development team, Relevant departments also established corresponding institutions to clarify the functions of the high-tech development groups, breaking down the objectives according to the general requirements of the government, also establishing the system of assessment responsibility, and defining the objectives of the stage.

Departments of provincial governments also strengthen the function of the statistical monitoring, evaluating the quality of the cooperative innovation of industry clusters and universities to safeguard the collaborative innovation and dock services to a high starting point, high standard, high quality finish [2].

Through a series of measures, the provincial governments improved the institutional mechanism of collaborative innovation between universities and industry clusters. Thus it provided a good policy and institutional environment for the joint work of universities and industry clusters.

4. ESTABLISH COLLABORATIVE INNOVATION AND DOCKING SOCIAL GROUPS

The table 1 shows the collation, analysis on the policy of universities and cooperative innovation of industry clusters in various provinces. Through this table, we witness that Jiangsu, Zhejiang, Guangdong and other provinces have set up special administrative institutions or social organizations of "Industry-university-institute Cooperation", which is

mainly responsible for the cooperative innovation docking services of the regional universities and industry clusters.

Table 1. Connecting management institutions of universities and industry clusters in some provinces

Province	Name of management organization	Key Responsibilities
Jiangsu Province	Group of university-industry collaboration	Implement the strategy of building an innovative province by the provincial committee and implement all aspects of the 11th five-year plan for science and technology development in Jiangsu Province and its supporting policies. Study the major problems in the university-industry cooperation, coordination of various departments to promote the action of university-industry cooperation, explore new mechanisms and mode of university-industry cooperation guidance, and promote the collaboration by regarding enterprises as the main body, market oriented and innovating system construction in university-industry cooperation.
Zhejiang Province	IUR (industry, university and research) Promotion Cooperation Association	Act as the bridge and the link among three sides of industry, university, research, financial institutions and government, stick together with all walks of life force and positive factors, joint domestic and foreign related organizations, universities, scientific research units, promote enterprises, especially private enterprises to enhance the ability of independent innovation and improve the enterprise market. Competition ability and economic benefit and to realize industrialization and upgrade.
	“Eight times and two increase”, in special operations coordination group for science and technology services	To ensure the smooth realization of “Eight times and two increase” of the technology service operation, it is supposed to supervise and urge the work to be carried out, and coordinate the problems in the working process.
Guangdong Province	The group office of university-industry collaboration in the ministry of education of Guangdong Province	Organize and lead the work of university-industry collaboration in the ministry of education of Guangdong Province. Organize the cooperation among the enterprise, R&D institution and the universities. Establish the cooperation fund of The group office of university-industry collaboration, and manage the demonstration base of university-industry collaboration in the ministry of education of Guangdong Province.
	Association for the advancement of "industry-university-institute" cooperation in Guangdong province	Summarize the skilled and new ideas, new models and new methods of industry-university-research cooperation; Promote technology transfer, achievement transformation, financing support and industrial upgrading; Train specialized personnel for the cooperation of production, study and research; Promote the internationalization of industry-university-research cooperation and the establishment of the cooperation fund for investment, financing and industry-university-research; Set up a platform for information integration services centered on enterprise needs, build a cooperative platform for government support and financial intervention, and serve enterprises and members in various forms.

For the purpose of promoting industry clusters development, strengthening the industry-university-research cooperation, improving the capacity of independent innovation in industries and accelerating the transformation of scientific and technological achievements,

these institutions play the role of bridge among the universities, enterprises, scientific research institutions, government and financial institutions, integrate the power of all circles of the society to carry out innovation of production, study and work, and improve the industry competition ability and Industrial economic benefit. At the same time, technical evaluation, technical economy, technical consultation, technology trading, technical services and other science and technology service agents are also needed.

5. CONSTANTLY IMPROVE THE SYSTEM AND MECHANISM OF SYNERGISTIC INNOVATION DOCKING SERVICE

Beijing, Shanghai, Guangdong Province and other regions are improving systems and mechanisms, including consulting and service mechanism, the achievements transformation mechanism, incentive mechanism and risk mechanism, in Collaborative innovation and docking services between universities and industry clusters.

5.1 Improve the consultation service mechanism

During the establishment of the perfect consultation service mechanism in the university and industry clusters docking service, technology transfer and consultation center is set up in universities to carry out scientific and technological consultation services.

5.2 Risk sharing mechanism

A mechanism for encouraging the technological innovation of universities and scientific research institutions should be set up to support the upgrading of independent innovative carriers in high-tech parks and establish a multi-layered risk-sharing mechanism.

5.3 Innovate and improve the personnel system

The personnel system is an important aspect that affects the connection service between universities and industry clusters. Local governments should improve and integrate personal systems as far as possible to facilitate the exchange of talents. The scientific and technological personnel of the university are allowed to leave the post to establish the high-tech enterprise or to transfer the scientific and technological achievements in other high and new technology enterprises; also, they are allowed to return to the original unit within the prescribed time limit.

5.4 Perfect incentive mechanism

The docking service between universities and industry clusters is basically to achieve a win-win for both parties, and to drive the operation of perfecting the motivation mechanism. We can see the incentive mechanism of some provinces and the perfection of the cooperation between the elements. Universities can invest in the technology, participate in the joint operation of enterprises and implement the technology factors there by participating in income distribution. Enterprises, universities, scientific research institutes and other units can be paid through the various forms of science and technology personnel remuneration. Remuneration and benefits shall be pegged to the salary and reward system. It is supposed to sign a technology underwriting agreement to extract the ratio from the income of technology development, transfer and consulting, and transfer a certain proportion from the technology share owned by the unit. The science and technology personnel in universities and research

institutes can sign an agreement with the unit to set up a science and technology enterprise part time without violating the economic interests of the unit and continue being provided for necessary scientific research conditions for science and technology personnel in the unit and be treat equally in the position [3].

5.5 Innovation evaluation mechanism

In service industry clusters in universities, regions focus on establishing innovation evaluation mechanism, and universities evaluate the scientific and technological achievements according to the technology evaluation system guided by the improvement of the innovative ability[4] Universities, scientific research institutes and enterprises should adopt differentiated evaluation criteria , improve the science and technology personnel appraisal, professional title evaluation system, improve the weight of the scientific and technological achievements transformation index and industrialization index, put the horizontal topic , which entrusted by the enterprises and institutions, and which undertaken by science and technology personnel of universities and research institutes into the scientific research workload assessment content and promote professional and technical positions for outstanding scientific and technological talents.

5.6 Improve the mechanism for managing intellectual property rights

Universities all over the country should establish a vibrant sound system of intellectual property management and integrate the quantitative indicators of intellectual property into the evaluation and assessment system of scientific research development or teaching practice. It should encourage and guide universities and scientific research institutions to transfer intellectual property rights to enterprises and form a new creative mechanism that is conducive to the rapid industrialization of new and high technologies, the combination of development projects and training talents.

6. ENCOURAGE DIVERSIFIED INVESTMENT CHANNELS

In the collaborative innovation and docking services between universities and industry clusters, provinces should encourage diversified funding channels to support their cooperation, including the following aspects:

6.1 Government funding

The local government has continuously strengthened the investment in science and technology, optimized the structure of government science and technology input, and ensured the implementation of major special project. Set up special funds for industry clusters development every year, support the development of industry clusters by means of loan discount, special subsidies and capital input, and increase financial support, to give play to the demonstration role of key industry clusters, and improve basic conditions.

6.2 Improve the investment and financing environment

Local governments should strengthen credit system construction, accelerate the development of venture capital investment, improve the investment and financing environment, and expand the investment and financing channels of science and technology enterprises.

6.3 Establish a diversified input mechanism

In addition to the special funds set up by the government, a diversified investment mechanism should be established to attract the support of social funds.

7. ENERGETICALLY SUPPORT THE CONSTRUCTION OF COLLABORATIVE INNOVATION TALENT TEAMS

In the policy documents of collaborative innovation and docking service between universities and industry clusters in some provinces, we should pay more attention to the collaborative innovation talent team construction.

7.1 Emphasis on talent introduction

All regions attach great importance to the introduction, cultivation and guarantee of talents. To begin with, the introduction of talent, for instance, Jiangsu Province paid special attention to talent introduction, and took various means to attract returnees who studied abroad to start a business in Jiangsu Province[5]. Jiangsu Province clearly pointed out that they took effective measures, through the market mechanism, to further reform and improve the talent selection, appointment, distribution system and the market system. What's more, they established incentive mechanism which is beneficial to the development of high and new technology, including encouraging technology investment, science and technology personnel share, rewarding the system of technology development and building a favorable talent environment. Jiangsu Province adopted various methods to create favorable conditions to attract the talent who studied abroad emphasis to who engage in high-tech research to establish a business [6].

7.2 Focus on team building

In terms of talent team building and talent training, it is necessary to implement global talent strategy, support high-level software personnel to study abroad and employ foreign experts to teach and work.

7.3 Promote talent introduction and exchange

The government departments concern to promote talent exchange between universities, research institutes and enterprises, select professors and doctors from the college to enterprise services, hire outstanding entrepreneurs or technical leaders to be “industrial professors” in the college, promote “the dual tutorial system” for graduate students, set up a guest researcher post for enterprise innovation personnel, select senior experts in enterprises to be professors or researchers and set up enterprise innovation post. At the same time, universities can set up a talent station according to the actual situation of the introduction of science and technology talents, support the corresponding conditions for the talent of enterprises entering the station, and in the project and platform declaration, professional title review and the opening of various research platform and other aspects, these talents of enterprises shall enjoy the same treatment with the school of science and technology personnel.

7.4 Innovative personnel training mode

Some universities constantly improved their talent training model. Such as Shandong University of science and technology who built the regional economic development and

high-skilled personnel training mode for the need of production, learning and research cooperation, cultivate number of majors closely related to regional pillar industries development, providing the reliable talents and intellectual resources for local economic development. It adopted a series of measures including multi-geographical, multi-professional and multi-level personnel training. These highlighted the characteristics of order cultivation, joint cultivation and delegation cultivation; Promoted students' engineering practice ability, gave full play to the existing teaching and research practice base, the employment and entrepreneurship base and the science and technology innovation base, relying on the Engineering Technology Research Center at all levels, training center and organize Internship activities corresponding majors and courses to effectively promote students' practical ability[7].

8. ESTABLISH A PLATFORM FOR COOPERATION AND INNOVATION BETWEEN UNIVERSITIES AND INDUSTRY CLUSTERS

The table 2 shows the interface service platform between universities and industry clusters in provinces. What's more, in the collaborative innovation between universities and industry clusters, the establishment of the docking platform is mainly composed of the following functions:

Strengthen the regional resource sharing. The equipment and scientific literature of universities are open to enterprises to promote the sharing of public innovation resources. The universities should build open education teaching resource information base with the support of the government. In addition, there are service platforms oriented by policy analysis and industry-university-research, such as the institute of government and industry in Shandong Province.

To establish the information resource base of universities and enterprises, we can inquire the scientific research information of universities and the scientific and technological demand information of enterprises through the database, such as, Shanghai university production and research cooperation center in Dongguan Province, the production and research cooperation network in Jiangsu province.

Establish an enterprise demand-oriented industry-university-research public service platform; expand the function of R&D public service platform, promote the resources integration; set up a production-study-research cooperation platform collected of project demand, universities, scientific research results supply of scientific research institutions, technical achievements trading and other functions in one body; establish an operational mechanisms for technology transfer and strengthen the transformation of scientific and technological achievements of colleges. Such as, the technology market of universities in Shanghai, science and technology achievement transformation service platform in Shandong Province.

Build research and development institutions. Local governments should support qualified universities, research institutes, local governments or enterprises to jointly establish laboratories or research, and development institutions.

Table 2. Interface service platform between universities and industry clusters in provinces

Name of docking service platform	Organizing unit	main body of composition	service content
Shanghai University Technology Market	Shanghai education committee, Shanghai science and technology commission, People's Government in Yangpu District	Technical supplier, technical demander, technical transaction service provider.	Aim to gather intelligence, capital and other elements, to bring into play the merits of science, technology and talents in Colleges, promote the university-industry cooperation, service the vast number of enterprises, accelerate the transformation and industrialization of scientific and technological achievements and make contributions to social and economic development.
Shandong Institute of production, research and research cooperation	Shandong Province propaganda Department and the Federation of Social Sciences	Research on industry, university and research Integration of the application of merits, committed to the development of cooperation between government, industry, education and research.	Integrate the application of merits, commit to the development of cooperation between government, industry, education and research. Integrate platform of Integration of Government, Industry, University and Research based on Policy Analysis and High-end academic guidance.
Jiangsu Productivity Promotion Center	Science and Technology Department of Jiangsu Province	Authority	Provide supportive public services for government science and technology management; provide professional public service for social science and technology innovation.
Beijing Institute of collaborative innovation		Co-construction of universities and enterprises	The aim is to penetrate in the market of scientific research.
Cooperative Information Network of Industry, Learning and Research, Ministry of Science and Technology of Guangdong Province	Guangdong provincial science and Technology Department	Authority	Guangdong Province, the ministry of education, the ministry of science and technology jointly promote the development strategy and policy measures of the combination of industry-university-research.
Guangdong Provincial Association for the Promotion of Cooperation between Industry, University and Research	Provincial Administration of Civil organizations Approves Civil organizations	non-governmental organization	Associate the advancement set up production-study-research cooperation platform, improve the long-term mechanism of production-study-research cooperation, integrate Guangdong industry competitiveness and capacity for independent innovation, accelerate innovation Guangdong and promote a sound, rapid economic and social development in Guangdong.
Guangdong Provincial Association for the Promotion of Cooperation between Industry, University and Research	Shaanxi Industry, University and Research Federation, Enterprise Technology Innovation Promotion Association, Technology Innovation Service Center	Limited liability company form	Implement market-oriented operation mechanism, explore and innovate the intermediary service mode of industry, education and research according to the needs of enterprises and markets, construct and create a platform and a space for interaction, association and exchange among all parties in the field of production, education and research.

9. CONCLUSION

In short, all regions can adopt a series of reform measures to provide a sound institutional environment, a sound financial environment, a positive cultural environment, a sound industrial chain and a healthy ecological environment for the development of strategic emerging industries thus promoting a Healthy and sustainable development.

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