Research on Ways of Value-Added of Transformer Enterprise Based on Manufacturing Servitization

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Abstract. Realizing the value added of the transformer enterprise is a key problem. Based on the analysis of the structure of the value chain and the value-added process, this paper proposes three ways for transformer enterprises to realize value added from the perspective of manufacturing service, such as R & D and design services, manufacturing services and marketing services. Transformer manufacturers need to introduce service management concepts, increase investment in service elements, and cultivate professional service personnel and other measures.

1. Introduction
With the rapid development of China’s industrial economy, the demand for electricity by various trades and industries has rapidly risen. According to State Grid’s forecast, the total electricity consumption of the whole society in 2020 will be 8.3 trillion kwh, and the average annual growth rate of electricity consumption during the 13th FYP will be 5.6%. With the continuous growth of power demand and the demand driven by the downstream, transformer manufacturing industry of China has developed rapidly. At present, there are many transformers manufacturing enterprises in China, such as Tianwei, CHINA XD and Huapeng. The number of enterprises is very large, but nearly 80% belong to small and medium-sized enterprises.

Service economy and changes in customer needs, making the living environment of the transformer business has changed. The cost of production factors, core technology research and development and intensified market competition restrict the value added of enterprises. This article focuses on the value chain of transformer enterprises and the process of value added activities. Based on the perspective of manufacturing services, this paper puts forward the ways selection for transformer enterprises to realize value-added, and provides a theoretical basis for the development of the industry.

2. Theoretical Analysis

2.1. Structure of Value Chain Analysis
The basic value activities of a transformer company come from the process of converting raw materials into a series of final products. The theory of value chain considers the value derived from basic value activities and auxiliary value activities (Michael E. Porter, 1985) [1]. Value added is believed to be achieved only through a large number of product assembly and manufacturing
With the development of information technology, people have a more profound understanding of the value added of the enterprise. Peter Hines (1998) [3] argues that raw materials and customers are new sources of corporate value creation and emphasizes that the use of information technology is an important part of supporting value activities. If each value activity in the value chain is subdivided, it can be divided into two parts: value-added activities based on material resources and value-added activities based on information resources. On this basis, Rayport and Sviokla (1995) [4] put forward the viewpoints of the virtual value chain. Information value-added activities (mainly including the process of collecting, organizing, screening and distributing information) are independent from the traditional value chains and form the virtual value chain.

According to the product circulation process in each link of the value chain, the value activities of enterprises can be divided into three parts: "upstream link", "internal link" and "downstream link" [5]. Based on this conclusion, the value chain of the transformer enterprises includes the upstream value chain (the purchase of raw materials and the cooperation with the suppliers), the internal value links (the product development and production operation of transformer design, new technology research and development, parts processing and core assembly), and the downstream value chain (product distribution, marketing, after-sales service and customer feedback). It’s that the structure of basic value chain of transformer enterprises, as in Figure 1.

![Figure 1. Basic value chain of transformer enterprise](image)

2.2. Process of Value-added Analysis

Value creation starts from the supply of raw materials, the production and processing links to the sales of products [6]. Transformer business is a production integrator on the transformer market. It mainly designs and manufactures transformer products based on market forecasts or product orders, and performs marketing based on transformers or transformer-related services. The entire value-added process can be divided into raw material value-added stage, production value-added stage and sales value-added stage (see Figure 2).
3. Effect of Servitization

Judging from the industrial development trend in the manufacturing industry, servitization tends to become more and more obvious [7]. The manufacturing servitization, proposed by Vandermerwe and Rada (1988) initially, they argue that instead of simply offering products, manufacturing companies should focus on customers and offer integrated packages which contain goods, service, support, self-service and self-support [8]. After that, many researchers begin to focus on this research field, and many concepts such as “Service-oriented Manufacturing [9],” “Service Enhancement [10],” “Product Service System [11]” have been proposed one after another. IBM, Rolls-Royce, GE and other enterprises have conducted business transformation, which from simple product providers to integrated service providers. The proportion of operating income from servitization is getting bigger and bigger, and enterprises’ increment of value has been achieved through the provision of services. In the trend of manufacturing servitization, the effect of servitization on the value chain of transformer enterprises is below.

3.1. Extension of Value Chain

At present, most of the advantages of the transformer enterprises are mainly reflected in the processing and assembly, more rough primary products, a single type of finished product, value-added space limited value chain, at the low end of the industrial chain. The manufacturing concept of service, the value chain will reconstruct the thinking, emphasizing all the activities of enterprises to service as the core, customer demand as the core to start. The value chain of enterprises extends to both ends, that is to say, front-end R & D, design, planning, brand and back-end sales, and service, financing and marketing extension, in order to constantly improve the competitiveness of enterprises.

3.2. Adjustment of the Emphasis of Value Chain Activities

The extensive application of advanced management methods and production modes has made the use of services a reality. While extending the value chain of enterprise, the emphasis of corporate value activities is also shifted from product manufacturing to service derivation and the main functions of enterprises are relocated to provide services. Transformer enterprise should focus on their advantages of resources. The emphasis of value chain activities will be shifted to larger value-added activities at both ends of the value chain. Enterprise can independently set up their own production and processing base, even some of the production and processing activities can be outsourced to other professional manufacturers. Then enterprises themselves focus on R & D design, marketing services and other sectors.
4. **Value-added Ways Analysis**

According to the production process, the value chain activities of transformer enterprise are reordered to form the value activities of R & D and design, production and marketing. Combined with the "smile curve," this paper proposes three ways of value-added of transformer enterprises in the service perspective (see Figure 3).

![Figure 3. Value-added ways based on servitization](image)

### 4.1. R&D and Design Servitization

In the R & D and design phase, the transformer companies should provide their customers with professional technical consulting services, personalized product design services and overall solutions. Companies engage customers in the design of their products, consider customers as "production collaborators". These ensure that the product system meets the actual needs of customers in the various activities of the value chain link, and thus enhance customer value. The scientific research strength of enterprises are required for these services.

### 4.2. Production Servitization

Manufacturing servitization means that transformer companies should put more service factors into the manufacturing processes. The traditional assembly line production mode should be upgraded to mass customization mode based on modularization. In the link of manufacturing, enterprises should increase investment in the information technology services, establish information management system and use big data as a support to gather information of individual product demand of different customers and to classify the orders by using information platform so that they can be prepared for mass customization. At the same time, the companies should design transformers modularly and standardize the main components production. By applying information sharing platform and electronic tag tracking technology on the production to assist to produce transformer products the enterprises could response to customers’ needs quickly, shorten the product lifecycle and speed up the delivery speed.

### 4.3. Marketing Servitization

More complete service chain is provided to customers from the transformer enterprise. Its model can be either a product-based service or a service based on customer needs. The so-called product-based services, is the "product + service". After the transformer enterprise delivers the product to the customer, it provides professional technical services such as equipment installation, maintenance, testing and maintenance. This is to ensure the normal and reliable operation of the product. In the event of a system emergency failure, the company can provide on-site disposal and emergency assistance services to its customers. The so-called service based on customer needs, is the use of their own enterprises in research and development, supply chain, sales and other advantages, to provide
professional services in the field of transformers, such as transformer equipment planning solutions, professional education and training services, core technologies to support the management services. These services provided by the professional services team.

5. Managerial Implications

5.1. Introduce Service Management Concept
Transformer companies need to introduce the concept of service management and take the service of manufacturing industry as a new impetus to the development of enterprises. Top leaders should profoundly recognize the opportunities brought by the trend of service orientation to enterprises, regard service strategy as an important strategy for enterprise development, and reposition the enterprise as an integrated service provider to replace the former transformer product manufacturers and gradually realize the enterprise transformation. Taking customer needs as the center, enterprise R&D, manufacturing and marketing departments under the guidance of service-oriented concept provide quality services to customers for achieving a win-win situation between customer value and enterprise value.

5.2. Increase Input of Service Elements
In the process of production and operation, transformer enterprises need to increase their investment in service elements. Enterprise development should rely more on knowledge, management, technology, information and other service elements. Enterprises should input a series of service elements around the front of the production process, products delivery to customers and customers use products etc.

5.3. Training Professional Service Personnel
Transformer companies need to focus on training professional service personnel. Select the complex talents with knowledge of business, good management and fine service, then establish an independent service team. Regularly carry out the training of service management, service marketing and other aspects to improve the service quality of enterprises. Pay more attention to the cultivation of the core technology service team, and build a team with strong scientific research strength through the cooperation of the project, the research institutes and universities.

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