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Analysis on Collaborative Innovation Mechanism of Industry-university-research Institute in Logistics Industry under the Background of 'Deep Integration of Informatization and Industrialization'

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Abstract

At present, due to the lack of effective operation mechanism, the performance of collaborative innovation in China's logistics industry is low. At the same time, the influence of new forms such as "deep integration of informatization and industrialization" on collaborative innovation of logistics industry is seldom considered in the current research.Therefore, under the background of "deep integration of informatization and industrialization", this paper focuses on five state variables, namely, innovation achievements, innovation income, innovation capital investment, innovation network attraction and innovation system synergy degree, from the formation and transformation of innovation achievements, the circulation of innovation funds, the flow of innovative talents and the collaborative mechanism of innovation subjects, analyzing the operation mechanism of Industry-university-research collaborative innovation system in logistics industry, so as to improve the performance of Industry-university-research collaborative innovation system.

Keywords

Deep integration of informatization and industrialization; Industry-university-research institute of logistics industry; Collaborative innovation; Operation mechanism.

1. Introduction

In the report of the 18th National Congress of the Communist Party of China, it was proposed to build a national innovation strategy with enterprises as the main body, the market as the guide, and the combination of enterprises, universities and research institutes. The implementation of the "2011 Plan" of the Ministry of Education pushed the collaborative innovation of Industry-university-research into the vision of scholars, entrepreneurs and government officials.Opened a lot of research on collaborative innovation, integrated, collaborative innovation of Industry-university-researchis refers to the colleges and universities, research institutes and enterprises around the key and common technology industry as well as the major problem in actual production, in their respective advantages of resources and capabilities, under the collaborative support of government, financial institutions, information intermediary organizations related subjects, and strive to made significant progress in scientific research, technological development and breakthrough innovation [1].The operating mechanism of collaborative innovation is directly related to the generation of synergic effect, and many researches focus on the operating mechanism of collaborative innovation. Yubing He proposed an Industry-university-research collaborative innovation model with triple interaction of "strategy-knowledge-organization" [2].Jin Chen et al. constructed a collaborative innovation framework from two dimensions of integration and interaction intensity [3].Based on knowledge collaboration,YueWu et al. constructed a

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knowledge collaboration process model of Industry-university-research collaborative innovation from three stages of preparation, operation and termination [4].By using the system dynamics method, EnjunXia et al. analyze the operating mechanism of the open innovation community network and its key factors in the operation process from three aspects: knowledge transfer and flow, human capital flow and innovation income growth [5].

At the same time, the 18th National Congress of the Communist Party of Chinamade a series of strategic plans, including adhering to the new path of industrialization and informatization with Chinese characteristics, and promoting the in-depth integration of informatization and industrialization. The new industrialization requires to speed up the establishment of large-scale and modern manufacturing logistics service system. However, there are few researches on collaborative innovation of Industry-university-research in the logistics industry, and the influence of new forms such as "deep integration of informatization and industrialization" is seldom considered.Therefore, under the background of "deep integration of informatization and industrialization", this paper will use the method of system dynamics to explore the internal operation mechanism of Industry-university-research collaborative innovation system in the logistics industry, so as to improve the performance of collaborative innovation in the logistics industry.

2. Analysis on Collaborative Innovation Mechanism of Industry-university-research in the Logistics Industry

In the logistics Industry-university-research collaborative innovation system, the number of innovation achievements, innovation income, innovation capital investment, innovation network attraction and innovation system synergy are five important state variables. These state variables are connected with each other through a number of auxiliary variables and rate variables, forming a whole and constituting the operation mechanism of the innovation system. Under the background of "deep integration of informatization and industrialization", we will analyze the operation mechanism of the logistics Industry-university-research collaborative innovation system in detail from four aspects, namely, the formation and transformation ofinnovation achievements, the circulation of innovation funds, the flow mechanism of innovative talents and the collaborative mechanism of innovation subjects, centering on five state variables.

2.1. Formation and Transformation Mechanism of Innovation Achievements

In the mechanism forthe formation and transformation of innovation achievements,the amount of innovation achievement and collaborative innovation income are two important state variables. It can be seen from Figure 1 that the number of innovation achievements in state variable is directly affected by the annual increase in the number of achievements in rate variable.Innovation achievement is the entity foundation for innovation subjects to commercialize and marketize intellectual property, that is, enterprises can either industrialize patented technology into new product innovation income, or directly take intellectual property as the transaction object through technology transfer and other means to obtain innovation income. The annual increase in the number ofachievementsis directly affected by the synergy of innovation systems, the comprehensive strength of universities/research institutions, and the ability of enterprises to absorb knowledge or ideas.At the same time, in the process of "deep integration of informatization and industrialization", logistics enterprises must change the traditional single inherent development concept, according to their own needs, fully absorb and apply information network technology, to achieve new stage of innovation. And the enterprise's ability to absorb knowledge is mainly composed of the enterprise's ability to acquire external knowledge and the ability to internalize and integrate external knowledge into the enterprise's independent knowledge form.Another state variable, collaborative innovation income, is

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affected by the conversion rate of innovation achievements.The achievements formed by the innovation system will be transformed into the sales revenue of innovative products through industrialization, and then the revenue of collaborative innovation will be increased.

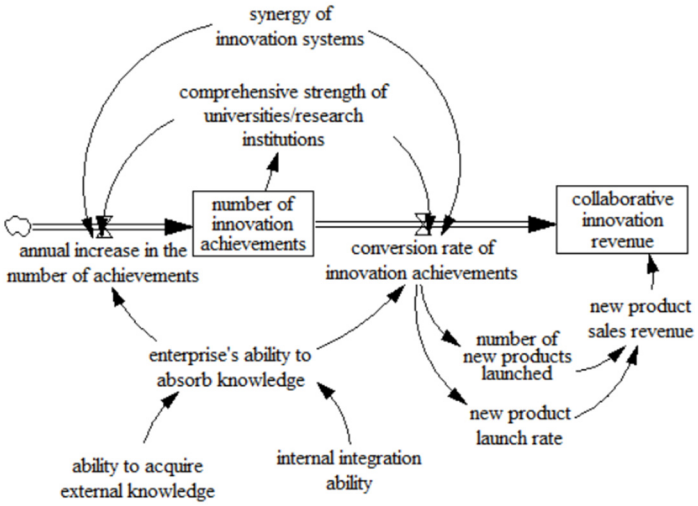

Figure 1: Achievement formation and transformation flow chart of Industry-university-research collaborative innovation system in the logistics industry

2.2. Innovative Funds Circulation Mechanism

Collaborative innovation income is an important state variable in the innovation fundscirculation mechanism,which includes two regulating variables: the increase of annual innovation income and the decrease of annual innovation income.Collaborative innovation revenue is the value expression of collaborative innovation results and the source of funds in the collaborative innovation system. The growth of innovation income is mainly reflected in the increase of intellectual property transaction income caused by the increase of patent number of innovation subjects and the growth of innovation product income caused by the industrialization of innovation results.Driven by the process of "deep integration of informatization and industrialization",the market demand of intellectual property transaction and the industrialization ratio of patent achievements have been improved, and the number of innovative achievements of Industry-university-research collaborative innovation system in the logistics industry has also been increased, thus promoting the increase of collaborative innovation income.In the actual operation, the increase of innovation income and the reasonable distribution of benefits not only have a great incentive effect on the members of the collaborative innovation system, but also enhance the attraction of the collaborative innovation network.This makes universities, research institutes and logistics enterprises have a firm willingness to cooperate and invest in the human and financial resources of collaborative innovation network, thus increasing the number of system innovation results.The decrease in innovation revenue is mainly attributed to obsolescence of products and technological advancesmake the existing technology lag behind. The elimination of products is caused by the development of product life cycle, which leads to the natural elimination of products and the failure of system structure and member quality to meet the market demand. As shown in figure 2.

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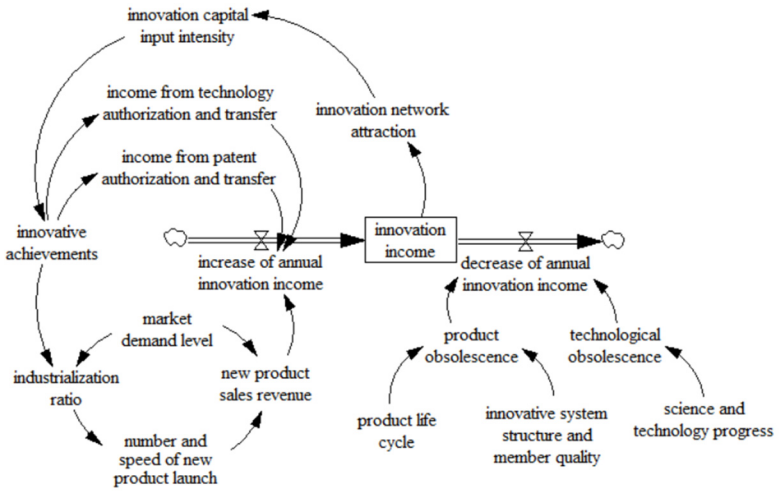

Figure 2: Capital circulationflow chart of Industry-university-research collaborative innovation system in the logistics industry

2.3. Innovative Talent Flow Mechanism

Figure 3 shows the flow of innovative talents in the logistics Industry-university-research collaborative innovation system. Human capital is not only the creator of knowledge, creativity and technology, but also the sole carrier of intellectual property. The flow of talent is often accompanied by the flow of technology and knowledge. Under the background of "deep integration of informatization and industrialization",it is required that the country should create an environment conducive to the outstanding talents.Centering on the urgent need for talents shortage in the integration ofinformatization and industrialization, a number of professional personnel training bases combining the logistics Industry-university-research will be built in key universities, large enterprises and industrial parks.At the same time, China will support colleges and universities to set up related disciplines centering on the cultivation of talents with the integration ofinformatization and industrialization, and strengthen the cultivation and introduction of talents with the integration of informatization and industrialization in the central and western regions.And promote the system of chief information officer of enterprises, encourage enterprises to introduce and cultivate interdisciplinary talents, and improve the coordination ability between informatization and business departments.Such a talent training system also plays a positive role in promoting the talent flow of the logistics Industry-university-research collaborative innovation system. In the actual operation of the innovative system, the number of system members is mainly regulated by the rate of new member increase and member exit. The increase rate of new members is mainly affected by the attraction of the collaborative innovation network, which in turn is restricted by the popularity of the innovation system and the benefit distribution of the innovation system,which mainly benefits from the increase of the income from system innovation. The number of members who quit the network is mainly restricted by the life cycle of system members. Those who lack understanding of innovation activities, fail to make positive contributions and gradually lose interest in participating will leave the collaborative innovation system with the end of the life cycle of the system.The average life cycle of system members is also affected by the synergetic degree of the innovation system.

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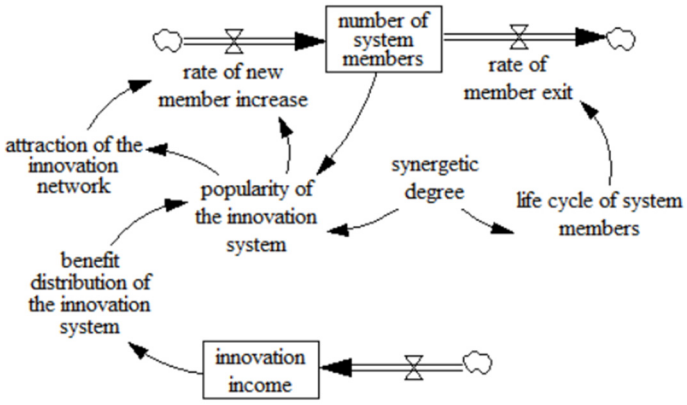

Figure 3: Talents flow chart of Industry-university-research collaborative innovation system in the logistics industry

2.4. Innovative Subject Collaborative Mechanism

The collaborative mechanism is a direct response to the breadth and depth of cooperation among innovation subjects in the logistics Industry-university-research collaborative innovation system. The higher the degree of collaboration, the more extensive and in-depth the cooperation among various subjects in the logistics Industry-university-research collaborative innovation system is, the higher the efficiency of Industry-university-research collaborative innovation will be.It can be seen from Figure 4 that the degree of synergy is mainly affected by two factors, namely the harmony level of system members and the discrete level of system members. In the actual operation of the innovation system, the harmony level of system members is affected by many factors, such as the distribution of system benefits, the degree of risk sharing among system members, and the sense of belonging of system members.Risk sharing mechanism is also a major factor affecting the harmony level of system members. Collaborative innovation among system members is not only for the purpose of obtaining scientific research results and economic income, but also for the very important purpose of reducing innovation risks.The sense of belonging of system members is mainly influenced by the cultural atmosphere of collaborative innovation system. With a strong sense of belonging, the willingness of cooperation among system members is higher, and the degree of system synergy is higher.And the "deep integration ofinformatization and industrialization" process continuously activate logistics innovation motivation, potential development and transformation, based on data driven, forge a support industry transformation of entrepreneurial innovation platform, vigorously develop new products, new technology, new mode and new formats, to accelerate the development of new infrastructure to build support fusion system.All these contribute tothe formation of a good collaborative innovation culture atmosphere, improve the synergy of the innovation system, enhance the sense of belonging of system members, so as to improve the harmony of system members. When the innovation system is at risk or at the end of the life cycle, the high dispersion level of system members will reduce the synergetic degree of the innovation system.

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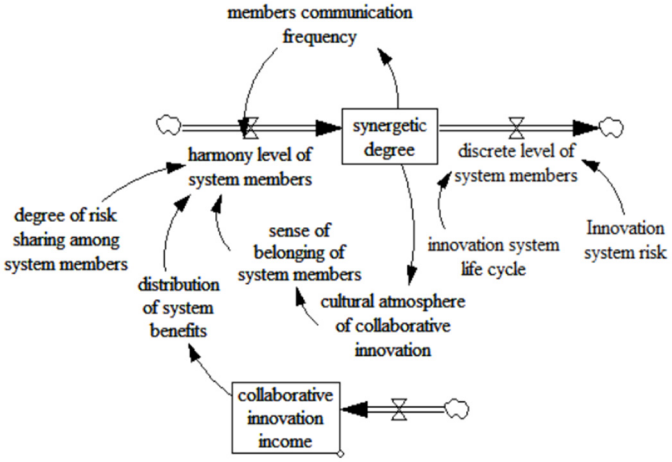

Figure 4: Collaborative structure flow chart of Industry-university-research collaborative innovation system in the logistics industry

3. Conclusion

In this paper, under the background of "deep integration of informatization and industrialization ", the flow stock diagram of system dynamics is borrowed.This paper analyzes the operation mechanism of the logistics Industry-university-research collaborative innovation system from four aspects: the formation and transformation of innovative achievements, the circulation of innovative funds, the flow of innovative talents and the collaborative mechanism of innovative subjects.The key to the sustainable operation and economic growth capacity of the logistics Industry-university-research collaborative innovation system is to take the innovation results as the purpose of cooperation, pay attention to the transformation of innovation results and the improvement of innovation income, establish a reasonable profit distribution mechanism, and enhance the attractiveness of the innovation system to attract talents. At the same time, it is necessary to create a good cultural atmosphere for innovation, improve the degree of collaboration among logistics enterprises, universities and scientific research institutions, and form a good collaborative mechanism, so as to improve collaborative innovation performance.

Acknowledgements

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