Research on Construction and Application of Internationalization System of Scientific and Technological Innovation in Shandong Province

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Abstract. At present, the wave of globalization has swept the world and penetrated into all aspects of social life, bringing opportunities and challenges. In the context of economic and technological globalization, the concept of internationalization of scientific and technological innovation has emerged as the times require. It has become an important strategic means for countries to adapt to globalization trends, respond to globalization challenges, and seize globalization opportunities. In recent years, the internationalization of scientific and technological innovation has increasingly become an important issue of concern to the provincial government. In order to further integrate deeply into the global innovation network, maximize the use of international scientific and technological resources, and strive to achieve new breakthroughs in becoming the forefront of innovative provinces and building an open innovation highland, this paper constructs the internationalization system of scientific and technological innovation in Shandong Province, and puts forward countermeasures and guarantee measures to promote the internationalization of scientific and technological innovation in Shandong Province.

Keywords: Scientific and Technological Innovation, Internationalization, Index System, System Construction

1. Introduction

Internationalization of scientific and technological innovation refers to a process in which a country actively participates in global scientific and technological cooperation and competition, jointly cope with international scientific and technological problems and challenges, and effectively uses global scientific and technological resources to accelerate its creativity. Scientific and technological innovation is the first productive force superimposed on the first power, and is the key to creating core competitiveness and promoting sustainable economic and social development. With the deepening and continuous spread of economic globalization, the internationalization of scientific and technological innovation has become an irreversible trend of the times, and has increasingly become the core symbol of the country's overall strength. Other provinces and cities in our country have launched researches on the internationalization of scientific and technological innovation and introduced relevant policies, such as Beijing, Hangzhou, and Kunming.
This paper is divided into four parts to discuss the construction and application of the international system of scientific and technological innovation in Shandong Province. The first part is to introduce the research status and purpose of internationalization of scientific and technological innovation. The second part is to build an evaluation index system for the internationalization of technological innovation. The third part is to propose countermeasures. The fourth part is to propose safeguards.

2. Status and Purpose
Currently, the international flow of scientific research funds, technology and personnel is accelerating, and the proportion of foreign funds in a country’s R&D funds is increasing, major countries in the world have introduced various policies and measures to attract foreign talents, and strive to seize the opportunities and gain advantages in the tide of innovation internationalization. From a domestic perspective, our country is in a period of important strategic opportunities, and economic and social development is in a critical period of transition from factor-driven to innovation-driven. In order to ensure that it will enter the forefront of innovative countries in 2030 and become the world's scientific and technological power by the time 100 years since China was founded, under the dual needs of short-term stable economic growth and long-term structural adjustment, internationalization of scientific and technological innovation cooperation is an effective grasp of implementing innovation-driven development strategies, gathering global resources, and enhancing my country's position in the global value chain.

In recent years, the investment in international scientific and technological cooperation in Shandong has grown rapidly, and the ability to cooperate in science and technology has been significantly improved. As of the end of 2019, Shandong Province has established 45 national-level international scientific and technological cooperation bases and 34 provincial-level brand international scientific and technological cooperation bases. It also has reached intergovernmental cooperation agreements with Japan and Israel, and has deepened with South Korea, Ukraine and the countries along the “Belt and Road”, "friend circle" of international scientific and technological cooperation keeps expanding. Although Shandong has initially possessed the ability to plan and allocate resources from a global perspective, on the whole, Shandong’s open innovation policy system and mechanism are imperfect, incentives and service systems that promote enterprises to "bringing in" and "going global" to carry out two-way scientific and technological cooperation not strong enough, lack of international intermediary service institutions that provide scientific and technological consultation, evaluation and operation management, the degree of deep integration into the global science and technology innovation network in Shandong is still relatively low.

In order to further give full play to the supporting and leading role of technological innovation, promote high-quality economic development, the conversion of old and new kinetic energy and the construction of innovative provinces, we must vigorously implement the strategic action of internationalization of scientific and technological innovation, accelerate the construction of an international system of scientific and technological innovation, actively integrate and actively deploy a global innovation network, gather global innovation resources, and strive to achieve new breakthroughs in the construction of an open innovation highland. This is very helpful for Shandong Province to build a technological innovation center with global influence and support Shandong Province to enter the ranks of innovative provinces.

3. Evaluation Index System Of Internationalization Of Scientific And Technological Innovation
The main evaluation bodies of the evaluation index system mainly include: scientific and technological related counterparts such as regional governments, scientific and technological bureaus that implement the internationalization of technological innovation, scientific and technological innovation internationalization-related parks, enterprises, scientific and technological research institutions, scientific and technological innovation-related institutions of higher learning and other innovation subjects.

The evaluation index system should be able to reflect the real situation of the internationalization of science and technology innovation bodies in Shandong province. The selection of specific indexes should adhere to the combination of highlighting, objective stability, easy access, scientific sensitivity,
qualitative and quantitative, and establish a dynamic adjustment mechanism. The evaluation index system should cover the transfer and transformation of scientific and technological achievements, research achievements already made, and the construction of an international scientific and technological cooperation platform. In accordance with the principles of scientific norms and quantitative operations, combined with the actual situation in Shandong Province, an "evaluation index system for the internationalization of scientific and technological innovation" was formulated (see Table 1), covering 8 first-level indicators, 22 second-level indicators, and 58 third-level indicators.

Table 1. Evaluation index system of internationalization of scientific and technological innovation.

| First-level Indicator | Second-level Indicator | Third-level Indicator |
|-----------------------|------------------------|-----------------------|
| 1. International Science and Technology Cooperation Agreement | 1. Cooperation Agreement | 1. Cooperation Country |
|                       |                        | 2. Intergovernmental Cooperation Agreement |
|                       |                        | 3. Non-Government Cooperation Agreement |
| 2. International scientific and technological cooperation research and development project | 2. International Science Program/Engineering | 4. Lead |
|                       | 3. National R&D project | 5. Participate |
|                       | 4. Provincial R&D project | 6. Total expenses |
|                       | 5. City-level R&D project | 7. Number of items |
|                       | 6. Unit-level R&D projects (Horizontal project) | 8. Total expenses |
|                       | 7. R & D institutions | 9. Number of items |
|                       | 8. International Science and Technology Cooperation Base | 10. Total expenses |
|                       | 9. Science and Technology Service Platform | 11. Number of items |
|                       | 10. Technical output | 12. Total expenses |
|                       | 11. Talent introduction | 13. Number of items |
|                       | 12. Talent introduction | 14. Number of R&D institutions established overseas |
|                       | 13. Talent introduction | 15. Number of overseas R&D institutions with cooperative relations |
|                       | 14. Talent introduction | 16. Total overseas funding for R&D projects |
|                       | 15. Talent introduction | 17. National base |
|                       | 16. Talent introduction | 18. Provincial base |
|                       | 17. Talent introduction | 19. Overseas Technology Incubator |
|                       | 18. Talent introduction | 20. Overseas Technology Transfer and Transformation Center |
|                       | 19. Talent introduction | 21. Overseas Joint Laboratory |
|                       | 20. Talent introduction | 22. Number of overseas branches established |
|                       | 21. Talent introduction | 23. Number of factories overseas |
|                       | 22. Talent introduction | 24. Leading International Science and Technology Organization/Joint Research Institution |
|                       | 23. Talent introduction | 25. Participating international scientific organizations/joint research institutions |
|                       | 24. Talent introduction | 26. Total number of high-level overseas talents introduced (including Hong Kong, Macao and Taiwan) |
|                       | 25. Talent introduction | 27. Talent type |
|                       | 26. Talent introduction | 28. Overseas talent introduction program |
4. Suggestions

4.1 Give Full Play to Location Advantages and Build an Innovation Highland Open to the Outside World

Shandong Province is a strategic node for China's expansion from south to north and gradient development from east to west. It is located at the intersection of the two economic maps of north and south. It is necessary to make full use of the international scientific and technological cooperation
mechanisms at different levels, to play the role of government guidance according to its own characteristics and advantages, to stimulate the enthusiasm of various types of R&D entities in cross-border collaborative innovation, and to actively implement international cooperation in scientific and technological innovation. Deeply cultivate Japan and South Korea, upgrade the level of technological exchange and cooperation with Japan and South Korea, explore the establishment of a bridgehead for innovation cooperation with Japan and South Korea based on the Shandong Peninsula, and build a national platform for China, Japan and South Korea technology innovation cooperation. Actively participate in the scientific and technological innovation cooperation of SCO member countries, countries along the “Belt and Road”, CIS countries and other innovative countries, distinguish between major innovation countries, key small countries and important medium innovation countries, and carry out differentiated and focused scientific and technological innovation cooperation and exchange. Facing the world's technological frontiers and key core technology bottlenecks, we will introduce and utilize leading international technologies, accelerate the transfer of scientific and technological achievements, and actively promote the accumulation of international innovation resources in Shandong.

4.2 Promote the Innovation of Systems and Mechanisms, and Create an International Ecology of Technological Innovation
Taking overall planning and comprehensive coordination as the direction, led by the science and technology department, a unified coordination mechanism for international science and technology cooperation and a rapid growth mechanism for international investment in science and technology cooperation were established. Provincial science and technology plans to set up special international scientific and technological cooperation projects to strengthen international cooperation in basic research, applied basic research, scientific frontier exploration and leading technology, key common technology, modern engineering technology, and disruptive technological innovation. Improve the international scientific and technological cooperation platform system, encourage the development of channels and systems that integrate into the global innovation network, "bringing in" and "going global" two-way construction of innovation platforms, transformation centers and new research and development institutions, and create a domestic and overseas integration of technology cooperation innovation chain.

4.3 Build an International Talent Support System to Accelerate the Introduction of High-end Innovative Talents
Improve the overseas talent flow facilitation policy, aim at key core technology areas such as artificial intelligence, chips, biomedicine, implement talent recruitment plans, and introduce leading, original, and iconic top talents (teams) with extraordinary measures. Optimizing the funding process for talent identification, "one case, one discussion" and "one person, one policy" strengthen support and guarantee. Promote market-oriented and professional talent recruitment, highlight talent recruitment and talent recruitment, explore the establishment of an "international talent ambassador", build talent pool, accelerate the construction of talent station, and establish a normal global talent network. Comprehensively comply with international talent evaluation standards, carry out pilots to provide achievement transformation brokers for high-level talents, fully stimulate talents’ innovation and entrepreneurship, efficiently reflect the value of talents and scientific research achievements, and create a good atmosphere for respecting talents, attracting talents, and using talents.

4.4 Consolidate the Foundation of Innovation and Increase the Attractiveness and Carrying Capacity of Global Innovation Resources
Fully mobilize all kinds of innovation resources in Shandong, actively introduce well-known enterprises, universities, research institutes and talent teams at home and abroad, accelerate the cultivation of local innovative talents, and promote the organic integration of the education chain, talent chain and industrial chain and innovation chain in Shandong. Enterprises are encouraged to actively participate in or take the lead in formulating international standards, applying for international patents, and improving the right to speak internationally in the field of technological innovation. Accelerate the construction of the Jinan Science and Technology Innovation City of the Chinese Academy of Sciences, build an
international scientific and technological innovation and entrepreneurship community, strive to create a comprehensive national science center, and create a regional open area for scientific and technological innovation. Establish and improve an international investment and financing service system for technological innovation, and promote the efficient allocation of international technological innovation resources at the level of capital operation.

4.5 Increase Opening to the Outside World and Build a Global-oriented Technological Innovation Cooperation System

Increase the opening of our province's science and technology plans (special projects, funds, etc.). Support foreign experts to lead or participate in strategic research, guideline preparation, project implementation, project review and acceptance. Encourage foreign-invested R&D centers in China to take part in undertaking our province's science and technology planning projects. Establish different R&D cooperation mechanisms for developed countries, emerging economies and developing countries. Build an R&D and innovation cooperation platform to attract more overseas technologies, talents and capital to Shandong for innovation and entrepreneurship, build a global technological innovation cooperation system covering project cooperation, personnel exchanges, information sharing, and infrastructure R&D cooperation with complementary advantages and mutual benefit.

5. Conclusion

Internationalization of scientific and technological innovation is an important strategic means for countries to follow the trend of economic and technological globalization, seize possible opportunities, and respond to new globalization challenges. The construction of the evaluation index system for the internationalization of scientific and technological innovation is conducive to the research on the theory and practice of the internationalization of scientific and technological innovation. This paper builds a multi-angle evaluation index system to measure the internationalization of scientific and technological innovation. Combining the development status of scientific and technological innovation internationalization in Shandong Province, it combines qualitative and quantitative, and proposes countermeasures and measures for the internationalization of scientific and technological innovation in Shandong Province. Combining the whole research process, the following conclusions and suggestions are mainly drawn: First of all, the degree of internationalization of technological countries can be measured by many factors such as international scientific and technological cooperation agreements, international scientific and technological cooperation research and development projects, and international scientific and technological cooperation platforms. These factors influence and restrict each other. Secondly, the development of internationalization of scientific and technological innovation requires overall strategic guidance. Finally, Shandong Province urgently needs to introduce a global strategy innovation internationalization strategy in order to participate more effectively in international science and technology activities.

Acknowledgment

This work was supported by Shandong Academy of Sciences International Science and Technology Cooperation Project (2019GHZD13) Research and application of key technologies of resource monitoring and decision support service system for international scientific and technological cooperation on the Belt and Road; Shandong Academy of Sciences International Science and Technology Cooperation Project (2019GHPY11) Institutional scientific research oriented system based on self-growth domain knowledge graph and customized industry knowledge graph.

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