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Study on the Influencing Factors of Quality Innovation Catalytic Ability of Equipment Manufacturing Enterprises in Liaoning

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Abstract: With the promulgation of the 14th Five-Year Plan, Liaoning should adjust quickly and improve its production efficiency. The equipment manufacturing industry as a pillar industry of Liaoning, in the 14th Five-Year Plan period and the second half of Made 2025, only with the innovative concept as the first guide, can keep up with the national development. Let the equipment manufacturing industry change from 'old' to 'new', and support the provincial economic development. Only in this way can we occupy the world Equipment manufacturing innovation technology first line. This paper synthesizes the lines of development of innovation concepts at home and abroad, and proposes initiatives to promote the development of quality innovation catalytic capacity in the equipment manufacturing industry in Liaoning, and to promote active quality innovation activities.

1. Introduction

The 2020 year was the slowest year of economic development after opening up. With the domestic epidemic under stable control, the GDP of the first quarter of the 2021 year has ushered in the fastest year-on-year growth of the golden period since the 2011 year. With the national GDP growth rate averaging 8.1% in the 2021 year, while the year-on-year growth of Liaoning Province was 5.8%, which is still 2.3% difference compared to the national average. As can be seen from 2020 the bulletin released by the Liaoning Bureau of Statistics, the equipment manufacturing industry accounts for 29.5% of the above-scale industrial added value and remains the first pillar of Liaoning's economic development[1], playing a vital role in the province's economic development.

The equipment manufacturing industry is an important industry to promote national economic growth, is the 'mother machine' for the development of various industries [2], and is the main battlefield for supply-side structural transformation and upgrading. Since the opening up, it has made remarkable progress globally and played an important role in the industrial chain of economic globalization. However, the Chinese manufacturing industry, which relies on the demographic dividend to enter the global market, has not yet changed its position of being locked in the low-end production chain in the process of economic globalization. Low added value, low level of technology and fragmented and isolated organization structure are the outstanding problems of

equipment manufacturing industry, which mainly plays the role of providing labor in the industrial value chain[3]. At the same time, many developed industrialized countries have refocused their attention on the manufacturing industry and started to improve the national manufacturing system, setting off a second wave of development in the equipment manufacturing industry to achieve a modern and innovative manufacturing system[4]. This will undoubtedly do more harm than good to manufacturing industry. Although equipment manufacturing industry has developed rapidly, the fact that it has only become bigger and stronger has not changed. In the face of only providing products and core technology, mass production of components and key parts are 'choked', as well as developed industrialized countries set off the challenge of redevelopment of high-end technology in the equipment manufacturing industry, where should manufacturing industry go? With the second half of the process, equipment manufacturing industry from the low-end to the high-end leap in demand cannot be delayed, strengthen independent innovation capabilities, adjust the organization of the industrial chain, improve product value-added has become the focus of the problem[5]. In this, the status of innovation is particularly prominent. 'Innovation' is throughout the entire process of economic development in the 'Fourteenth Five-Year Plan' and as the core of modernization. Liaoning, as old equipment manufacturing industry', not only to retain the existing advantages, but also to keep pace with the times and actively strive to create a 'new'. After the 'Fourteenth Five-Year Plan' promulgated at the 2022 beginning of the year, Liaoning has issued new documents. Which demanded to develop a three-year vigorous promotion of technological innovation, and in the direction of equipment manufacturing industry to basically achieve the transformation of intelligent documents. Let improve the provincial equipment manufacturing industry structure, accelerate the development of high-end manufacturing technology and technological innovation as the primary goal. This paper discusses the development path of innovation theories at home and abroad from the factors influencing the innovation catalytic capacity of equipment manufacturing enterprises in Liaoning firstly. Then distinguishes from the development of capitalist manufacturing innovation, and studies the factors influencing the innovation catalytic capacity in the transformation from low-end equipment manufacturing to high-end equipment manufacturing on the basis of the existing domestic foundation. Finally, this paper puts forward development suggestions for each element.

2. Current Status of Domestic and International Research

In the 18th century, Adam Smith was the first economist to explain the role of technological progress in promoting economic growth in his book, The Wealth of Nations. With the aim of enriching the nation and the people, Smith made the division of labor the first factor, suggesting that it was instrumental in driving productivity, promoting economic development and increasing national wealth. The division of labor leads to a significant increase in the productivity and focuses people's attention on their assigned narrow area. By this way, it can reduce the process of repetitive learning, thereby increasing the learning capacity of society and promoting technological innovation. When workers are assigned work, they tend to increase labor productivity in a 'practice makes perfect' manner. If the impact of human intervention has raised productivity to a relatively high level or there is little room for improvement, it is more advantageous to use simpler mechanical labor, which is why ordinary workers are often found inventing in manufacturing jobs in real life[6]. This is the result of step-by-step innovation in the form of improved operating techniques for workers, improved production equipment and improved organization in the division of labor.

If Smith only vaguely elaborated on the role of innovation in economic growth, Schumpeter explicitly discussed the concept of innovation as an endogenous force in the economic system in 1912. He pointing out that innovation is the determining factor in the development of capitalist

economies rather than labor and representing innovation as a new production function[7]. On this basis, Rostow produced ‘take-off doctrine’[8], Solow produced ‘Solow model’[9] of economic growth. Considering J. Utterback's link between innovation and technology[10], Lundvall's comparative analysis of national systems and innovation[11]. The innovation theory flourished from generalization to elaboration day by day.

Domestic innovation theory has also seen a boom in thought since 1880s. Fu Jiaji[12] proposed the creation of a theory of technological innovation based on national conditions that differentiates it from Western capitalism. Peng et al. [13] suggest that government action can be directly or indirectly involved in the process of independent innovation by enterprises. Li et al. [14] discuss the problems in combining the triple helix theory with the Chinese context. Luo et al. [15] summarize the trends and directions of innovation capability in terms of cognition, theory and measurement. Li et al. [16] find that knowledge creation produces different effects at each stage of innovation in high-tech enterprises, and use the Amos model to analyze the return and risk curve of innovation investment at each stage. Wang Shumin and Wang Tao [17] argue that there are positive and negative effects of contextual conditions on social capital and autonomous innovation capability, and that social capital promotes and hinders autonomous innovation capability of firms with strong enterpriser strategy orientation and strong defender strategy orientation respectively. Based on the DEA method, Zhao et al. [18] established an evaluation model for the innovation capability of equipment manufacturing industry and discussed the independent innovation capability of each year of the equipment manufacturing industry.

After combing all the data, we found that some foreign capitalist countries discussed the impact of innovation on economic development a hundred years ahead of our country, and deeply recognized the importance of innovation, and that foreign cooperation in mastering core technology is mastering the right to speak. For our country, the transformation from producer to innovator in the short term is not an easy task. The leap from a large country to a strong country, independent innovation is the decisive element. In addition, equipment manufacturing enterprises innovation capacity by macro-resource constraints and development environment, whether the development of sustainable and efficient innovation there is a great deal of uncertainty[19].

3. Analysis of the Influencing Factors of Innovation Catalytic Capacity of Liaoning's Equipment Manufacturing Industry

At present, although the innovation development of the equipment manufacturing industry in Liaoning Province has made great progress, there are still many problems that need to be solved. The innovation development of the equipment manufacturing industry is the result of a variety of factors, so it is of paramount importance to clarify the factors influencing the innovation catalytic capacity of the equipment manufacturing industry. Based on the open-ended model proposed by Mou et al.[20], this paper considers the factors that promote innovation catalytic capacity in Liaoning's equipment manufacturing industry from research to development from three aspects: demand, supply and political system. Firstly, the role of market competition in innovation catalysis is self-evident, while the level of science and technology and the talent factor also play an irreplaceable role in the process of enterprise innovation development. At the same time, the development of the manufacturing industry has always been the focus of national development, so government support is also one of the factors we have to consider. To sum up, this paper selects four factors for analysis: market competition, science and technology level, talent factor and government support.

3.1. Market Competition

‘How to survive the competition in the market, how to get a larger market share and thus a larger income’ are the problems that many enterprises must face. As the saying goes, ‘Learning is like sailing against the current; if you don't advance, you fall back.’ This is also the case with market competition. If enterprises face the pressure of market competition, if they stagnate and fail to innovate and upgrade their industries in time, they will be out of the direction of market development and eventually eliminated. Only through continuous innovation and upgrading of the industry can we gain a leading edge in the market competition. Market competition is like a sword hanging over the head of an enterprise, constantly reminding it to innovate and upgrade its industry. When an enterprise gains market advantage through innovation, its competitors will also increase their own market competitiveness by increasing their innovation efforts. In this way, the enterprise that has seized the first opportunity in the market will lose its original market advantage. This shows that if an enterprise wants to achieve long-term development, it must constantly look for breakthroughs and constantly upgrade its industry innovation.

3.2. Level of Science and Technology

Science and technology is the first productive force. In the process of innovation and upgrading of the equipment manufacturing industry, the first step is to improve its own science and technology level. Science and technology is the fundamental driving force of enterprise innovation and upgrading, promoting the continuous innovation and development of enterprises. Therefore, improving the level of enterprise science and technology is an indispensable part of the road to innovation and development.

On the one hand, at present, some of the equipment manufacturing enterprises in Liaoning Province have a low level of science and technology, many of which still need to be imported from abroad, and the innovative development of enterprises relies heavily on their own level of science and technology. The technical barriers set for us by foreign countries greatly restrict the innovative development of enterprises themselves.

On the other hand, science and technology are applied to the production of products through processing, which can improve the production efficiency of products, save the production costs of enterprises and improve the economic efficiency of enterprises. At the same time, the application of new science and technology can produce new products, and product differentiation can better improve the market competitiveness of enterprises themselves.

3.3. The Talent Factor

‘A country is founded on talent, and an industry thrives on talent.’ Science and technology talent is the core force to promote the innovative development of enterprises. The process of innovation and development of equipment manufacturing enterprises is indispensable to the training and investment of scientific and technological innovative talents as well as scientific and technological application talents. With the development of the intelligent era, increasing the training and investment in talents has become an important guarantee for the innovative development of enterprises.

At present, equipment manufacturing enterprises in Liaoning Province are still subject to many key core technologies in other countries, the main reason is the lack of scientific and innovative talents. In order to grasp the initiative of innovation development, improve the professional knowledge and skills of technical personnel, cultivate scientific and innovative talents is the key. Only master the core technology to have a ‘sense of security’, so as to achieve enterprise innovation

and upgrade the solid foundation. In addition, in the process of innovation and upgrading of enterprises, the correct guidance of scientific and technological application talents is also needed. On the one hand, the application and description of new technologies, the operation and application of new equipment all require the supervision and guidance of scientific and technological application talents with specialist knowledge. On the other hand, compared to the management mode of traditional manufacturing industries, the management mode of new intelligent industries is more complex. To ensure that the process of innovation and upgrading of enterprises is carried out in an orderly manner, scientific and applied talents are essential to guide the process from the sidelines.

3.4. Government Support

The government has always played an important role in the process of innovation and upgrading of enterprises. Through strict legal regulation, reasonable resource allocation and perfect incentive mechanisms, the government has provided a strong impetus for the innovative development of enterprises.

As an industrial pillar of Liaoning Province, the equipment manufacturing industry has always been valued by the government. In the 14th Five-Year Plan, the provincial government emphasized the industrial development and intelligent upgrading of the manufacturing industry and issued various supporting policies, which greatly promoted the innovative development of enterprises. Firstly, the process of intelligent upgrading of enterprises will consume a lot of human, material and financial resources, the government gives enterprises some subsidies and tax incentives, which not only can reduce the pressure of enterprises in the process of achieving innovation and upgrading, but also can increase the enthusiasm of enterprises to innovate and upgrade. Secondly, the government can increase the protection of intellectual property rights and the attraction of scientific and technological innovators, which creates a good environment for enterprise innovation and can largely increase the willingness of enterprises to innovate. Finally, the government can provide many scarce resources for enterprise innovation through the reasonable allocation of resources. Sufficient resources make enterprises more confident in the process of innovation and upgrading, which further promotes the development of enterprise innovation.

4. Conclusion

By analyzing the existing deficiencies of Liaoning's manufacturing industry, this paper focuses on the severe situation of service-oriented transformation of manufacturing industry, the low efficiency of technological innovation, the slightly mediocre development of high-end manufacturing industry and the financing difficulties of the whole manufacturing enterprises, and puts forward corresponding countermeasures and suggestions. Through the layer by layer analysis of the above problems, it can be found that, at present, the high-end technology industry in Liaoning Province is unique, but the situation of other medium and low-end manufacturing industries is slightly serious. Therefore, in order to fundamentally solve the problem of insufficient innovation catalytic capacity, we should adjust measures to local conditions. For medium and low-end industries, we should focus on cooperation. On the basis of cooperation, we can obtain more resources and choose favorable conditions for our own development, Create more value for yourself, create utilization value for the whole cooperation system and achieve each other; for the high-end manufacturing industry, we should pay attention to its own cluster effect and drive the surrounding development by itself. At the same time, the core technology should be further developed and the catalytic innovation ability should be strengthened. Through the establishment of cluster network structure, we can make full use of various effective resources and maintain our dominant position

under the impact of foreign markets, At the same time, actively develop and narrow the gap with foreign advanced technology as much as possible.

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