

# Research on the Coordinated Development of Industrial Chain, Innovation Chain and Service Chain of Venous Industrial Park from the Perspective of Integration

Kai Zhang

School of Information and Safety Engineering  
Zhongnan University of Economics and Law  
Wuhan, China 430073

Guofu Zhao\*

School of Business Administration  
Zhongnan University of Economics and Law  
Wuhan, China 430073  
School of Business  
Sias University  
Xinzheng, China 451150  
\*Correspondence Author

**Abstract**—This paper analyzes the connotation of the industrial chain, innovation chain and service chain of venous industrial park into three dimensions: value chain dimension, supply and demand chain dimension and knowledge chain dimension. From the perspective of synergy theory, this paper puts forward the coordinated development of industrial chain, innovation chain and service chain through integration, and puts forward four levels of integration route. The first level is to integrate the three dimensional chains in the same chain to realize the coordinated development of the three dimensions of the same chain, so as to ensure the benign development of the whole chain. The second level is to realize the coordination of value chain dimension, supply and demand chain dimension and knowledge chain dimension of venous industrial park through the integration of the same dimensions of three chains. The third level is the integration of value chain dimension, supply chain dimension and knowledge chain dimension on the basis of the third level integration, and finally realizes the integration of industrial chain, innovation chain and service chain, and realizes the coordinated development of three chains. On the basis of the above three levels of integration, the collaborative development model of venous industrial park is constructed, and this paper puts forward some policy suggestions that the government should adopt in the coordinated development of the three chains.

**Keywords**—*integration perspective; venous industry; innovation chain; service chain; coordinated development*

## I. INTRODUCTION

Venous industry has become an important industry of national and social sustainable development strategy, and together with arterial industry to form two major components of circular economy [1]. The venous industry, which focuses on the development and utilization of waste resources, product production and consulting services, is composed of two parts: one is the process of waste resource utilization and

innocuous treatment, the other is the process of renewable resource production [2]. Vein Industrial Park is an ecological park composed of R & D institutions, production and service enterprises, which are mainly engaged in the above two processes. The development of regionalization has become an important form of intensive development of venous industry, and many cities are actively promoting the construction of venous industrial park.

The vigorous development of venous industry and the construction of venous industry park are closely related to the technological innovation and supporting service improvement of venous industry. However, at present, there are some uncoordinated phenomena between the venous industrial chain, the innovation chain and the service chain, such as the innovation subject, the service subject and the industrial subject do not combine their own interests with the development of the whole industry, and the behavior is lack of coordination and consistency. As a result, technological innovation, service and industrial development are not in line with or even separated from each other, innovation achievements cannot be transformed into productive forces through effective services, and industrial development lacks technical and service support, which affects the development of venous industry [3]. Therefore, it is necessary to integrate innovation, service and industry into a complete system. At present, there are few studies in this field. Cao Qun and Jiang Zhenhuan have made a conceptual analysis of the three dimensions of industrial chain value chain, supply chain and knowledge chain in the general sense, and think that the organic integration of these three dimensions can promote the development of industrial chain [4]. Zhao Guofu and Su Kewu put forward the mechanism and countermeasures of the coordinated development of three chains in venous industrial park [5], which provided a useful reference for this study. Based on the theory of coordination, this paper deconstructs and analyzes the industrial chain, innovation

chain and service chain of venous industrial park from three dimensions: value dimension, supply and demand dimension and knowledge dimension. And it puts forward four integration strategies that can achieve collaborative development. In theory and practice, it is a new attempt, and it is expected to play a role of throwing a brick and attracting jade.

## II. ANALYSIS ON THE CONNOTATION OF INDUSTRIAL CHAIN, INNOVATION CHAIN AND SERVICE CHAIN OF VENOUS INDUSTRIAL PARK

### A. *Connotation of the Industrial Chain of Vigorous Industrial Park*

With regard to the connotation of industrial chain, Wu Xianfu and Yang Yongde and other scholars call the supply and demand, the relationship between input and output and the relationship between time and space layout as the industrial chain before and after the economic activities. [6]. Scholars such as Ji Xuhong and Wu Yonglin think the industrial chain is the core of the enterprises with strong competitiveness in the industry, with capital, technology, products and so on as the bond, in order to form regional and industrial competitive advantages for the purpose, and form a dynamic strategic relationship chain with value added ability with related enterprises. [7]. Zhang Lixiang and Feng Chaojun believe that the industrial chain is an industrial ecosystem based on the division of labor and the relationship between supply and demand within the industry, which is divided into vertical transfer chain and horizontal cooperation chain [8] [9] and vertical transmission chain. Such as the value chain that embodies the process of industrial value creation, the supply chain of the relationship between supply and demand & input and output, and the knowledge chain of knowledge creation and dissemination [10], they reflect the connotation of the industrial chain from different angles. Horizontal cooperation chain, such as innovation to promote industrial development [11], service to support industrial development [12], reflects the relationship between promotion and support of industrial development, and belongs to industrial supporting problems [13]. Comprehensive scholars' definition of industrial chain, combined with the characteristics of the current innovation-driven era and the increasingly important role of the service industry in economic development, This study holds that the industrial chain is a competitive enterprise and its related enterprises in the same industrial sector in a certain geographical area, driven by model, technology and product innovation, and supported by supporting services. A chain dynamic enterprise alliance with value added function, supply and demand relationship and knowledge transfer relationship. The industrial chain of the venous industrial park is a chain dynamic strategic alliance formed around the venous industry in an ecological park.

This study draws lessons from the ideas of Cao Qun, Jiang Zhenhuan [4] and Zheng Daqing [14] to analyze the connotation of industrial chain, and understands the connotation of industrial chain of venous industrial park from three dimensions: value dimension, supply and demand

dimension and knowledge dimension. Among them value dimension from the perspective of value creation and value flow, the supply and demand dimension is from the relationship between supply and demand & input-output relationship, knowledge dimension from the perspective of knowledge creation and dissemination, which analyses the industrial chain of the venous industrial park, respectively.

1) *Value dimension*: The value dimension of venous industrial park industrial chain discusses the value distribution and correlation of the whole process from waste recovery, sorting, innocuous treatment, resource utilization, intermediate materials to finished products, value distribution and correlation in the whole process of final consumption, Value is the value organization form and value-added process hidden in the deep layer of the industrial chain, which embodies the value attribute of the venous industrial chain and is the foundation of its development. In terms of organizational form, the industrial chain of venous industrial park links each enterprise in the park through value flow to form a coordinated and unobstructed value chain system through value dimension. Each link of the venous industrial chain has the value increment, but the distribution is not uniform. The resource utilization and regeneration treatment link converts the waste into the valuable resource for human beings, and the value increment is remarkable, which is the core link of the venous industry. It is the essential difference between it and the arterial industry.

2) *Supply and demand dimension*: In the division of labor within the venous industry, with waste resource disposal and reuse enterprises as the core, waste recyclers, centralized merchants, manufacturers of intermediate products and finished products, distributor, retailer, the network chain structure formed by the end user constitutes the supply and demand chain of the venous industry. Through the flow of materials or products on the supply chain, the relationship between input and output, each link of the venous industrial chain is linked, and the connection of the venous industrial chain in the relationship between supply and demand is realized [4].

3) *Knowledge dimension*: The operation of the enterprise is moving from the center of the logistics to the center of knowledge creation, absorption and application activities [15]. In the activities of innovation, R & D, product production, marketing and other activities, a new Idea, a new product, is usually inspired by a number of factors, and the participation of multiple subjects is born. The participating subjects form the knowledge chain[16] in the process of information transfer, technology exchange and knowledge sharing. In the venous industry chain, the waste harmless treatment is discharged into the natural world, or a series of links are converted into the products needed for producing the life, and each link is played by the knowledge. Therefore, the industrial chain of the venous

industrial park is a chain integrating the value chain, the supply chain and the knowledge chain.

*B. The Connotation of the Innovation Chain of the Venous Industrial Park*

Innovation is the driving force of industrial development. Rothwell (1992) believes that the dual role of technology promotion and market pull will promote a series of innovation chain reactions of market subjects to form innovation chain [17]. Luo Lin and Gu Xin et al. [18] defined the whole process of technology transformation and application as the innovation chain. Cui Xiaoyang et al. [19] believe that the innovation chain is a series of knowledge innovation activities guided by meeting the market demand,

which is driven by a core subject of innovation. This study holds that innovation chain is a kind of knowledge, technological innovation and communication network chain structure, which is composed of several subjects with a certain subject as the core, which is influenced by the environment such as talents, culture, and policy and so on. The innovation chain of venous industrial park is composed of enterprises, universities, scientific research institutions and the government, et al., which has cooperative relationship, meets the needs of economic, social and environmental development, and takes talents as the support of knowledge and technological innovation. (as shown in “Fig. 1”)

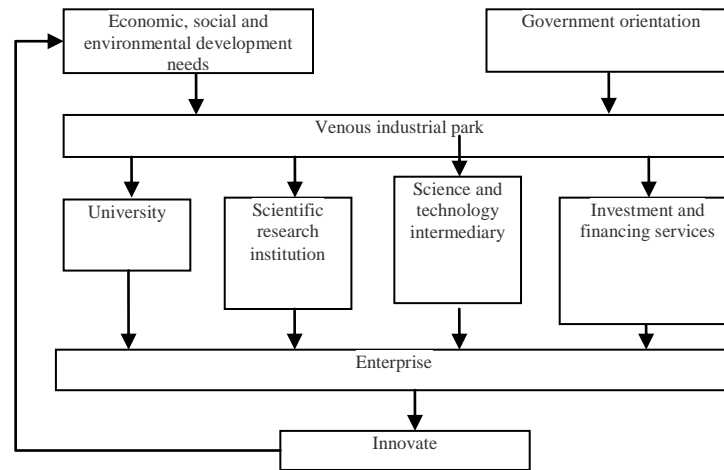


Fig. 1. Structure of innovation chain in venous industrial park.

There are at least the following links in the innovation chain of venous industrial park that need to be innovated. First of all, waste recovery model needs to be innovated. At present, the recycling mode of domestic waste is mainly based on "waste recovery guerrilla + waste recycling bin" and supplemented by "manufacturer + seller". There are disadvantages in disassembling and classifying waste products. It should be changed to mainly "manufacturers + sellers", "waste recycling guerrilla + waste recycling bin" as auxiliary mode [20] Secondly, the technology of waste resource treatment is backward, which leads to the price of renewable resources is often higher than that of primary resources, and the sale of renewable resources is not smooth. Therefore, the technology of recycling treatment needs to innovate and reduce the cost of regeneration process [21]. Third, the burying technology and decomposition technology of innocuous waste treatment need to be further broken through.

Similar to the industrial chain of venous industrial park, it is necessary to analyze the innovation chain from three dimensions: value dimension, Supply & demand dimension and knowledge dimension [22]. From the point of view of value dimension, the venous industry is the same as other industries, and the innovation process generally goes through many links, such as basic research, applied research,

technological innovation, product design, trial production and marketing planning. The innovation of each link is valuable to the next link, forming the innovation value chain. From the point of view of supply and demand dimension, the innovation results of each link are equivalent to the products in the supply chain, the last link is the provider of innovation results, the next link is the demand side of innovation results, and the feedback will be made on the innovation achievements of the previous link, put forward the demand for improvement and form re-innovation. From the point of view of knowledge dimension, knowledge is the source of innovation. The innovation of each link should digest and absorb the knowledge of the previous link of innovation or knowledge condensed in the product, combine the new demand, add or create new knowledge elements to form a new "product". Therefore, in the venous industry, from waste recovery and classification, resource treatment, harmless treatment, intermediate products to final product research and development, design, production, improvement of the whole process is a chain linked to knowledge innovation, which formed the venous industry innovation knowledge chain. Therefore, the innovation chain of venous industrial park is also a chain that integrates value chain, supply and demand chain and knowledge chain.

C. Connotation of Service Chain of Venous Industrial Park

Scholars' research on service chain can be summarized into two aspects. First, taking the service enterprise as the object, scholars find that the service alliance with complementary advantages is much higher than the service efficiency and quality of a single enterprise, so the concept of "service chain" is put forward [12] [23]. Second, when scholars study the product supply chain, they abstract the increasingly important service and form a service chain that runs through the product life cycle [18]. The two aspects of the research come together and form the thought of service chain. On the basis of summing up the previous studies, this study holds that the service chain is a network chain structure formed by using modern management theory, information technology and other tools to organize the specific organization and link related to the service in the process of maximizing the service object demand (including quality of service and efficiency).

The service chain of venous industrial park is a service creation and service value-added closed-loop network chain, running through the whole venous process of waste recovery, disassembly and classification, centralized acquisition, resource treatment, recycling treatment, innocuous treatment, product development and design, intermediate product production, finished product production, marketing and brand communication, recovery and reconstruction and so on. Service chain participants include government, enterprises, associations and various social organizations. The service contents include waste recovery and classification knowledge training, waste recovery information service, waste value evaluation and trading service, basic research on

waste recycling and treatment, financing service, high-tech talent service, intellectual property service, Information consulting services, venous industry incubation services, product inspection and testing and third-party certification services, market information consulting services, marketing services, professional marketing planning services, etc.

It is also necessary to analyze the connotation of venous industrial park service chain from three dimensions: value dimension, supply & demand dimension and knowledge dimension. First of all, from the point of view of value dimension, service creates value. Science and technology intermediary service has built a bridge for venous technology research and development and application enterprises, so that R & D results have produced value for R & D departments, intermediary service departments and result application enterprises and even regional economic development in industrialization. A value chain is formed among the subjects [24]. Secondly, from the point of view of supply & demand dimension, service is also a commodity, accompanied by business flow, information flow and capital flow in the process of service provision, which accords with the typical characteristics of supply and demand chain. Finally, from the perspective of knowledge dimension, professional service needs professional knowledge, accompanied by knowledge transfer in the process of service [25]. Therefore, the venous industrial park service chain is still a chain that integrates value chain, supply & demand chain and knowledge chain. The relationship between venous industrial park industrial chain, innovation chain, service chain and their value dimension, supply & demand dimension, knowledge dimension is shown in "Fig. 2".

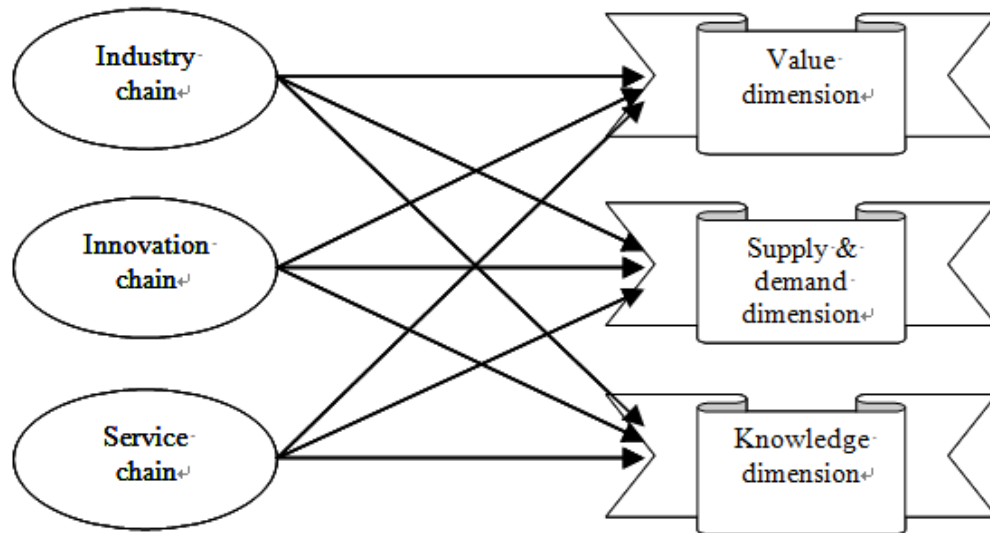


Fig. 2. Schematic diagram of the relationship between industrial chain, innovation chain, service chain and its dimension.

III. INTEGRATION OF INDUSTRIAL CHAIN, INNOVATION CHAIN AND SERVICE CHAIN OF VENOUS INDUSTRIAL PARK

A. The Research Perspective of Integration

The idea of integration comes from the collaborative theory, which is a kind of organization and management form to realize the cooperative operation between the system

and the subsystems in the system, and to adjust the resources and modes dynamically. Integration is the premise of coordination [26]. Synergy theory is an important branch theory of system science, which has been gradually formed and developed on the basis of many disciplines since 1970s. It is a new subject, which takes the similarity or common characteristics of multiple subsystems, the joint action mechanism and the cooperative mechanism as the research

object, and discusses the internal causes and processes of multiple subsystems from disorder to order. [27] The collaborative problems of industrial chain, innovation chain and service chain in the development of vein industrial park are consistent with the research object of synergy theory and are suitable for discussion by means of synergy theory. The idea of integration is the core idea of collaborative theory. He integrates the object of analysis into one system, so as to find the way to optimize the system as a whole. Integration thought has become an important mode of thinking to promote economic and social development. In recent years, the idea of integration has penetrated into various fields, such as industrial chain integration, supply chain integration, knowledge integration, resource integration, relationship integration and other theories emerge in endlessly, and become more and more widely used. Cheng Dening [28] studied the comparison and selection of agricultural industrial chain integration models, and Zhang Jiemei [29] studied the knowledge integration of M & A enterprises. Fan Yannan and Yunlexin et al. [30] studied the influence of knowledge integration ability on the innovation performance of manufacturing enterprises. Yao Jianming [31] studied the resource integration of online shopping supply chain from the perspective of service capability equilibrium. Their research provides a reference for this paper to try to use integration theory to study the collaborative development of venous industrial park industry chain, innovation chain and service chain.

#### *B. Integration of Industrial Chain, Innovation Chain and Service Chain of Venous Industrial Park*

Based on the existing problems of industrial chain, innovation chain and service chain in the development of venous industrial park, this study puts forward the following three levels of integration route.

The first level is the integration of the three dimensions in the same chain. In the same chain, the three dimensions of value dimension, supply & demand dimension and service dimension are not isolated, but complementary and interdependent. It needs to be integrated (see "Table I") to ensure coordinated development on the basis of consistent connotation. First, the integration of the three dimensions of the industrial chain. In the venous industrial chain, value creation is the fundamental and driving force of the existence and development of every enterprise, but it must be based on the premise of meeting the downstream demand, only the products are recognized by the downstream enterprises and transformed into real orders. The value of upstream enterprises is realized in part, Only when upstream enterprises provide services to downstream enterprises in a timely manner or even actively and are recognized, can the value of upstream enterprises be fully realized. For example, an upstream enterprise in the venous Industrial Park produces recycled materials of high quality and low price at a lower cost. It is cheaper for downstream enterprises to buy recycled materials for that enterprise than to buy raw materials from the market. And can get the upstream enterprise timely material supply and the good technical guidance service, when every enterprise reaches this state, it

realizes the integration of value dimension, supply & demand dimension and knowledge dimension in the industrial chain. Second, the integration of the three dimensions on the innovation chain. Every innovation in the innovation chain of venous industry should be based on knowledge, driven by value, and should be innovated from the starting point and foothold to meet the needs of downstream industries. For example, resource regeneration technology innovation is a key link in the innovation chain. Technology R & D departments should first analyze the technological realization conditions and innovation value of this innovation, evaluate whether incremental contributions can be made, and analyze the possibility that the innovation achievements will be recognized by the society and transformed into the elements of industrial development in the real economic and technological environment. Therefore, the integration of the three dimensions of the innovation chain can improve the efficiency of innovation and the conversion rate of innovation results, and enhance the externality of innovation knowledge under the premise of reasonable protection of innovation knowledge, so that more enterprises in the industry can benefit. Promote the better and faster development of venous industry. And the third is the integration of three dimensions on the service chain. Taking the intermediary consulting service of waste plastic recycling technology as an example, it is an important link in the service chain, connecting the technology research and development department upward and connecting the resource recycling enterprise downwards. It is highly knowledgeable and professional to link the technology supply side with the demand side. Therefore, as such an intermediary consulting service enterprise, it is necessary not only to integrate the plastic regeneration technology and knowledge in the upstream technology research and development link, but also to integrate the production situation and technical status knowledge of the industrial sector, to transform the technology supply of the technology research and development department into the technology demand of the industrial sector, or to transform the resource regeneration technology demand of the industrial sector into the scientific research topic of the technology research and development department, so as to realize the knowledge creation value of the technology research and development department, the value of Technology and knowledge dissemination in intermediary consulting Department and the application of new technology and new knowledge in Industrial sector to enhance the value of economic, social and environmental benefits. In a word, only by integrating the three dimensions of the same chain can we ensure the coordination of the three dimensions of the whole chain.

TABLE I. FOUR INTEGRATION LEVELS OF INDUSTRIAL CHAIN, INNOVATION CHAIN AND SERVICE CHAIN OF VENOUS INDUSTRIAL PARK

Chain	Dimension	The First Level of Integration: the Integration of Three Dimensions in the Same Chain	The Second Level of Integration: the Same Dimension Integration Between Different Chains	The Third Level of Integration: the Integration of Three Chains
Industry chain	Value dimension			Integration
	Supply & demand dimension	Integration		
	Knowledge dimension			
Innovation chain	Value dimension			
	Supply & demand dimension	Integration		
	Knowledge dimension			
Service chain	Value dimension			
	Supply & demand dimension	Integration		
	Knowledge dimension			

The second level is the integration of the same dimensions among the three chains, that is, three chains integration of value dimension, integration of supply & demand dimension, integration of knowledge dimension (see “Table I” Column 4 and “Table II”). The first is integration of the value dimensions of the three chains. The theoretical and technological innovation of scientific research units and technology research and development departments on the innovation chain can be transformed into the technology needed by the venous industry department in time, and help the industrial department to produce the products needed by the market through timely and thoughtful service. It realizes the integration of three chains: industrial chain, innovation chain and service chain. The second is the integration of the supply and demand dimensions of the three chains. In the innovation chain, new technologies and new models, such as QR code technology, image recognition technology, perceptual technology, wireless network technology, WeChat Pay, Alipay payment, intelligent logistics, big data and so on, continue to emerge. If these innovative products solve the problem of matching the supply and demand of products and services between upstream and downstream enterprises in the venous industry, the high cost of logistics transportation, the problem of centralized storage and transportation and intensive management, they will must improve the efficiency of logistics management, improve the value of enterprises in the venous industry park. The third is integration of the three chain knowledge dimensions. In the venous industry, waste classification knowledge, resource regeneration knowledge, innocuous treatment knowledge, new product research and development knowledge, production and manufacturing knowledge, brand marketing knowledge, patent application and protection knowledge, economic and legal knowledge permeate the industrial chain. In each link of innovation chain and service chain, only by effectively integrating and using this knowledge can the development of venous industry be original and active.

For example, when a manufacturing enterprise in the park needs to break through a certain technical problem, R &

D and service enterprises can quickly use the knowledge they have to help solve it at a low cost and high quality, when a new technology in R & D enterprises needs to be tested in practice. According to the intention of R & D enterprises, manufacturing enterprises can cooperate with each other to complete the practical inspection, and the service enterprises can provide professional supporting services to realize the integration of knowledge dimension. Technology, production and service are essentially the integration and innovation of knowledge.

Therefore, in the venous industry, the foundation of the collaborative development of innovation chain and service chain is knowledge. The integration of knowledge will greatly promote the development of venous industry.

TABLE II. SECOND INTEGRATION LEVEL OF INDUSTRIAL CHAIN, INNOVATION CHAIN AND SERVICE CHAIN OF VENOUS INDUSTRIAL PARK

	Integration of the Same Dimensions of the Three Chains		
	Value dimension	Supply & demand dimension	Knowledge dimension
Industrial chain	Integration	Integration	Integration
Innovation chain			
Service chain			

The third level is the integration of industrial chain, innovation chain and service chain. The three chains are subsystems of the venous Industrial Park, which need to be integrated on the basis of the above two levels of integration (see “Table I”, Column 6 and “Table III”). First of all, from the relationship between knowledge, service and value, the related knowledge of venous industry itself is valuable, and knowledge provides a guarantee for improving the production management process and improving the performance of products, and creates value for many enterprises. In the service process, through the knowledge transfer to make the service object satisfied. Therefore, value

dimension, supply & demand dimension and knowledge dimension take products and services as the carrier to achieve internal consistency and perfect integration. Secondly, from the relationship among the three chains, the industrial chain is the basis of the development of the innovation chain and the service chain, the innovation chain is the catalyst for the development of the industrial chain and the service chain, and the service chain is the link between the industrial chain and the innovation chain. If the venous industry wants to develop better, it needs innovation and service in every link, so it can give birth to innovation and service. Innovation and service are based on industrial development, but also counteract on the development of venous industry, which can promote the development of venous industry, and improve the environment of innovation and industrial development. Only the full integration of the three chains can make the coordinated development between the relevant scientific research institutes and enterprises in the venous industrial chain, provide inexhaustible power for the development of venous industry, and realize the high end of industrial development through the upgrading of the "chain" [32].

TABLE III. FOURTH INTEGRATION LEVEL OF INDUSTRIAL CHAIN, INNOVATION CHAIN AND SERVICE CHAIN OF VENOUS INDUSTRIAL PARK

	Value Chain Dimension	Supply and Demand Chain Dimension	Knowledge Chain Dimension
Industrial chain	Integration		
innovation chain			
service chain			

#### IV. THREE-CHAIN COORDINATED DEVELOPMENT MECHANISM

##### A. Three-Chain Collaborative Model

Integration is the premise of coordination, but integration does not necessarily bring coordination, whether to achieve coordination can be qualitatively evaluated by experts, or can be measured quantitatively with the help of mathematical models. In this study, it is considered that using the output function of venous industrial park to measure the coordination of three chains of industrial chain, innovation chain and service chain of venous industrial park is a method worthy of consideration. According to the cooperation theory, this research assumes that the three subsystems of the industrial chain, the innovation chain and the service chain of the venous industrial park form the ordered self-organized structure of the interaction after the non-linear integration, On the basis of this hypothesis, the composite function of collaborative development of venous industrial park is constructed.

$$Y = f(C(v, s, k), N(v, s, k), F(v, s, k), T(i)) \quad (1)$$

In this formula,

- Y is the output function of coordinated Development of Venous Industrial Park;

- C is the value chain, supply & demand chain and knowledge chain in the industrial chain of venous industrial park, cooperate sub-function;
- N is the value chain, supply & demand chain and knowledge chain in the value chain of venous industrial park, cooperate sub-function;
- F is the value chain, supply & demand chain and knowledge chain in the service chain of venous industrial park, cooperate sub-function;
- T is the same chain dimension cooperative subfunction between different chains in the venous industrial park,  $i=v, s, k$ ;
- v is the value chain dimension;
- s is the supply and demand chain dimension;
- k is the knowledge chain dimension.

The mechanism and influencing factors of the coordinated development of industrial chain, innovation chain and service chain in venous industrial park are similar to the input-output relationship between capital and labor in Cobb-Douglas production function. Therefore, this study imitates Cobb-Douglas production function to construct the output function of collaborative development of venous industrial park as an analysis tool for the coordinated development of three chains of venous industrial park. By analogy with Cobb-Douglas production function, the composite function of the above collaborative model can be transformed into the following functions that can actually be solved.

$$Y = C^\alpha N^\beta F^\lambda \quad (2)$$

In this formula,

- Y is the output function of coordinated development in venous industrial park, which expresses the output of collaborative development in venous industrial park;
- C is the input of industrial capital in the industrial chain of venous industrial park, and  $\alpha$  is the elasticity coefficient of capital output;
- N is the product of innovation achievement and achievement result conversion rate in venous industrial park innovation chain, and  $\beta$  is innovation achievement output elasticity coefficient;
- F is the product of the quantity of service chain with  $\Sigma$  Man-hour · unit price expressed in the service chain of the venous industrial park and the service satisfaction expressed as a percentage, and  $\lambda$  is the elasticity coefficient of the service output.

For model application, before and after integration, the industrial capital growth rate C, the capital output elasticity coefficient  $\alpha$ , the product N of the innovation result growth rate and the innovation result conversion rate, the innovation result output elasticity coefficient  $\beta$ , The product F of the

service growth rate expressed by the number of man-hours and the service satisfaction expressed by the percentage, The service output elasticity coefficient  $\lambda$  is replaced by (2) formula, and get  $Y_1$ ,  $Y_2$ , if  $Y_2 - Y_1$  is significantly greater than 0, indicates that the triple chain integration has a coordinated effect.

### *B. Three-chain Coordinated Development Mechanism*

According to the previous analysis and integration of the industrial chain, innovation chain and service chain of venous industrial park, this study holds that the design of three-chain coordinated development mechanism can be considered from the following five aspects. First, it is the environment-oriented mechanism. The development of venous industry, technology and service innovation should be guided by improving the environment, so that industrial development, innovation and service should be consistent and coordinated development because of their common mission, vision and goal. Second, the government attaches importance to the technological innovation and supporting service construction of venous industry and continues to invest in the mechanism. Without the support of the government to attach importance to and continue to invest funds, it is difficult to achieve coordination in the development of venous industrial park industry chain, innovation chain and service chain by relying only on the investment of enterprises to carry out technological innovation and self-service. The government should invest funds to mobilize universities, scientific research institutes and other scientific research institutions to carry out technology development, and do a good job of technology transfer and other supporting services. Third, it is the benefit distribution mechanism. The key to developing the venous industry is to deal with the entity enterprise and technology service and the innovation department in the industrial chain, and the allocation of the benefit of scientific research institutions is the key to the development of the venous industry. Some innovation and service with good social and environmental benefits, while the economic benefit is temporarily poor, the government should buy priority. In addition, in order to protect the enthusiasm of the producer of renewable resources, the government of certain renewable resources should make a minimum price limit. Fourth, it is the knowledge flow and value-added mechanism. Knowledge flows in mutual learning, embodies its value in flow, and creates value for knowledge creation and application departments. Therefore, the government should often organize lectures on resource recycling and environmental protection in venous industrial parks and residents' communities, so as to make knowledge flow, create environment and provide internal motive force for the development of venous industry. Fifth, it is the binding mechanism of laws and regulations. In the industrial chain, innovation chain and service chain, the entity enterprises of all parties often take their own interests as the starting point, and it is inevitable that they will do harm to the environment, waste resources, damage the interests of other parties and even the state. Therefore, it is necessary for supporting laws and regulations to restrain and supervise these organizations or individuals. Under the action of the above five

mechanisms, the industrial chain, innovation chain and service chain of venous industrial park have the conditions of coordinated development.

### *C. Policy Recommendations*

The theory of coordination is an important tool to solve the problem of disharmony in the construction and development of venous industrial parks. Therefore, according to the theory of coordination, this paper puts forward some suggestions to solve the problem from the perspective of integration. In the previous analysis, it is revealed that the industrial chain, innovation chain and service chain of venous industrial park have three dimensions: value dimension, supply and demand dimension and knowledge dimension, which are their common characteristics, and at the same time, the integration thinking and cooperative development mechanism of the three chains are put forward. However, the coordinated development of the three chains will not form spontaneously and needs to be realized under the action of government policy. To this end, the following policy recommendations are made in this study:

*1) The government should do a good job in top-level design and establish an innovative system of industrial technology and management services:* Top-level design is to design the overall institutional framework, industrial policy, organizational structure and management service innovation system of venous industrial park industry chain, innovation chain and service chain from top to bottom by using systematic thinking from a strategic point of view.

In terms of the overall system framework, the national and relevant departments should develop long-term strategic planning for the development of the vein industry, determine the strategic objectives and the implementation strategies, and the local governments accordingly develop the regional strategic planning and implementation strategy. At the same time, through the laws and regulations, the recycling, disassembly and utilization of the renewable resources, the technological innovation and related services in the innocent treatment process should follow the principles, the responsibilities and obligations and the rights to be enjoyed, so as to be the basis for guiding the development of the industry, innovation and service. For example, the source, project establishment, appropriation of funds, application and evaluation of scientific research achievements, intellectual property ownership of the venous industry can be embodied in a regulatory manner.

In terms of industrial policy, the government will improve the status of venous industry in society, economy and environment, and strengthen the investment and policy support of government finance in the development and development of venous technology and supporting services. For example, in terms of government funds support, bank credit, subsidies and tax reduction policies, we have inclined to venous enterprises, service enterprises and scientific research institutions to build a social industry system with three subsystems of waste recycling, disassembly and utilization and harmless treatment, forming the industrial value chain with close relationship between the intravenous



industry enterprises, scientific research units and service enterprises, supply and service chains and service chains, and promote the coordinated development of industry, innovation and service through market-oriented operation and enterprise management [33].

In terms of organizational support, consideration can be given to setting up a special department of venous industry development within the administrative department of industry and information technology, which shall be responsible for the implementation of venous industry policy and coordination with finance, science and technology, environmental protection, industry and commerce and other administrative departments, and undertakes the bridge and link functions of venous industry enterprises, service enterprises, scientific research units and the government [34]. At the same time, we can also consider the establishment of venous industry development promotion association, by which the association undertakes the functions of propaganda, coordination, self-discipline, service and so on, so as to promote the coordinated development of venous industry, scientific research and service.

In the aspect of industrial technological innovation system, the specialty of resource regeneration and processing & utilization technology, innocuous treatment technology is very strong, which requires strong technical support and service system. Therefore, we should draw lessons from Japan's experience in the research and development of "venous industry" technology, and establish multi-level, multi-category environmental technology research & development institutions and industrial technology research & development system, and provide the following three aspects of security: The first is to set up a special fund for comprehensive utilization of renewable resources to ensure the basic research and investment of comprehensive utilization of renewable resources. The second is to set up industrial development technology system and service system construction fund to ensure waste recycling technology, innocuous treatment technology, biotechnology and other technology patent applications, transfer and legal advisory service system input; The third is to actively promote the establishment of a cooperative and collaborative innovation system for production, government, study, research, and citation, improve the conversion rate of scientific research achievements in industrial development, and strengthen the introduction, digestion, and absorption of foreign advanced venous technology. Improve the technical level and service level of venous industry [2].

In terms of management service innovation system, Business guidance and management should be carried out by specialized agencies. According to the venous industry strategy of the national and local governments, the management department of the venous industrial park should clearly outline the blueprint of the industrial development of the park, clarify the path of industrial development, clarify the problems existing in the development of the park, and coordinate all factors as a whole, promote the innovation, service and industrial coordination in the development of the park, and support the implementation and promotion of the industrial plan of the park.

2) *Attaching importance to the role of market in the allocation of resources, and guiding enterprises to carry out technological innovation and investment in venous industry by means of marketization:* The government's subsidy policy to the enterprise and technology innovation project of the venous industry should be dynamically adjusted and optimized in practice, so as to avoid immutable or excessive changes, and to monitor the implementation of the subsidy policy and the use of subsidy funds, and give full play to the guiding role of the government subsidy fund, Pay more attention to the internal motivation of market subject innovation and service[35].At the same time, the government should also consider giving appropriate subsidies to downstream enterprises or end consumers who consume venous products, and gradually reduce subsidies to venous industry enterprises when the venous industry enterprises grow to a certain extent. Increase subsidies to consumers, thereby curbing enterprise speculation and corruption, and gradually guiding consumers to change their consumption attitudes and accept and consume recycled products.

3) *Attaching importance to the construction of innovation and service environment, promoting industrial development through innovation, promoting three-chain collaboration through service:* Innovation is the catalyst of the development of the venous industry. The government should create an innovative atmosphere and service environment conducive to the development of the venous industry, standardize and supervise the market, ensure fair competition, promote the sharing of knowledge in the park, and let the knowledge of the venous industry flow in the park, to promote technological innovation and coordinated development with knowledge. The first is platform innovation, the construction of public service platforms and laboratories of venous industrial park technology research and development. The investment in the research and development of new technology in venous industry generally requires huge funds, which can not be borne independently by individual industrial enterprises, even if individual enterprises are willing to invest, but can not form economies of scale advantage. Therefore, the government should assume this responsibility and allocate the most important resources to build a public service platform for technological research and development [35] Secondly, the reduction, reuse and resource utilization of circular economy can not be separated from technological innovation. The principle of reduction requires reducing the consumption of resources and energy through technological innovation, and the principle of reuse requires the production of reusable products or parts through technological innovation. The principle of resource utilization requires that waste should be transformed into available resources through technological innovation to reduce the impact of waste on the environment. In the process of developing venous industry, technological

innovation is the core. The third is industrial innovation, which draws lessons from the advanced experience of the construction of venous industrial parks in developed countries such as Japan, explores the development model of venous industries and industrial clusters, and makes use of the advantages of cluster organizations through geographical concentration or proximity. On the basis of specialization and cooperation, it produces aggregation effect and improves the competitiveness of venous industrial park. Finally, service innovation, there are many links in the development of venous industry that need supporting services, such as basic research financing services, high-end scientific and technological talent services, intellectual property trading services, information consulting services, technology transfer services. Inspection and testing and third-party verification services, market promotion and publicity services, professional marketing services, etc., building innovation and service platforms, setting up innovation entrepreneurship funds, etc., these measures can promote the coordinated development of the venous industry.

## V. CONCLUSION

This study analyzes the three dimensions of venous industrial park industrial chain, innovation chain and service chain, which are value dimension, supply and demand dimension and knowledge dimension, respectively, on this basis, using the theory of coordination, this paper puts forward to achieve the coordinated development of industrial chain, innovation chain and service chain through integration, and put forward three levels of integration route. The first level is to integrate the three dimensional chains in the same chain to realize the coordinated development of the three dimensions of the same chain, so as to ensure the benign development of the whole chain. The second level is the integration of the same dimension of the three chains to realize the separate coordination of the value dimension, the supply & demand dimension, and the knowledge dimension of the venous industrial park. The third level is to integrate the value dimension, supply & demand and knowledge dimension on the basis of the second level integration, and finally realize the integration of industrial chain, innovation chain and service chain, and realize the coordinated development of three chains. Finally, the paper puts forward the policy suggestions that the government should adopt in the coordinated development of the three chains. It is considered that the government has done a good job in the top-level design of the overall institutional framework, industrial policy, organizational structure, technological innovation system and management service innovation system et al., At the same time, the government should pay attention to the role of the market in the allocation of resources, guide enterprises to engage in technological innovation and investment in venous industry through the market, attach importance to innovation, and realize coordination in innovation. The deficiency of this study is that only from the point of view of coordination theory, this paper puts forward the integration idea of coordinated

development of venous industrial park industry chain, innovation chain and service chain, but the driving factor of their coordinated development is a variable that cannot be ignored. Therefore, in the further research, the problem should be discussed based on the research and interview data.

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