Construction of Industrial Ecosystem of an Electric Company under Ecological Perspective

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Abstract. Be confronted with more and more fierce competition environment, only by constantly integrating, constructing and restructuring internal and external resources as well as capabilities can enterprises adapt themselves to the rapidly changing environment and maintain the advantages of sustained competition. Business competition has changed from product competition of single enterprise to competition of business ecosystem. Therefore, how to build a business system is the key to win competition. This paper draws lessons from business ecosystem and industrial ecosystem concept and takes the subordinate industry company of a large enterprise as the research object. On the the basis of combing its characteristics and organizational structure, an industrial ecosystem is tired to constructed.

Keywords. Ecological perspective; industrial ecosystem; construction.

1. Introduction

Ecosystem refers to a dynamic unified whole with self-regulation ability which is formed by the combined action of material cycle and energy flow from organisms and abiotic environment in a certain space [1, 2]. Inspired by the concept of ecosystem, Robert Frosch and Galopoulos first proposed the industrial ecosystem (IES) concept in 1989. They thought that in order to improve the utilization ratio of resources and the growth rate of income, it is necessary to study the industry development from the angle of ecosystem [3-6]. Industrial ecosystem is not only the recycling of resources, but also affected by external political, economic environment, enterprise strategy formulation, market demand and other factors. Therefore, in order to expand the application field of industrial ecosystem, the concept of business ecosystem (BES) emerged as the times required [7]. Moore creatively defined it as a kind of "economic union" based on the interaction between the organizations which is composed of customers, suppliers, producers, investors and other stakeholders. In the ecosystem, all actors play different roles, shoulder different missions, perform their duties and promote the healthy development of the ecosystem [8]. Business competition has changed from product competition of single enterprise to competition of business ecosystem. Therefore, how to build a business system is the key to win competition. The BES is usually an economic community composed of several enterprises with symbiotic relationship, involving a number of industries associated with the core business, sub-contractors and suppliers on the upstream of the value chain, distributors below the value chain, customers and other trading partners, and competitors within the same industry, partners [9]. The core idea of BES is to emphasize how the
core enterprises form competitive advantages through building the value platform and leveraging the capabilities of other enterprises in the system through the platform. From the point of BES, this paper sorts out the industrial companies affiliated to a company and tries to establish its IES, which provides a new way of thinking for the long-term development of its industry.

2. The elements and characteristics of the company’s IES

In order to explore the elements of BES, Moore proposed a seven dimension analysis framework, which is referred as “4P3S”, namely people, place, product, process, structure, shareowner and society. He also pointed out that BES is composed of the core enterprise, extended enterprise, related social organization and enterprise as well as other environment [10]. Therefore, the elements of the business ecosystem can be divided into two categories, including the enterprise elements and the environment elements.

The company’s IES has the characteristics of both natural ecosystems and complex adaptive systems. The main features are as follows:

(1) Diversity of system members
The company’s IES covers a wide range which breaks the shackles of traditional industry boundaries and is not limited by the size, geographical and other conditions. Diversity is beneficial to the system to create value while alleviating the impacts of changes in the external environment.

(2) System opening
Openness refers to the interconnection between various factors within the company such as the company and the surrounding material, human and information resources. It is this openness allowing the company’s IES to be equipped with absorptive capacity beyond the value chain system. Through constantly integrating into emerging technologies, the IES attracts more members to join, and expands the scale of the ecosystem so as to enhance the overall competitiveness. In addition, the main body and the external environment of the system continue to interact with each other and obtain resources from outside. The system is not only adaptive to the external environment, at the same time, can also influence the external factors to a certain extent.

(3) Coordination and evolution
Coordination and evolution are the goal of the company’s IES. With the help of the system platform, the IES provides more market space and competition opportunities for stakeholders which may help system members to improve themselves and better access to resources. Inevitably, a mutually beneficial symbiosis will be formed to promote the virtuous cycle development of the system.

(4) Dynamic adaptability
The company’s IES is in the process of continuous evolution and the system members adapt to each other and develop together. At the same time, there is exchange of material, energy circulation and information transfer between the company and the outside world. In the process of system operation, the material flow, energy flow, information flow and value stream are continuously exchanged. The system draws resources from the environment, then these resources achieve value-added and ultimately meet customer demand through the transmission, processing, and transformation.

The company’s IES studied in this paper focuses on the interaction among the elements of the system, so the elements of the enterprise are mainly analyzed. The elements of an enterprise include the following seven aspects: resources, activities, decisions, standards, roles, business entities, and business models. As for the company’s IES, the interaction between enterprises is constantly changing the structure of the system, so it is difficult to clearly define the boundaries of the ecosystem, and can not specify its specific scope and size. In this case, we have to divide or define an ecological system according to the research object, content and goal, it will aim to set the system based on the boundary, so as to analyze what members system plays an important role and the relationship between each other.
3. The structure of IES

After putting forward the concept of BES, a typical business ecosystem structure model was constructed by Moore in 1996, as shown in figure 1. The structure model decomposes the BES into the core supply chain system, supports the environment system, the competition system and the social natural environment system according to the tightness and importance of the member relations within the system.

![Typical structure model of BES](image-url)

**Figure 1.** Typical structure model of BES.

A BES based on a natural ecosystem model transcends the boundaries of enterprise and industry, which meets the new market demand, and make the system internal members can earn profit through cooperation. This unique perspective helps to better organize and lead business enterprises to achieve win-win results among members in the BES.

According to the position and characteristics of the enterprise in the BES, they can be divided into four types, namely the keystone, the dominator, the landlord and the niche.

The keystone provides a platform for other enterprises which binds large and distribute enterprises and customers together to promote the whole ecosystem operating, enhance the stability and effectively stimulate innovation as well as improve the overall health. The dominator is vertical or horizontal integration, occupying and control most of the nodes. The niche has unique expertise and focuses on certain businesses as it uses key resources provided by other companies to carry out business activities. This perspective helps enterprises to determine their position in the BES, so as to adopt the corresponding strategy. It is conducive for system members to understand the importance of evolution and contribute to the prosperity of the whole system. Based on this perspective, we can make improvements to the original business ecosystem structure model, as shown in figure 2.
4. The construction of company’s IES

Taking a company as the research object, the industrial ecosystem is constructed according to the above mentioned typical structure model of BES. The company’s main business is power supply services which is mainly undertaken by each power supply company. Around the business, the company has established corresponding industrial companies in the fields of power research, electrical equipment, general contracting, information communication and electronic commerce, energy saving, environmental protection, logistics services, media publicity and so on. For the company, the construction of its IES is as follows.

(1) Radicating core enterprises

The core enterprise is the center of the company’s IES that provides a rallying point for industries related to its interests to form a new system. The ability of core enterprises, playing an irreplaceable role as leader, determines the level of ecosystem integration and has a major impact on the formation of long-term strategic relationship between enterprises. The grid operators owing to the company undertake the main business when the rest of the company’s subsidiaries provide them with products, technologies and other services, therefore the grid operators are the core enterprises. Meanwhile, the international company is undertaking foreign business and promote other enterprises to explore overseas markets, so it is also the core enterprise in the system.

(2) Determining traction enterprises

Traction enterprises can drive other companies in the ecosystem in a particular area. In the IES, the equipment contract firms, e-commerce company and electric car service company can create the market and customers to other companies in different areas that drive the progress of products and technologies as a result. Based on the above analysis, these companies have been identified as traction enterprises in the IES.

(3) Establishing dynamic enterprises

A dynamic enterprise is an enterprise that provides specialized products, technologies or services in an ecosystem. In the company, the electrical equipment groups, information communication industry are dynamic enterprises providing core products. And the research institutes are innovative dynamic

![Figure 2. Improved structure model of BES](image-url)
enterprises that provide the original impetus for technological progress and sustainable development of the ecosystem.

(4) Determining supported and guaranteed enterprises

Supported and guaranteed enterprises refer to enterprises that provide various services to support the efficient operation of the entire ecosystem, such as media groups, logistics companies, maintenance companies, materials companies and training centers.

According to the above analysis, the construction of the company’s IES structure is shown in figure 3.

![Industrial ecosystem structure of the company](image-url)

**Figure 3.** Industrial ecosystem structure of the company

In addition to the above mentioned various enterprises, environment subsystem in the ecological system including government departments and other regulatory quasi government organizations, support system mainly include investors, owners, trade associations, trade unions and other institutions, the formulation of standards. The customer subsystem contains both direct and indirect customers.

5. Conclusion

The IES proposed in this paper is the application of BES in large enterprise groups whose original definition is expanded. From the angle of BES, this paper aims at constructing an IES of a company. The core enterprises, traction enterprises, dynamic enterprises and supported and guaranteed enterprises are determined and the proposed IES is more concerned about the relationship between the members of the system. This kind of research angle can create more value for the whole system as well as realize the economic prosperity and healthy development of the enterprise group.

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