Current Situation and Defects of Technology Transfer in Colleges and Universities of Guangdong Province

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Abstract: This paper focuses on analysis of technology transfer of colleges and universities in Guangdong Province and proposes relevant improvement strategies for the defects existing in technology transfer of colleges and universities in Guangdong Province.

1. Introduction

Technology transfer refers to the process in which a technology is transferred from its place of origin or field of practice to other places or fields. According to its transfer direction, it can be generally divided into two categories: bidirectional transmission in geospatial location and unidirectional diffusion in different fields of practice. According to the transfer mode, it can be divided into paid transfer and unpaid transfer. According to the scope of transfer, it can be divided into international transfer and domestic transfer. In addition, for technology transfer, there are many external factors, including national laws, regulations and policies, market demand, links between enterprises and universities, etc. Because of the uncertainty of these external factors, the problems in the process of technology transfer are still obvious.

2. Research status of technology transfer of colleges and universities in Guangdong Province

Scientific research human resource status of regular institutes of higher education in 2017 is as below:

Fields of science, industry, agriculture and medicine: in 2017, the total number of teaching and research personnel engaging in science, industry, agriculture and medicine in regular institutes of higher education (including affiliated hospitals) was 72012, up 9.99% compared with that in 2016. There were 25930 persons with the title of a senior professional post, accounting for 36.01%, up 12.80% compared with that in 2016. There were 19593 doctoral candidates, accounting for 27.21%, up 14.70% compared with that in 2016.

Fields of humanities and social sciences: in 2017, the total number of teaching and research personnel engaging in humanities and social sciences in regular institutes of higher education was 52461, up 4.12% compared with that in 2016. There were 16030 persons with the title of a senior professional post, accounting for 30.56%, up 4.55% compared with that in 2016. There were 1060 doctoral candidates, accounting for 17.27%, up 11.49% compared with that in 2016.

In 2017, regular institutes of higher education in Guangdong Province carried out technology transfer and transformation (fields of science, industry, agriculture and medicine) to service local economic development, as below: according to incomplete statistics, a of January 2018, there were 1584 various kinds of science and technology service platforms in regular institutes of higher education in Guangdong Province, and the construction expenditure invested was 10.691 billion yuan in total. Among them, there were 645 engineering centers (16 national-level engineering centers, 14 ministry-level engineering centers, 453 provincial-level engineering centers, 162 urban-level and county-level engineering centers), and the construction expenditure invested was 3.962 billion yuan in total. There were 171 industry-university-research bases (7 provincial-level bases and 164 bases at

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the level of education department), the construction expenditure invested was 1.483 billion yuan. There were 392 laboratories co-built with enterprises, and the construction expenditure invested was 1.859 billion yuan. There were 205 other research and development platforms, and the construction expenditure invested was 3.362 billion yuan.

In 2017, regular institutes of higher education in Guangdong Province and enterprises cooperated to apply for and gain the approval of 10088 vertical science and technology projects, and horizontal projects entrusted by enterprises, and the expenditure of 5.34 billion yuan was approved. Among them, there were 2826 vertical projects, with the expenditure of 3.046 billion yuan approved; there were 7262 horizontal projects, with the contract expenditure of 2.294 billion yuan.

There were 680 contracts for technology transfer, and the real income was 119.766 million yuan that year. Among them, 58 contracts were signed with state-owned enterprises, and the real income was 18.12 million yuan that year. 10 contracts were signed with overseas-funded enterprises, and the real income was 2.184 million yuan that year. 550 contracts were signed with private enterprises, and the real income was 122.065 million yuan that year. 62 contracts were signed with other enterprises, and the real income was 30.039 million yuan that year. The projects completed by cooperation between regular institutes of higher education in Guangdong Province and enterprises won 148 science and technology awards, including 6 national awards, 11 minister awards, 67 provincial awards and 64 city-level awards.

Table 1 Patent application and authorization of colleges and universities in Guangdong Province in 2017

atent application		Patent authorization		Patent ownership	
No.	Year-on-year growth	No.	Year-on-year growth	No.	Year-on-year growth
20042	30.71%	8616	15.51%	30020	22.81%

Data source: Manual of scientific research statistical data of regular institutes of higher education in Guangdong Province[R].2018

Table 2 Technology transfer of regular institutes of higher education in Guangdong Province in 2017

Technology transfer contract		Contract amount		Real income that year	
No.	Year-on-year growth	Expenditure (1000o yuan)	Year-on-year growth	Expenditure (1000o yuan)	Year-on-year growth
680	79.89%	19194.4	-29.26%	11976.6	-25.30%

Data source: Manual of scientific research statistical data of regular institutes of higher education in Guangdong Province[R].2018

Table 3 Real income ranking of technology transfer of regular institutes of higher education nationwide in 2017

Ranking	Region	Real income that year (100 million yuan)	Percentage
1	Shandong Province	6.32	17.27%
2	Beijing	6.21	16.97%
3	Jiangsu Province	4.94	13.50%
4	Shaanxi Province	2.45	6.70%
5	Chongqing Municipality	2.12	5.79%
6	Liaoning Province	2.09	5.72%
7	Sichuan Province	1.75	4.78%
8	Zhejiang Province	1.49	4.07%
9	Shanxi Province	1.30	3.56%
10	Henan Province	1.28	3.51%
11	Guangdong Province	1.20	3.27%
12	Shanghai Municipality	1.19	3.25%
13	Hubei Province	0.95	2.61%
14	Fujian Province	0.90	2.47%
15	Jilin Province	0.52	1.42%

16	Anhui Province	0.51	1.41%
17	Hebei Province	0.35	0.97%
18	Tianjin City	0.28	0.76%
19	Hunan Province	0.22	0.61%
20	Heilongjiang Province	0.19	0.52%

3. Defects existing in technology transfer of colleges and universities in Guangdong Province

3.1 The matching degree of scientific and technological innovation and market demand is low

For technology transfer of colleges and universities in Guangdong Province, the matching degree of scientific and technological innovation and market demand is low, and the graduates of colleges and universities cannot better meet market demand. Thus, colleges and universities suffer certain loss in the development process. Due to many technology transfer categories and channels, some differences will exist inevitably during matching with market demand. This cannot be separated from flexibility of market regulation, but meanwhile this also reflects the lack of sufficient market surveys and researches. The root cause of the problem lies in colleges and universities.

3.2 There is lack of systematic technology transfer policy and legal system

The improvement of laws, regulations and policies is an important precondition for supporting colleges and universities to achieve technology transfer. However, college technology transfer has gradually risen in recent years, and the fast-paced social development also drives college technology transfer to achieve faster development. Since the foundation of China is weak in this aspect, there are many problems accumulated in the development process. The shortage of systematic technology transfer policy and legal system is a major problem faced by technology transfer of colleges and universities in Guangdong Province. The problem can reflect the insufficient research efforts of China in this aspect. Besides, many uncertain factors and fast changes lead to the need of policy change and adjustment. It is still necessary to further enhance the study on the improvement of legal system. But, relevant professional researchers are insufficient, and flexibility of market adjustment is strong. Thus, certain conflicts exist between the two.

3.3 Independent innovation capability and driving force of colleges and universities are insufficient

Innovation input, innovation management and innovation output are the main indicators to evaluate independent innovation effect of colleges and universities. Under the historical background of constructing Guangdong-Hong Kong-Macao Greater Bay Area, it is required to approximate world-class universities in Hong Kong and Macao. Although independent innovation capability of colleges and universities in Guangdong Province has kept improving in recent years, some main problems still exist such as insufficient innovation input, low proportion of innovative talents, few leading figures and innovation management lag. As a result, colleges and universities in Guangdong Province lack world-class independent innovation capability of, and low innovation output quality is low. Meanwhile, few technological achievements reach the world leading level.

4. Improvement strategies for technology transfer of colleges and universities in Guangdong Province

4.1 To construct market-oriented mechanism based on market and enterprise demands

Since flexibility of market regulation is high, the technical demands of enterprises in the market change also dramatically. Thus, technology transfer of colleges and universities in Guangdong Province need to generally investigate the demands of market and enterprises and construct market-oriented mechanism based on market and enterprise demands. In this way, technology research and development persons cultivated by colleges and universities can better meet market and

enterprise demands. Meanwhile, enterprises can achieve better development, contribute to scientific research of colleges and universities in turn and promote the better development of colleges and universities. Both are related to each other and supplement each other. So in the process of technology research and development, technology application and transfer, enterprises should give more help to colleges and universities.

4.2 To improve policy security system and perfect internal and external incentive mechanisms

The sound system and perfect management system are important preconditions for supporting industrial development. Technology transfer development in Guangdong Province is in the front ranking. But relative to some foreign developed countries, even Hong Kong and Macao, there are still some defects. Since it starts late, the development speed is low. Thus, relevant policy security systems are not sound enough, and laws and regulations are not perfect enough. For this problem, enterprises need to enhance communications with colleges and universities which should further improve internal and external incentive mechanisms. For the national government, it is required to enhance improvement of relevant laws and regulations and improve policy security system so as to provide a relatively stable and harmonious environment for colleges and universities to achieve technology transfer.

4.3 To strengthen internal support system construction of colleges and universities, and collaboratively innovate for technology transfer normalcy mechanism

For technology transfer of colleges and universities in Guangdong Province, a prominent problem is that they pay attention to technology import, and ignore technology digestion. The research and development achievements are not well matched with the achievements required by enterprises. Moreover, for the return effect for scientific research cause in colleges and universities is also not strong. For such problem, science and technology planning and resources of each department in colleges and universities should be proposed, and the plan and path planning for scientific research and development should be specified. Scientific research and achievement R&D should not be conducted blindly. It is necessary to fully understand market demands and construct technology transfer normalcy mechanism through collaborative innovation. Colleges, enterprises and participants should divide the work and cooperate to promote formation of various forms of innovation clusters and technical alliances, and formation of large-scale technology transfer and application to realize mutual benefit, win-win and joint development.

5. Summary

To better resolve the problems existing in technology transfer of colleges and universities in Guangdong Province, and improve quality level of technology transfer of colleges and universities in Guangdong Province, firstly, it is required to actively solve the defects existing in current technology transfer. The main problems existing in technology transfer of colleges and universities in Guangdong Province are closely related to the problems in social development of China. In addition, these problems will not just influence scientific research of colleges and universities, but also affect the development of independent innovation capability and improvement of comprehensive national power. Scientific and technological innovation has been a focus topic and field in China. However, due to insufficient innovation capability and achievement transformation, innovation efforts are weak in China. To further improve the development level of science and technology, national government should improve relevant policies, laws and regulations. Meanwhile, enterprises, colleges and universities should make greater efforts.

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