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Research on the Construction of Evaluation Index System of Regional High-Quality Development Promoted by Intellectual Property Rights

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Abstract. This paper expounds the connotation of high-quality development from the perspective of "five development concepts", and analyzes the dialectical relationship among innovative development, coordinated development, green development, open development and shared development. On this basis, a relatively complete evaluation index system of intellectual property to promote high-quality development has been constructed, and finally, the countermeasures of intellectual property to promote high-quality development have been proposed.

Key words. Intellectual property, five development concepts, high quality development, evaluation index system

1. Introduction

The report to the 19th National Congress of the Communist Party of China pointed out that the Chinese economy has shifted from a stage of high-speed growth to a stage of high-quality development, and is now in a crucial period of transforming the development model, optimizing the economic structure and shifting growth drivers. In this regard, the academic community has carried out a series of studies, forming a rich research results [1], such as the connotation of "high-quality development" [2], constraints and influencing factors [3][4], objectives and transformation path [5][6], index system construction and measurement [7]-[9] and other aspects of the research. Have carried out extensive research from theoretical or empirical perspectives [10]-[11].

In the 14th Five-Year Plan for National Economic and Social Development and the Outline of 2035 Goals, the work on intellectual property rights is centralized and separately formulated, and the strategy of making China stronger through intellectual property rights is clearly stated. In the main indicators of economic and social development in the 14th Five-Year Plan, the number of high-value invention patents

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per 10,000 population is set. Judging from a series of national deployment around intellectual property work, the emphasis on intellectual property has been elevated to an unprecedented strategic height [1].

Practice shows that to promote high-quality development, on the one hand, we need to grasp the connotation of "high-quality development" scientifically; On the other hand, an appropriate evaluation index system of regional high quality development should be constructed to guide the practice of regional economic and social development.

Ma Ru et al. [12] constructed and measured the high-quality development evaluation index system of China's regional economy from five dimensions of high-quality supply, high-quality demand, development efficiency, economic operation and opening-up. Li Jinchang et al. [13], starting from the two aspects of "people's needs for a better life" and "unbalanced and inadequate development", the main contradictions of Chinese society in the new era, constructed a high-quality development evaluation index system consisting of five first-level indicators, that is ,economic vitality, innovation efficiency, green development, people's life, and social harmony, and 27 second-level indicators. Wei Min et al. [14] constructed a measurement system of high-quality economic development from 10 dimensions, including optimization of economic structure, innovation-driven development, efficient allocation of resources, improvement of market mechanism, stable economic growth, coordination and sharing among regions, quality of products and services, improvement of infrastructure, construction of ecological civilization, and benefits of economic achievements. Zhang Junyan et al. [15] pointed out that the essential connotation of high-quality development is to meet people's ever-growing needs for a better life, and to achieve efficient, fair, green and sustainable development, aiming at the existing problems of high-quality development index system and measurement in China.

There are few reports on the research of taking intellectual property elements as high quality development evaluation indicators.

2. Connotation and essence of regional high-quality development

Development is an important issue in today's society and the top priority for the Communist Party of China to govern and rejuvenate the country. An important task set forth at the 18th National Congress of the CPC is to "concentrate on construction, pursue development with undivided attention, grasp the law of development, innovate the concept of development, and solve difficulties in development". Centering on the concept of "innovative development", the Fifth Plenary Session of the 18th CPC Central Committee clearly put forward the five development concepts of "innovative, coordinated, green, open and shared". [11][16]

2.1 The Concept of "Five Major Developments"

(1) Innovative development is the driving force

Innovation is the soul of a nation's progress; it is the driving force for a country's prosperity and the source of eternal vitality for a political party. At present, from the perspective of international situation, the competition of comprehensive national strength is essentially the competition of innovation ability. From the perspective of

domestic economic and social development, after more than 40 years of sustained and rapid development since the reform and opening up, China's economic aggregate has become the second largest in the world, with per capital GDP approaching 8,000 US dollars, but the problem of unbalanced and inadequate development is obvious. The Fifth Plenary Session of the 18th CPC Central Committee stressed that we must put innovation at the core of national development and continue to promote theoretical, institutional, scientific and technological, cultural and other innovations, so that innovation runs through all the work of the Party and the country and becomes a common trend in the whole society.

(2) Coordinated development is the method

Coordinated development is an important measure for scientific development, focusing on solving the problem of unbalanced development. Remarkable achievements have been made in China's coordinated development since reform and opening up. However, unbalanced, uncoordinated and unsustainable economic and social development still exist. The task of narrowing the development gap between urban and rural areas and between regions and promoting coordinated economic and social development remains arduous.

(3) Green development is our goal

Green development focuses on the harmonious coexistence between man and nature, and aims to build a beautiful China that is resource-conserving and environment-friendly. Green development determines the direction of development. We should properly strike a balance between economic development and environmental protection, firmly establish the idea that protecting the ecological environment means protecting productive forces, and improving the ecological environment means developing productive forces, and work more consciously to promote green, circular and low-carbon development.

(4) Opening up and development is a strategy

An important part of open development is the linkage between internal and external development. Since the beginning of the new century, economic globalization has deepened, economies are increasingly interdependent and interconnected, and mankind has become a community with a shared future. At the same time, the world economic structure is undergoing new changes, the international financial crisis has had a far-reaching impact, systemic and structural risks remain prominent, and China still faces grave challenges for its future development.

(5) Shared development is our destination

Social equity and justice are important issues that need to be solved. Fairness and justice are inherent requirements of socialism with Chinese characteristics, and achieving social fairness and justice is a consistent proposition of Chinese Communists and a major task in developing socialism with Chinese characteristics. The socialist cause is the cause of the vast majority of the people. The ultimate goal of development is to serve the people and ensure that everyone enjoys the opportunities and benefits of development. Therefore, sharing is an essential requirement of socialism with Chinese characteristics and an important measure to achieve fairness and justice.

2.2 The support of intellectual property rights to the concept of "Five Major Developments"

(1) Intellectual property is an important support for innovation and development. As a legal guarantee for innovation, intellectual property effectively stimulates innovation,

escorts innovation, and protects innovators from obtaining actual economic benefits. We should constantly improve the intellectual property system, promote the effective connection between intellectual property policies and policies of science and technology, industry, trade, finance and taxation, so as to promote building a powerful intellectual property country through institutional innovation [17][18].

(2) Intellectual property plays an important role in coordinating urban and rural development and regional development. In terms of balancing urban and rural development and narrowing the gap between urban and rural areas, the development of intellectual property rights has unparalleled room to play. Intellectual property rights should be used to promote agricultural modernization, narrow the development gap between urban and rural areas, reduce the Engel coefficient of rural areas, and coordinate urban and rural development.

(3) Green is realized in the course of development, which is the internal requirement of social progress. The key to green development is scientific and technological innovation. Environmental protection is increasingly dependent on the support of science and technology and the protection of intellectual property rights.

(4) Intellectual property trade is an important embodiment of intellectual property support for open development. Intellectual property trade promotes the international opening and sharing of innovative products, promotes open innovation, and improves the welfare level of the world.

(5) Increase the sharing of intellectual property between regions, as there is significant regional imbalance in the development of intellectual property. Increasing the transformation and application of intellectual property between regions will help optimize the allocation of intellectual property resources between regions, promote the circulation and sharing of intellectual property between regions, increase the social and economic benefits of intellectual property, as well as improve the level of social welfare.

3. The internal mechanism of intellectual property driving high-quality development

3.1 The innovative role of intellectual property rights

(1) Intellectual property provides the source power for innovation

① Intellectual property provides rules for innovation. The systematization and standardization of intellectual property data is the crystallization of human wisdom and the summary of objective laws, which provides a steady flow of power for innovation. To grasp and apply these wisdom and laws in practical activities, the innovation will form a virtuous cycle, so as to promote scientific and technological innovation, economic development and social progress[17][18].

② Intellectual property rights provide resource allocation for innovation. Intellectual property rights play an important role in providing big data support for innovation, saving costs for the early preparation and later protection of innovation achievements, establishing coordination mechanism for the profit distribution of innovation subjects, promoting the transformation of innovation achievements, comprehensively optimizing and integrating the allocation of production factors and innovation factors, and deeply integrating innovation achievements with economic and social development in various fields[17][18].

③ Intellectual property provides a platform for the dissemination of innovation results. Intellectual property is the bridge and link between innovation and market, and it is a very important link in realizing the value of innovation.

So it can be said that intellectual property provides a direct source of innovation.

(2) Intellectual property provides strong support for innovation

Among intellectual property rights, the invention patents with the highest technical content directly reflect the power of innovation ability. The quantity, quality, scale and level of intellectual property ownership, as well as the ability to use and manage intellectual property rights, have become important indicators to measure a country's economic, scientific and technological strength. Practice has shown that countries and regions with sound intellectual property systems and better implementation have stronger innovation capacity and higher level of economic and social development. For these countries, intellectual property is not only the choice of development strategy, but also the embodiment of comprehensive national strength.

(3) Intellectual property rights provide support for innovation

For enterprises, technological innovation is the key to win market advantages and improve competitiveness. Technological innovation cannot be separated from the protection of intellectual property rights and the incentive effect on innovative talents. If the protection of intellectual property rights is weak, technological innovation cannot play its role. Only by promoting scientific and technological innovation and unleashing and developing social productive forces can we achieve sustained and sound economic and social development.

3.2 Innovation-driven mechanism of high-quality development

(1) Technological innovation as the source of power to promote the continuous improvement of social efficiency.

In all kinds of innovation systems, technological innovation is always in the core position. From the micro point of view, technological innovation can upgrade the original production factors, improve the production efficiency, change the original production mode of enterprises, and reduce the dependence on resources. From a macro point of view, technological innovation has changed the original pattern of social resource allocation and made the overall allocation of social resources more efficient[19].

(2) Talent as the core driving factor to accelerate technology diffusion and application of achievements.

The core factor of innovation drive is talent drive, and human capital is the most active and positive factor in the whole process of innovation. Innovation needs a team, and the team needs innovative talents. Only with innovative talents can there be innovative achievements, and the promotion and application of innovative achievements must rely on talents. Therefore, from the macro level, the core of accelerating the construction of high-quality economic innovation drive is to strengthen the construction of innovative talents and consolidate the foundation of innovation human capital. From the micro level, innovative talents will produce innovative results, and the improvement of labor quality will improve labor productivity. At the same time, the progress at the micro level will promote the development at the macro level. With the innovation of talents, it will improve our independent innovation ability and strengthen our core competitiveness. Through the joint action of micro and macro level, talents become the core factor to promote high-quality economic development.

(3) Funding guarantees high-quality output.

Only high-quality innovation input can produce high-quality innovation, so as to improve the quality of innovation investment of Chinese government and enterprises, thus provide important guarantee for high-quality economic development.

(4) The synergy between the market and the government is related to the ultimate realization of high-quality development.

How to accurately and efficiently allocate innovation factors such as capital, technology and human resources to innovation entities is the key to achieve innovation-driven high-quality development.

3.3 Synergy between intellectual property rights and high-quality development

Synergetic theory holds that the system is composed of a large number of subsystems with completely different properties. Openness, interaction and self-organization form the spatial, temporal or functional structure of the system [20][21]. The key to the transition from disorder to order of the system lies in the interrelated "synergistic effect" [22][23] among subsystems within the system. Intellectual property rights and high-quality economic development can be seen as two closely related subsystems under the technology-economy system. Taking intellectual property as the variable that dominates the technology system and high-quality economic development [24], there is a coupling and coordination relationship between intellectual property and high-quality economic development, and the subsystem of intellectual property and the subsystem of high-quality economic development constantly exchange material, energy and information. Intellectual property subsystem provides continuous source technology supply for high quality development subsystem of economy; In turn, the subsystem of high-quality economic development provides sufficient R&D guarantee and market demand for the subsystem of intellectual property, and both of them promote and coordinate each other. When the new technology is applied to the market, or the demand of the high level of the market stimulates the emergence of the new technology, the technology-economy system will produce local mutations, promote the overall system transition from order to local disorder, and generate disturbances, and gradually make the overall system appear oscillating and even phased disorder until the sub-systems within the system complete self-reorganization and form endogenous variables. At the same time, under the joint action of other exogenous variables, the whole technology-economic system will return to an orderly state. The continuous evolution of the technology-economy system has been promoted by a new and more optimized orderly process from order to disorder within the technology-economy system [1].

4. Evaluation index system for the promotion of high-quality regional development by intellectual property rights

4.1 Construction principles of evaluation index system

A high-quality development evaluation index system should be established, and indicators should be screened according to the following principles [25].

(1) Guiding principle.

Based on the concept of high quality development, research and analysis of regional development prospects to guide the path of future regional development.

(2) Principle of comprehensiveness.

It can assess the level of regional economic and social development and existing problems in an all-round and multi-angle way.

(3) The principle of simplicity.

When selecting the evaluation index, it is required that the index be representative and can effectively reflect the development of the evaluation Angle.

(4) Principle of comparability.

In order to facilitate comparative evaluation, the selected indicators can be compared horizontally within the region.

(5) Operability principle.

In order to ensure the credibility and objectivity of the evaluation results, the data source is required to be authentic and reliable.

(6) Openness principle.

We should not only consider the commonalities of economic and social development, but also conform to the economic and social characteristics of different regions.

4.2 Evaluation index system of regional high-quality development promoted by intellectual property rights

On the one hand, for the high-quality development subsystem, the evaluation index system for regional high-quality development is studied from the five major development concepts. On the other hand, for the intellectual property subsystem, in the existing evaluation index system, many of them only consider the input or output of intellectual property as a single factor. However, from a performance perspective, the selection of evaluation indicators must cover the process and results of intellectual property activities. Therefore, this article studies the creation and application of intellectual property, and measures their indicators separately, thus form a relatively complete evaluation index system for promoting high-quality regional development by intellectual property rights. As shown in Table 1.

Table 1. Evaluation index system of regional high-quality development promoted by intellectual property rights

subsystem	Primary index	Secondary index	Index description
High quality development subsystem (Y)	Innovation-driven development (Y_1)	Innovation investment	R&D /GDP
		innovation output	Number of invention patent applications
	coordinated development (Y_2)	regional coordinated development	Per capita disposable income ratio of urban and rural residents
		Industrial Coordination Development	Proportion of added value of Tertiary sector of the economy in GDP
		risk-prevention	Rate of qualified Products
	Green development (Y_3)	Green Resources	Per capita water consumption
			Rate of harmless treatment of household waste
		Green Society	Energy consumption per ten thousand yuan of GDP
			Greening rate of built-up areas
		Green Management	Proportion of energy conservation and environmental protection expenditure
	Open development (Y_4)	International communication	Total number of people exit/entry
		international trade	Gross Import and Export Volume/GDP
			Total foreign investment/GDP

	Sharing development (Y_5)	Achievement sharing	Ratio of urban and rural consumption expenditure
			Ratio of per capita disposable income of urban and rural residents
			The ratio of regional per capita GDP to national per capita GDP
		public service	Per capita education expenditure
			Per capita healthcare expenditure
Intellectual Property Subsystem (X)	Intellectual Property Creation (X_1)	Investment of intellectual property	R&D personnel full-time equivalent
		Output of intellectual property	Number of invention patents per ten thousand person
	Application of Intellectual Property (X_2)	Transactions of intellectual property	Number of regional contracts for technology flow in the technology market
			Regional contract amount for technology flow in the technology market
		Maintenance of intellectual property rights	The proportion of effective invention patents to the total number of invention patents
			The rate of patent maintenance

$$\gamma(Y_i, X_j) = \frac{1}{n}\sum_{1}^{n}\frac{\min\min\left|y_i(k)-x_j(k)\right| + \zeta\max\max\left|y_i(k)-x_j(k)\right|}{\left|y_i(k)-x_j(k)\right| + \zeta\max\max\left|y_i(k)-x_j(k)\right|} \quad \text{(E1)}$$

[26]

According to Table 1 and (E1), we can obtain the grey correlation $\gamma(Y_i, X_j)$ between the high-quality development subsystem indicator Yi (i=1,2,3,4,5) and the intellectual property subsystem indicators X1 and X2, thereby obtaining the degree of influence of the intellectual property subsystem indicator Xj (j=1,2) on the high-quality development subsystem indicator Yi (i=1,2,3,4,5).

5. Measures for intellectual property to promote high-quality development

5.1 Accelerate core technology innovation and rationally allocate science and technology resources.

First of all, we should strengthen the investment in basic research, increase the proportion of basic research funds, establish a reasonable investment mechanism for technological innovation, and rationally plan the allocation of various scientific and technological elements. Secondly, we should establish and improve our intellectual property protection system and stimulate the innovation vitality of enterprises, universities and research institutes. Finally, we should deepen the supply-side reform, deeply study the current input and output structure of science and technology in our country, promote the application and popularization of scientific and technological innovation, and apply the core technologies to push our industrial chain towards high-end development[19].

5.2 Strengthen the training of innovative talents and stimulate the vitality of innovation.

Establish and improve the talent management mechanism to meet the requirements of innovation and development and conform to the law of innovation. Deepen the reform of education system, do a good job in the top-level design of talent training programs, innovate education methods, improve the talent evaluation system, rationalize the evaluation indicators of innovation ability, quality and contribution, stimulate the enthusiasm of innovative talents [27], accelerate the training of strategic innovative talents with international frontier level, and provide the core power for the high-quality development of Chinese economy.

5.3 Increase financial support for innovation to provide strong guarantee for innovation activities.

The government's investment of funds should improve the efficiency of the use of funds to avoid the waste of funds; Enterprises should establish and improve the management methods of capital investment, enhance their macro-planning ability and market competitiveness, and avoid scattered allocation of scientific and technological resources and low overall operation efficiency caused by low efficiency of capital investment within enterprises.

5.4 The government and the market should work together to promote development.

The market should play a decisive role in the allocation of innovation resources, while the government should also provide good management and quality services. Finally, through the synergy between the market and the government, as well as the effective supply and allocation of innovation factors and resources, we can realize the high-quality development of innovation-driven economy[28].

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