



# A Review on the Research of Producer Services Supply Chain in China

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**Abstract.** With the development of modern manufacturing industry, the division of production is more and more detailed, and the importance of producer services is more and more prominent. In order to clarify the development status and trend of China's producer service supply chain, based on the development status and problems of China's producer service supply chain, this paper analyzes the influencing factors of the collaboration of the production + service mixed supply chain from the connotation and characteristics of producer service supply chain. At the same time, the author thinks that the producer service supply chain of China is still in the development status quo, and the producer service industry of China's manufacturing industry is still in the situation of fighting alone. How to develop and strengthen the producer service supply chain of China's manufacturing industries.

**Keywords:** Productive services · Supply chain · Manufacturing

## 1 Introduction

China's the Eleventh Five-Year Plan emphasizes that we should vigorously develop the producer oriented service industry, refine and deepen the professional division of labor, reduce social transaction costs, and improve the efficiency of resource allocation, so as to realize the transformation of economic growth mainly driven by industry to driven by i-industry coordination [1]. The right choice to optimize China's industrial structure is to learn from the experience of developed countries, take the development of service outsourcing as a breakthrough, focus on the development of modern producer services, stimulate the linkage effect between producer services and manufacturing, promote the formation of effective industrial agglomeration of producer services, and promote the upgrading of local enterprises' industrial chain [2]. China's economic activities are changing from manufacturing industry as the center to service industry as the center, and the relationship between manufacturing industry and producer services is increasingly close [3]. There are two characteristics of manufacturing servitization: one is input servitization, that is, service elements play an increasingly important role in the total input of manufacturing; the other is output servitization, that is, service products play an increasingly important role in the total output of manufacturing. Producer services can improve the production efficiency of other elements of enterprises, so as to reduce the input of resource consuming elements or replace the input of resource consuming elements [4]. As a result, the healthy development of the manufacturing industry is

inseparable from the strong support of the producer service industry. At the same time, the trend of the service-Oriented industrialization of the manufacturing industry has gradually become clear.

At present, the development of producer services in China is relatively backward, and the lack of interaction mechanism between producer services and manufacturing industry, especially in the distribution network, logistics, financing and other aspects, has seriously affected the improvement of the competitiveness of manufacturing industry [5]. The research on producer service supply chain is still at the stage of concept definition and arrangement, and the research on the organic integration of manufacturing supply chain and service supply chain is relatively lacking, especially the quantitative research and empirical research [6]. For manufacturing enterprises, through the support of supply chain, reduce operating costs, through effective cooperation between enterprises to improve efficiency and flexibility become the key [7]. With the development of modern information technology, it is inevitable to improve the productive service level of manufacturing enterprises and cultivate a large number of professional producer service providers [8].

In view of the core status of producer services in manufacturing industry and the fact that producer services in China are relatively backward, it is very urgent to carry out relevant research. With the transformation of enterprises to service-Oriented manufacturing, the traditional manufacturing supply chain is gradually transformed into a hybrid supply chain with both manufacturing and service functions. In order to find out the current research situation and problems in China, this paper reviews the related research.

## **2 Definition of Connotation of Manufacturing Supply Chain**

### **2.1 Definition of Producer Services Supply Chain for Manufacturing**

In 1988, vandermerwe and Rada pioneered the concept of “Servitization of Manufacturing”. The servitization of manufacturing is defined as the transformation of traditional manufacturing enterprises from simply providing tangible goods or goods and additional services to providing “goods service package” with customers as the center [9]. According to white (1999), servitization of manufacturing is a process of dynamic change, in which the role of manufacturer changes from goods provider to service provider [10]. Szalavetz (2003) thinks that servitization of manufacturing has two meanings: first, the efficiency of internal services is increasingly important to the competitiveness of manufacturing enterprises. Competitiveness comes not only from the efficiency of traditional manufacturing activities, but also from the effective organization and provision of internal services, and its importance and complexity are gradually increasing; second, the complexity and importance of external services related to goods to customers Increasing [11]. At the same time, China’s academia has also given a lot of attention to the servitization of manufacturing. For example, Lei Lin and Guisheng Wu think that servitization of manufacturing is that manufacturing enterprises further strengthen and enhance the original service support activities in order to obtain competitive advantage. This kind of service enhancement is mainly manifested in two aspects: basic enhancement and promotion enhancement [12]. According to the content of services provided

by enterprises, Jingmei Ma believes that servitization of manufacturing includes general value-Added services based on products and professional services separated from products [13]. Jiguo Liu and others believe that servitization of manufacturing refers to manufacturing enterprises' aim to obtain competitive advantage and change the value chain from manufacturing centered to service centered [14]. Dapeng Zhou believes that servitization of manufacturing is an economic trend of increasing proportion of input and output of service elements remanufacturing [15].

A classic definition of supply chain in academic circles is proposed by Professor Xiaoliang Li: "around the core enterprise, through the control of logistics, information flow and capital flow, from the purchase of raw materials to the production of intermediate products and final products, and finally by the sales network to deliver products to consumers, it is a whole chain composed of suppliers, manufacturers, distributors, retailers and final users Body function network chain structure". Here, the supply chain is oriented to manufacturing enterprises, around the logistics, its management purpose is to reduce costs and improve efficiency [16].

To sum up, its definition should be: in the process of transformation from product supply chain to product service supply chain, the role of supply chain itself will change, from only providing products to providing products and additional services, and then to providing the integration scheme of products and services. Therefore, the supply chain has also changed from a single product supply chain or services supply chain to a product service supply chain integrating products and services [17]. That is, the mode of integrated management of information, service process, service capability, service performance and service funds from the initial service provider to the final customer, which is dominated by productive services and formed for the generation and delivery of services.

## **2.2 Characteristics of Producer Services Supply Chain for Manufacturing Industry**

The transmission and collection of services of each node depend on the flow and sharing of information. The flow in the whole supply chain is not physical products, but services. Of course, some services still depend on the physical flow of products, such as logistics services. But our research focuses on the flow of services. Service industry is an indispensable part of a country's development. The rapid development and prosperity of modern service industry has become an important symbol of a country's and regional economic modernization [18]. Manufacturing enterprises will produce different types of producer services around all aspects of product production. Manufacturing enterprises will produce different types of production service demand around all aspects of product production. Producer services supply chain is a complex system, but the reality exists in our economic society. Because service is intangible and difficult to measure, customers often participate in the process of service delivery. Service providers and customers have to communicate face to face. Therefore, the structure of the service supply chain is much simpler than that of the product supply chain. Compared with the operation mode of the product supply chain, there is only one service supply chain, that is, completely pulling and market reacting, which is determined by the non storability of the service and the diversity of the service demand. The manufacturing oriented producer service supply

chain is a combination of the two. The span of supply chain nodes is different, so it has complexity.

It is also dynamic. The supply chain is composed of members with different executive functions. Its operation process involves logistics, information flow, capital flow and so on. It is closely related to the external environment and constantly interacts with the external environment [19].

Due to the needs of enterprise strategy and adapting to the change of market demand, node enterprises and service providers need to be updated dynamically. With more and more participants in the supply chain and wider geographical scope, supply chain management gradually changes from closed, static and linear structure to open, dynamic and network structure [20]. This makes the manufacturing oriented producer service supply chain dynamic.

At the same time, it also has the characteristics of user oriented. User demand pull is the driving source of information flow, products and services, capital flow operation in the supply chain, is an essential part. Driven by customer demand, through the establishment of strategic partnership between enterprises in the supply chain, we can comprehensively improve the satisfaction of cooperation among enterprises, so as to achieve the goal of improving the satisfaction of end users [21].

Crossover is also an important feature. There are more cooperative enterprises in each node, the supply chain structure grows [22], and many supply chains intersect, which increases the difficulty of supply chain management and coordination.

### **3 The Influencing Factors of Supply Chain Coordination Between Manufacturing Industries and Producer Services in China**

After the “integration of industrialization and informatization”, China has put forward the “integration of two industries” of advanced manufacturing industry and modern service industry for the first time. Recently, the national development and Reform Commission and other 15 departments jointly issued the "Implementation Opinions on Promoting the Deep Integration Development of Advanced Manufacturing Industry and Modern Service Industry", which provides direction in cultivating new formats and new modes of integration development and exploring new paths of integration development in key industries and key fields [23]. With the further development of producer service industry, producer service supply chain has been gradually formed. As one of the core work of establishing producer service supply chain, supplier selection has become an important part of its development and stability. The research of supply chain management has always been a research hotspot of scholars at home and abroad. However, the definition and understanding of supply chain management pay more attention to the transformation process of physical products in manufacturing industry, while the research of service supply chain management involving service transformation process is relatively less [24]. At present, the research of supply chain management has gradually started from product supply chain to service supply chain. According to the development status of producer services, this paper discusses how to evaluate and improve the performance of producer services from the perspective of supply chain management [25].

To build a modern economic system, we must develop the economy with high quality. The focus of economic development lies in the real economy, and the key and difficult point of developing the real economy lies in the manufacturing industry. "Proposal of the CPC Central Committee on Formulating the Fourteenth Five-Year Plan for National Economic and Social Development and the Long-Range Goals for the year 2035" proposes to promote the deep integration of modern service industry with advanced manufacturing industry and modern agriculture, and accelerate the digitization of service industry. With a new round of development of information industry and the transformation of global manufacturing industry from single production to "production + service", it is an inevitable choice to promote the high-Quality development of manufacturing industry to promote the symbiosis and coordinated development of manufacturing industry and service industry [26].

In the field of China's manufacturing industry, multinational companies occupy the high end of the industrial value chain by virtue of the comparative advantage of producer services, and earn high profits. However, the development of producer services in China is relatively backward, and there is no interactive mechanism between producer services and manufacturing industry, especially in the distribution network, logistics, The development of logistics finance can promote the interaction and cooperation between third-Party logistics enterprises, financial institutions and small and medium-Sized enterprises in the supply chain, so as to promote the interactive development of producer services and manufacturing industry in China, and realize the "seamless link" between them [27]. Supply chain enterprises, which constitute the whole social system, play a more important role in collaborative management. First of all, supply chain enterprises need to solve the basic and development problems of the supply chain through the overall management and control of the whole supply chain, and play a general role. Secondly, the supply chain enterprises need to analyze and coordinate the problems in each link of the supply chain, and constantly investigate the rationality of the business process, so as to achieve the effect of collaborative management. Finally, supply chain enterprises need to manage the implementation process of each link of the supply chain in order to improve the supply chain foundation. Through the collaborative management of the above three aspects, the whole supply chain can run more efficiently. A good information tracking and quick response mechanism is established in the supply chain system to alleviate the difficulty of production schedule control caused by the characteristics of collaborative production and outsourcing in the supply chain [28].

The coordination problem of Service-Oriented Manufacturing Hybrid Supply Chain (SMHSC) composed of vendors, Service providers and integrators and dominated by manufacturers. Product demand is affected by service effort level of service providers and market random factors. By using the Stackelberg game model, it is proved that the simple revenue sharing contract cannot coordinate the service-Oriented manufacturing mixed supply chain, but the service effort cost sharing model designed on this basis can coordinate. The results show that the effective parameters of revenue sharing and cost sharing must satisfy two linear relationships and a certain value range in the coordination of hybrid supply chain. Under such conditions, all participants of the hybrid supply chain can obtain excess profits and maintain the healthy operation of the supply chain [29]. In our daily life, it is not difficult to find such a situation, a company's products after research

and development, production, after listing has no expected sales; its main products in the sales of one or two years later, the market began to decline. An enterprise's products have been sought after by many similar products as soon as they are listed on the market. Since an enterprise's products are listed on the market, it has never been a day of easy life. For two years, it has been on the verge of collapse [24].

Some people think that this is the current situation of fierce competition in the Chinese market. Therefore, many enterprises believe that the current market is becoming more and more difficult, and the opportunities are less and less. The upgrading of industrial structure is the focus of Jiangsu's economic development. The upgrading of manufacturing structure is inseparable from the support of producer services. The core of foreign trade supply chain management is to obtain competitive advantage in the form of an overall industrial chain. Supply chain management is the process of interaction between producer services and manufacturing industry. The industrial chain that gathers logistics, technology and information interacts with manufacturing industry under the coordination of foreign trade enterprises, and allocates resources reasonably with specialized division of labor. Knowledge and technology diffusion is the driving force for manufacturing industry to improve its technological capability and transformation and upgrading [30].

With the rapid development of producer services, collaborative management of service supply chain has attracted more and more attention. Under this background, this paper analyzes the characteristics of producer services supply chain, and uses the traditional supply chain model for reference, analyzes the basic model of collaborative management of producer services supply chain and the relationship between its components [31]. The key is to understand and control the market. This paper analyzes the composition and characteristics of the service supply network of manufacturing enterprises, and analyzes the ternary relationship and its changes under the producer service supply network, so as to clarify the new requirements of manufacturing enterprises for suppliers under the producer service supply network. Then, based on the classification dimension of Kraljic matrix, the classification system of producer services for manufacturing enterprises oriented to service strategy is established, and the Kraljic matrix classification method based on DEA linear programming is introduced. The producer services of service-oriented manufacturing enterprises are divided into four types: Strategic producer services, bottleneck producer services, leverage producer services and non critical producer services. Through questionnaire survey, eight commonly used producer services are located in each type of service [32].

Enterprises must have market awareness in order to better integrate into the market. The goal of an enterprise can only be achieved through the market. Due to the fluctuation of the market, the competitiveness of enterprises has been transformed into the competition between supply chains. In the modern market economy environment, all the will and behavior of enterprises must meet the needs of the market, take users as the core, better meet the needs, better integrate into the supply chain of producer services, meet the needs and improve competitiveness. The key to China's transformation from a big manufacturing country to a powerful manufacturing country is continuous innovation to integrate the production chain and service supply chain. In the era of change is the only constant, innovation is the normal operation of enterprises, in order to better integrate

the supply chain and producer services supply chain, in an invincible position in the competition [33].

#### **4 Analysis on the Application of Producer Services Supply Chain in China**

In 1999, Edward G. Anderson and Douglas J. Morrice began to apply the theory of supply chain to the field of service [34]. Service supply chain has gradually developed into a new research direction in the field of supply chain. In order to meet the needs of globalization, many Chinese enterprises have focused on the global layout of supply chain. The trend of supply chain globalization is more and more obvious, and it is becoming the key content of a new round of national competitiveness [35]. Under the penetration and integration of information technology, China's producer service supply chain is accelerating its development and extension. In practice, some industry supply chains show agile response speed, efficient collaboration ability, accurate matching efficiency and powerful service functions, which help enterprises enter a new space of cost reduction and efficiency increase [36]. At present, the competition in the field of manufacturing industry has focused on the front-End R&D and back-End marketing and other service links. The extended development of service supply chain makes the proportion of professional services in modern service industry, such as logistics and marketing, technology R&D, human resource development, software and information services, financial services, accounting and auditing lawyers, higher and higher [37]. The service mode is diversified [38]. For example, Xumei Zhang and others conducted a pricing equilibrium analysis in view of the situation that mobile phone manufacturers and telecom operators jointly launched "product + service" contract mobile phones, considering network externality, service level, mobile phone price adjustment ratio of telecom operators and other factors [36]. Shenzhen Langhua enterprises carry out the "supply chain + business" cross domain service, relying on the operation mode of five platforms such as circulation business integration, private financial holding, cross-Border e-commerce, intelligent logistics and foreign trade comprehensive service, give full play to the enterprise resource integration and cross industry coordination ability, and provide service for customer enterprises in one or more businesses such as industry, finance, Internet, logistics and foreign trade For the third party supply chain solution system services. Due to the diversity of service types, the types of service providers are also relatively diverse. Different types of service providers provide differentiated services at different stages. Some service providers need to integrate services and products into product service systems and provide them to customers, while others can directly face customers [39]. They are mainly concentrated in developed areas. The distribution pattern of location agglomeration of producer services shows that producer services are closely related to the level of urbanization. The agglomeration effect of producer service industry is more obvious than that of manufacturing industry, which is mainly concentrated in a few big cities or metropolitan areas [40]. Because the agglomeration trend of production services is determined by the natural needs of human contact and information uncertainty, legal, advertising and accounting services are more concentrated in the central business district of metropolis. Therefore, the more developed countries and regions have formed a set



of development models and promotion methods suitable for the region through years of manufacturing service practice. In contrast, the less developed regions have a slower development of producer service supply chain.

In recent years, many high-Tech parks and logistics parks have been set up in various provinces and cities of China, and the construction of CBD has been strengthened one after another, all of which are aimed at forming industrial cluster effect. But throughout the country, producer service clusters are mostly based on low cost, and their innovation ability and ability to participate in international competition are not strong. In addition, in the construction of various parks, the concept of regional cooperation is lacking, and the phenomenon of low-Level repeated construction is very common [41].

Although the Chinese government, industry associations and scholars have made some achievements in the research and implementation of producer services, it is still in its infancy, mainly focusing on tracking and learning foreign models, and has not yet put forward a systematic theoretical framework with Chinese characteristics System and implementation methods, the leading advantages of regional industrial cluster model in promoting industrial development have not been fully reflected, most of the clusters are large but not strong, and the effect is not obvious [42]. On the whole, China's supply chain is still in its infancy. Affected by the backward management concept, imperfect credit mechanism, lack of industry standards, serious institutional constraints and policy barriers, and insufficient basic support, there are still many problems in process optimization, business collaboration, technology promotion, risk prevention and green development, which need to be solved [37].

The Yangtze River Delta has become the largest base for China to undertake the transfer of global manufacturing industry. The development of headquarters economy based producer services in Shanghai can provide good support for the development of manufacturing industry in Shanghai and its Yangtze River Delta [43]. Service supply chain has become an important way to transform economic growth and improve the competitiveness of service industry. So it is a new way to optimize the structure of service industry to transform the traditional service industry structure through service-Oriented supply chain. Service supply chain management is committed to reduce costs and improve efficiency. Service oriented enterprises guide the supply chain management mode, which creates a good opportunity to improve the overall competitiveness of the service industry. Service supply chain management can not only reduce the actual cost of providing services, remove the obstacles affecting the provision of high-Quality services, but also effectively improve the satisfaction of enterprise customers and general consumers [44]. Producer service supply chain can summarize the mode of Shaangu, that is, through service integrators, all kinds of suppliers can be provided It integrates with end customers, and provides a comprehensive service system based on capability management, demand management, supplier relationship management, customer relationship management, service delivery management, and capital and financing management [45]. In the producer service industry cluster base, through the establishment of long-Term cooperative relationship between service enterprises, strengthen forward or backward network economic ties and cultivate common service enterprise culture, improve the degree of interdependence of service enterprises in the cluster base, so as to increase mutual trust, reduce the uncertainty from outside the cluster base and reduce transaction



costs [46]. For service providers, since they become part of the product service system from the production stage, it is beneficial for different types of service providers to serve customers in the subsequent stages, which not only promotes the development of producer services, but also provides a way to realize the value-Added of product follow-Up services and forms a long-Term profit value-Added point [47]. On the other hand, with more and more producer service enterprises gathering, the service products that can be provided are continuously enriched, the industrial chain is continuously extended, and the correlation between industries is continuously improved, which can optimize resource allocation, reduce service costs, and increase the social welfare level of service enterprises and service employees [39]. The adoption of supply chain management mode can really enable enterprises to win the market with the lowest cost, the fastest speed and the best quality, and what benefits is not an enterprise, but an enterprise group [1]. Therefore, in the operation process of service supply chain, service providers pay more attention to creating value with customers and stakeholders, rather than realizing value through one-Way product transfer like the original industrial supply chain. Therefore, in the service supply chain, any upstream enterprise should regard customers as a key link in the value network. Not an isolated entity. That is to say, the customer is regarded as a kind of resource of enterprise value realization, rather than the service object of enterprise value realization. In the model of service supply chain, demand is the main line instead of product [48]. In this situation, the effective strategic interaction between supply and demand becomes a kind of dynamic ability that must be possessed to obtain sustainable competitive advantage. This ability enables enterprises to increase their knowledge of customer status and preferences.

Servitization of manufacturing is the inevitable result of the development of productive forces. The penetration of manufacturing into service is the only way for manufacturing enterprises. The most important service object is enterprises, and service should go to enterprises [49]. Producer service supply chain is a complex system, but the reality exists in our economic society, service is intangible and difficult to measure, customers often participate in the process of service delivery, service suppliers and customers have to communicate face to face, so the structure of service supply chain is much simpler than that of product supply chain [50]. Therefore, it is necessary and inevitable to promote the development and improvement of producer service supply chain.

## 5 Conclusion

Compared with the traditional supply chain, the service flow and logistics of producer service supply chain coexist at the same time. The service flow is heterogeneous, dynamic and uncertain, which is difficult to describe and evaluate quantitatively [51]. China's economically developed regions, such as the eastern region, should give full play to the role of the market and promote the integrated development of manufacturing and producer services, so as to drive the industrial transformation in the western region [52]. Most of the research focuses on the traditional product manufacturing industry. On the definition and understanding of supply chain management, more attention is paid to the production and transformation process of physical products in the manufacturing industry, while the research on service supply chain management involving service transformation and

delivery process is relatively less [53]. Chinese manufacturing enterprises should constantly make the supply chain mode and service mode innovated. The establishment of manufacturing supply chain based on collaborative services such as enterprise procurement, logistics and service is the inevitable way to improve the operation efficiency and management level of manufacturing supply chain and enhance the competitiveness of enterprises.

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