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Construction and Perfection of Industrial Innovation System

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ABSTRACT. *Innovation at the industrial level is the key to a country's independent innovation and the inevitable choice for China's industrial development. To construct a perfect industrial independent innovation system, three mechanisms are needed, that is, an open R&D mechanism, Industry (enterprise clusters) should establish open innovation with global R&D institutions; Innovative fund raising and investment mechanism, Industry (enterprise clusters) should increase R&D investment as much as possible on the basis of ensuring its usual financing channels; Innovative talent training mechanism, Industry (enterprise clusters) should pay attention to the cultivation of entrepreneurs and the training and stimulation of technical personnel.*

KEYWORDS: *Industrial Innovation, R&D Mechanism, Input Mechanism, Talent Training Mechanism*

1. Introduction

Since reform and opening up, China's economy, mainly in the manufacturing sector, actively participated in the International Division of Labor and successfully created a "made in China" brand. On the way from a large manufacturing nation, a large consuming country to a "large creative country", the Innovation Road of most Chinese industries still needs to be explored and tested. Innovation at the industrial level is the key to a country's independent innovation and the inevitable choice for China's industrial development. It is the foundation and core to ensure the industry to achieve catch-up independent innovation that establish a smooth R&D mechanism within the industry to make it run smoothly and innovate continuously. In order to construct the independent innovation system of industry smoothly. In order to construct the independent innovation system of industry smoothly, to be clear, first of all, industry is the main body of technology innovation input; Secondly, the industry or the core enterprise in the industry is the main body of technology research and development; Finally, industry is the main body of the final innovation achievement and innovation benefit distribution.

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2. Construction of industrial innovation system

The industrial innovation ability is the system integration of Enterprise cluster's innovation ability in the industry. The construction of industrial innovation system is a process of re-allocating innovation resources. The main factors directly related to industrial innovation are government, market, technology, talents, capital, academic institutions and so on. The innovation system composed of these factors related to industries or enterprise clusters in the industry is shown in the figure below.

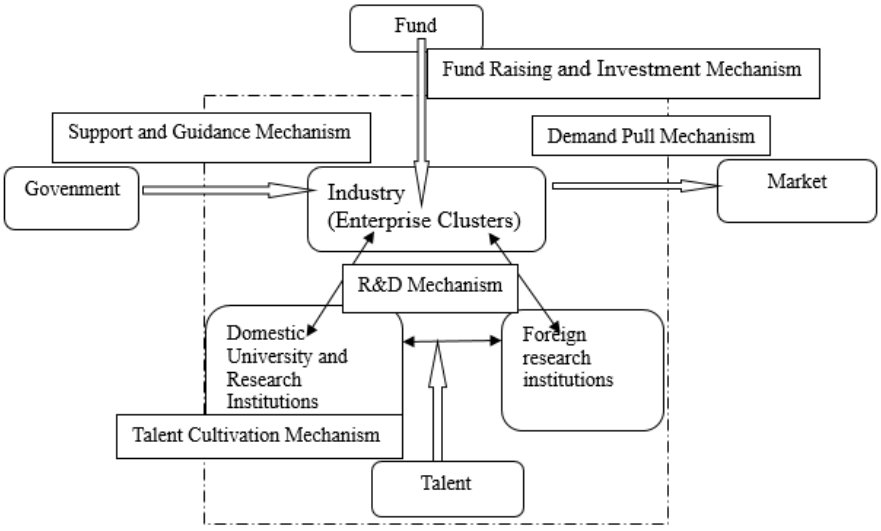

Fig.1. Industrial Innovation System

To build a complete independent innovation system and establish a smooth operation mechanism among the elements, we must start from all aspects shown in the figure.

The government and the market are the main external factors faced by the industry, which play a guiding and auxiliary role for industrial innovation. The government plays a guiding role in the competitive advantage of industries. By creating a social environment conducive to innovation, relying on its own position in the economic system, the government condenses resources for industrial innovation and provides information needed for innovation, formulates or adjusts relevant policies to ensure the smooth progress of industrial technological innovation, strengthens technical standards, and directly adopts innovative achievements to promote industrial innovation. The market provides the basic function for the resource allocation of industrial innovation and points out the direction for innovation. Innovation according to market demand is the key to the rapid marketization of industrial innovative products. In some "market failure" areas, the

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government is a necessary supplement to market allocation.

External factors are the foundation and internal factors are the key. This paper mainly considers the technology R&D mechanism formed between other factors and industrial entities. In addition to a few monopoly industries can be regarded as the main body of innovation as a whole, for most industries, the establishment of technological innovation system with enterprises in the industry as the main body is the breakthrough and key factor for the construction of industrial innovation system and even national innovation system. The key of enterprise innovation lies in the input of various innovation resources. Compared with the R&D investment of western developed countries such as Europe and the United States, China is relatively weak in this respect. In order to establish and improve the industrial innovation system with enterprises as the main body of innovation and enable enterprises to master the core technology through independent innovation, it is necessary to increase R&D investment and lay a solid foundation for innovation under the background of opening up.

3. Perfection of industrial innovation system

3.1. The Perfection of R&D mechanism

Independent innovation is not equal to "self innovation", which does not exclude opening and integration, and does not abandon technology introduction. The open R&D mechanism includes the collaborative innovation between the upstream and downstream industry chains, the joint innovation of industry and research institutions, and the open innovation between industry and global R&D institutions in the context of globalization.

First of all, there is a complete chain of innovation between the upstream and downstream industrial chains, which has a chain effect, value-added effect, pull effect and magnet effect. The strategy of "differential first, integral later" can be adopted to reduce the difficulty of the overall technological development of the industry. In the process of technology development from easy to difficult, the industry can continuously accumulate technology and experience, and finally realize the mastery and application of high-end technology. In addition, innovation can be transferred and utilized from industry to industry, and technology can be improved if there is a high degree of interlinkages between different industries, such as automobiles and steel, machinery, and petrochemicals. Secondly, "industry university research" is the comprehensive embodiment of the effective exertion of the strength of all walks of life in the market economy system. Enterprises, government run research institutes and universities are the three main executive bodies of R&D activities. For the industry itself, linking "study" with "research", making full use of the scientific research resources of universities and research institutions, building a professional scientific research team, reducing the cost of research and development, cultivating professional talents, speeding up the pace of research and development, and better meeting the actual needs of industrial

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innovation, the industry has obtained the maximum benefits with the minimum cost. Finally, under the background of globalization, technological innovation can be carried out "on the shoulders of giants" and make full use of available technologies and resources from all over the world. At present, the world's major companies have built a large number of cooperation and exchange platforms to make up for their own shortcomings. The industry should make use of its own advantages, strengthen international cooperation, expand R&D resources, absorb and introduce advanced experience, management mechanism and core elements of foreign industries on the world stage, carry out transnational scientific and technological cooperation, and jointly create and share international innovation achievements, so as to achieve technological catch-up.

3.2. The Perfection of fund raising and investment mechanism

Innovation needs a lot of capital investment. For example, every part of the automobile industry needs extremely high capital investment only for mold, and innovation also needs huge risk investment. Financing is therefore critical to the success or failure of innovation. From the perspective of capital sources, it mainly includes the investment of enterprise's own funds, the assistance of government's fiscal and taxation policies, loans from financial institutions, venture capital, securities market financing and foreign funds. Among them, the investment of Enterprise's own funds is the main source of innovation funds.

Different enterprises adopt different ways to raise innovation funds. For example, Huawei takes the internal shareholding of employees as the main financing channel, while ZTE adopts the method of listed investment. The proportion of R&D investment in sales revenue is the key to the smooth development of enterprise R&D activities. From the beginning of Huawei's establishment, there was a rule and tradition that 10% of its annual sales revenue should be used for R&D. The emphasis on R&D has brought Huawei rapid growth. In *The 2018 EU Industrial R&D Investment Scoreboard* published by European Commission which summarized 2500 companies' R&D input of 46 countries and regions in 2017-2018, 438 enterprises in Chinese mainland were listed. These Chinese enterprises are not only famous in China, but also have more and more influence in the world. Therefore, it is very important to increase R & D investment for the technological progress of the industry.

3.3. The Perfection of talent cultivation mechanism

Talent is the first resource of independent innovation, mainly including entrepreneurs and technical personnel. Entrepreneurs are the driving force of innovation activities. The entrepreneur's risk-taking Spirit and innovation spirit play a more important role than material factors in the smooth development of enterprise's innovation activities for the orderly promotion of the whole industry's innovation process. According to Rostow, a development economist, in his theory of "economic take-off", the order of economic take-off is the formation of entrepreneur

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team. Enterprises invest capital and technology into the most efficient and promising production activities, promote the development of innovation activities, and finally, promote the formation of the main departments. Prominent entrepreneurs will act as role models, guiding more and more enterprises to imitate, in the industry with a distinctive culture of innovation. At present, many provinces have launched the "entrepreneur cultivation plan implementation plan". Therefore, whether from the perspective of enterprises or the government, we should establish and improve the selection mechanism, training mechanism, incentive mechanism and restraint mechanism of entrepreneurs according to the actual situation.

Technicians master the most core and competitive technology of the industry, which is the mainstay of enterprise development. The training mechanism of technical talents includes three aspects: talent introduction, talent training and talent encouragement. For talent introduction, we can make full use of domestic and international talent resources, adopt the policy of both training and introduction, and strengthen the overall level of industrial R&D team as soon as possible. ZTE and the Ministry of education have reached a strategic cooperation on the joint construction of "ICT (information and communication technology) industry education integration innovation base" in the field of undergraduate colleges and universities. ZTE's information teaching platform has been opened free of charge, so as to promote the innovation of relevant majors in the training mode of applied talents. Improving the loyalty of talent to enterprises and stimulating their enthusiasm for research and development, are the purposes of the enterprise talent incentive policy. Huawei's value evaluation and distribution concept of "struggle oriented" and "don't let Lei Feng suffer losses" retain 90% of Huawei's talents. Therefore, the corporate culture is first of all a soft incentive, reflecting the respect and fairness of employees. On this basis, according to the contribution of technical personnel to innovation activities, enterprises should encourage them in a just, fair and reasonable way, which not only creates opportunities for them to further study and display their talents, but also can establish diversified incentive mechanisms to retain outstanding talents.

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