Original Research Article

Research on strategic partner selection under industrial agglomeration

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Abstract: The selection of excellent partners for enterprises is crucial to the establishment and operation of industrial agglomeration enterprise alliances. It is not only related to the creation of new market values, the reduction of cost of cooperative enterprises, but also directly affects the efficiency of enterprise alliances. This study analyzes the theory of enterprise cooperation under industrial agglomeration, and establishes the index system, selection method and scientific rational selection process of strategic partner selection under this foundation and background，to provide theoretical guidance for enterprises to choose the best strategic partners for industrial agglomeration.

Keywords: Industrial agglomeration; Strategic partner; Indicator system.

1. Introduction

The formation of enterprise alliance strategic partnership under industrial agglomeration is conducive to reducing the total cost and inventory level of the industrial chain, enhancing information sharing and communication between all parties, maintaining the consistency of operation among strategic partners and expanding their own competitive advantages, so as to realize the economic benefits of upstream and downstream enterprises, improve management level, reduce transaction costs, and improve product quality and user satisfaction, ensure that products are completed on time and in quantity to improve performance. Obviously, the selection of appropriate strategic partners will inevitably make the core enterprises produce a series of great advantages that cannot be compared with the traditional "vertical integration" management mode in many aspects, so as to improve the competitiveness of the whole industrial chain. However, if we choose an inappropriate strategic partner, the damage will be very huge. How to use correct methods to evaluate and select strategic partners will become a key factor affecting the efficiency of the industrial chain and decide whether enterprises can win in the ever-changing market competition.

Therefore, the selection of excellent partners is very important for the establishment and operation of industrial agglomeration enterprise alliance, which is directly related to the long-term sustainable development of enterprises and affects the economic benefits of enterprises to a great extent. Based on this, how to establish a perfect selection system and evaluation system is an important topic for relevant enterprises. Although the existing enterprise partner evaluation methods are rich and diverse, they have different advantages and disadvantages. Most evaluation methods are too subjective and basically depend on the subjective feelings of decision analysts. In this case, it is inevitable to make mistakes in decision-making. Therefore, under the special background of industrial agglomeration management, it is indispensable for partners to select and evaluate high-quality partners in order to achieve the goal of industrial chain and achieve win-win results.

2. The necessity for Enterprises to Cooperate under Industrial Agglomeration

2.1 Conditions of Cooperation

According to the theory of capability or resource, the important factor determining the development of an enterprise is whether it can obtain capability and resources, rather than the existing competitive advantage[1,2].

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Enterprises have three ways to obtain capabilities and resources, namely internal development, acquisition and cooperation. In other words, not all enterprises are suitable to obtain capabilities and resources through cooperation, and internal development and acquisition are also important means. Generally, it is more suitable for enterprises to develop by themselves when the enterprises under industrial agglomeration have stronger strength than that of the industry and develop activities of high significance[3]; if the capacity and resources are limited and the importance of each activity is low, the enterprise can directly adopt the way of acquisition[4].

Generally, the following situations are applicable to enterprise cooperation: the strategic importance of activities is high or medium, but the ability of enterprises is low compared with the best level of the industry; or the strategic importance of the activity is secondary, but the ability of the enterprise is only secondary relative to the best level of the industry. In the above cases, the best way to obtain resources and capabilities is cooperation, which can promote the long-term development of the enterprise, as shown in Figure 1.

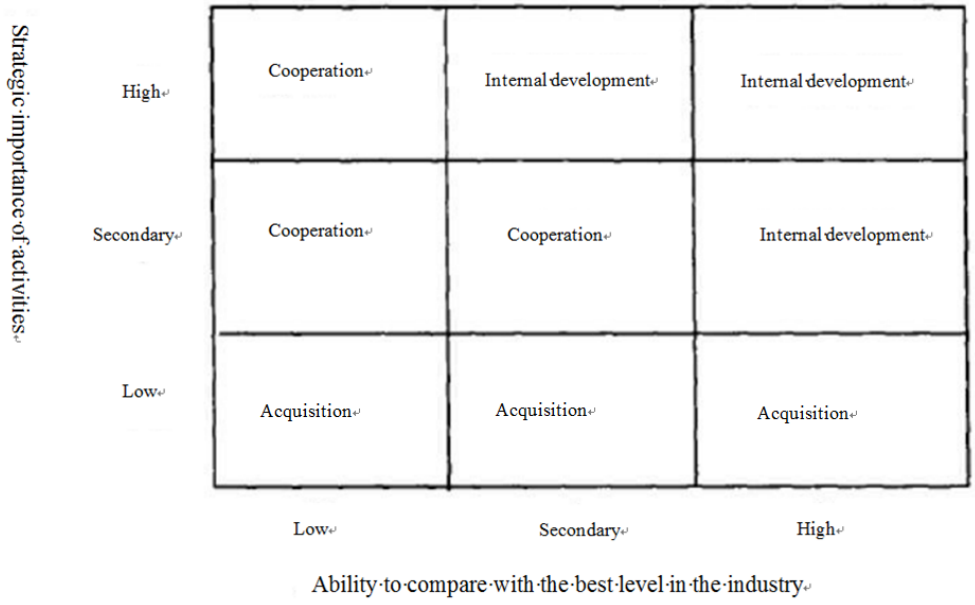

Figure 1 Enterprise cooperation matrix.

The above analysis reflects the conditions for a single enterprise to adopt the cooperation strategy. From the perspective of the whole industrial cluster, the existence of enterprise strategic cooperation needs to meet the following two conditions:

1) For the alliance enterprise, the overall income of the alliance exceeds the sum of the income when it operates alone;

2) internally, each member can get more benefits than when there is no alliance.

Through the above analysis, we know that all enterprises in the industrial chain choose to adopt strategic cooperation, first of all because of their limited ability of business activities. Through strategic cooperation, they can obtain higher income than fighting alone. Under this situation, it is most suitable to form a strategic partnership under industrial agglomeration.

2.2 Necessity of Enterprise Strategic Cooperation under Industrial Agglomeration

The advantages of enterprises in establishing strategic cooperative relations under industrial agglomeration are mainly reflected in the following aspects:

1) Change the competitive nature of an industry. For example, forming a license agreement for a technology can not only promote the technology, but also promote the standardization of the technology.

2) Improve the core competitiveness of enterprises. For a long time in the past, the competition rule of market peers was “irreconcilable”, and the emergence of strategic cooperation broke this situation and

fundamentally changed the traditional mode of competition, indicating that enterprises need to establish strategic cooperation relations and achieve win-win through negotiation and cooperation with the purpose to improve the core competitiveness. Specifically, it is reflected in two aspects: first, enterprises can restrict and weaken competitors by establishing strategic partnerships, which is objectively helpful to improve their industry status; second, through strategic cooperation, enterprises can adopt higher quality resources and capabilities to develop their own advantageous links and form core competitiveness[5-7].

3) Realize the economic effect of speed. In the production field, partners implement "concurrent engineering" and agile production, and "manufacturing and trading alliance"[8], which can greatly optimize the production and trading process, not only save costs, but also achieve economic benefits.

4) Acquire technology. At present, in the era of rapid development of information and rapid renewal of science and technology, it is difficult for enterprises to realize the in-depth development of vertical integration. In order to minimize risks and losses, most enterprises choose strategic cooperation under industrial agglomeration, so as to effectively reduce costs, transfer technology and promote the rapid development of industry technology.

5) Reduce risk. Under industrial agglomeration, enterprises can effectively reduce risks by forming strategic partnerships[9]. The specific methods include reducing investment costs, entering the market faster and obtaining benefits, product portfolio diversification, etc., which will greatly reduce the risks[10].

6) Achieve economies of scale. In the context of industrial agglomeration, the benefits and efficiency of strategic cooperation are higher, which is more conducive to the large-scale production of products and thus can effectively reduce the production cost[11].

3. Index System and Method of Strategic Partner Selection under Industrial Agglomeration

3.1 Index System of Strategic Partner Selection under Industrial Agglomeration

The selection of strategic partners under industrial agglomeration is the focus of enterprise strategic management. When selecting strategic partners, enterprises usually integrate the influence of many factors, including customer demand, relevant national policies, external market environment and internal institutions[12–14]. And then enterprises reasonably select strategic partners in combination with their own characteristics and market prospects. Generally, the main factors affecting the selection of strategic partners are as follows:

1) Price and cost factors. Price and cost factors are the key factors that must be investigated in business negotiations. They are directly related to both enterprise profits and the input-output ratio of the whole industrial chain. Generally, price and cost factors usually include transportation cost, transaction cost, R&D cost, opportunity cost, etc.

2) Quality factors. Quality factors include quality evaluation, quality system certification, quality management, product qualification rate, sample quality, etc. For any enterprise, product quality meeting the standard is the most basic requirement. Product quality is the foundation of an enterprise. Only with qualified product quality can an enterprise survive and gain competitive advantage.

3) Delivery factors. Delivery factors include delivery punctuality and delivery time. How to deal with the delivery problem directly affects the long-term operation of enterprises and even the whole industrial chain, which must be seriously considered.

4) Development capability factors. Product renewal is an important motivation to promote the development of enterprises. Product R&D is a long-term process, which needs the full support of all links of the whole industrial chain.

5) Service factors. Service factors include customer satisfaction, technical service level, service response speed, service attitude, etc. The current market is dominated by buyers. Under this situation, the competitiveness

of enterprises depends on their own service level, which directly determines their long-term development.

6) Technical factors. Technological factors include technological density, technological advantage, technological R&D capability and speed[15]. It is not only the core competitiveness of enterprises, but also the pillar of enterprises.

7) Willingness to cooperate. The factors of willingness to cooperate include the degree of common desire and ambition, the degree of emphasis on enterprise cooperation, etc. Only when each enterprise in the industrial chain has the willingness to cooperate can the benefits of all parties be maximized.

8) Enterprise reputation factors. Enterprise reputation factors include cooperation history, enterprise ethics, contract execution rate, etc. For the selection of strategic partners, enterprise reputation is an important reference basis, which largely determines whether the enterprise can develop in the long term.

9) Management and cultural factors. The factors of management and culture include the compatibility of corporate culture, the unity of management thought, corporate loyalty and so on[16]. Management and cultural factors are the spiritual system of the whole enterprise. This factor runs through the whole enterprise. Only by paying attention to and managing relevant factors can enterprises ensure the long-term sustainable development.

The above influencing factors are important evaluation indicators during the selection of strategic partners. It should be noted that the selection of partners should be objective and avoid one-sided treatment of certain factors. The size of the enterprise is not the most important factor in the selection of partners. The most important is which enterprise can bring more benefits and value to the whole industrial chain. Under the background of industrial agglomeration, it is more difficult to select strategic partners. We should not only consider the above factors, but also use scientific methods and index system in combination with the principles of strategic partner selection and evaluation.

The strategic partnership index system obtained through analysis is shown in Table 1.

Table 1 Strategic partner selection index system.

Primary index	Code	Secondary index	Primary index	Code	Secondary index
Business capa-bility	T1	Quality	Development capability	T4	Financial condition
	T2	Price		T7	Benefit
	T3	Delivery capacity		T10	Technological capability
	T8	Production capacity		T12	Enterprise development prospect
	T9	After-sales service		T18	Adaptability
Primary index	**Code**	**Secondary index**	**Primary index**	**Code**	**Secondary index**
Management capability	T11	Facilities and equipment	Development environment	T14	Political environment
	T13	Personnel cooperation		T15	Economic environment
	T20	Cooperation management within the department		T16	Technical environment
	T22	Management		T17	Cultural environment
Primary index	**Code**	**Secondary index**	**Primary index**	**Code**	**Secondary index**
Cooperation ability	T5	Communication system			
	T19	Information system connec-tivity			
	T21	Departments Cooperation			

3.2 Methods of Strategic Partner Selection

Selecting a suitable strategic partner requires comprehensive consideration of many factors, including the quality of the partner's products, whether the partner can deliver on time and with quality, and whether the selected partner meets the characteristics of the enterprise[17]. In the fierce market competition, choosing appropriate partners can help enterprises obtain greater competitive advantage. How to choose a suitable partner is an important issue for enterprises. The method of strategic partner selection has attracted the attention of enterprises.

With the changing market and the development of science and technology, the evaluation methods of strategic partner selection under industrial agglomeration are also changing with each passing day. Generally,

the evaluation methods mainly fall into two categories: quantitative selection methods and qualitative selection methods[18]. Generally, enterprises will not choose only one evaluation method when conducting comprehensive evaluation. The common practice is to comprehensively use multiple evaluation methods.

3.2.1 Qualitative Method

3.2.1.1 Intuitive Judgment

Visual judgment method refers to the method that the forecaster makes prediction with the past knowledge and experience and comprehensive analysis ability, or relying on the wisdom and experience of the masses[19]. It is a traditional prediction method, also known as "empirical judgment method". The advantage of visual judgment method is that it is simple and easy. In general, people can judge the prediction object according to their own knowledge and experience. It is conducive to give play to people's intelligence which can judge the true and false, the right and wrong of the prediction object, and make correct judgment and reasoning.

This method is mainly applicable to the initial stage of industrial agglomeration. Because enterprises do not understand other surrounding enterprises, it is difficult to measure it with scientific index method. Therefore, managers rely on their experience and analytical ability to judge other enterprises and select partner enterprises for further decision-making of selecting strategic partners in the future.

3.2.1.2 Bidding Method

If suppliers are motivated by competition and have large orders, the most appropriate means to select suppliers is the bidding method[20]. The specific operation steps of this method include three links: first, scientifically prepare the bidding document, then establish a perfect bid evaluation team and bid evaluation rules, and finally reasonably organize and complete the bidding activities. The bidding document is not only a target assignment of the purchasing enterprise, but also a bidding operation manual. The bidding document usually includes: bidding project description, technical specifications, delivery time and place, contract sample and bidding document format. Public bidding and invitation bidding are two main bidding forms for selecting suppliers in enterprise procurement. A key link in bidding activities is to organize bid evaluation. Bid evaluation means the specific selection of suppliers. To perform well in bid evaluation activities firstly needs to organize a good bid evaluation team; second, formulate a good bid evaluation rule; third, organize bid evaluation activities. Advantages: high competitiveness provides enterprises with more choices of suppliers, and is more conducive to obtaining products with better cost performance. Disadvantages: complicated procedures, long time, poor procurement flexibility, etc.

This method is generally applicable to the selection of ordinary partners in industrial agglomeration. Cooperative enterprises with high quality and low price can be found through bidding. It can be used in the early stage of industrial agglomeration to investigate the general situation of cooperative enterprises for further analysis and selection of strategic partners.

3.2.1.3 Negotiation Selection Method

Negotiation selection method refers to the method of negotiation selection when there are many partners and it is difficult for enterprises to choose. Enterprises can roughly select several more favorable partners, and then negotiate with them respectively to determine the appropriate partners. Specifically, the enterprise first selects several qualified partners according to its own needs, and then communicates and exchanges with these partners on specific details, so as to determine the final partner. Negotiation selection method is commonly used in enterprise operation, which is more suitable for the situation where there are few partners and time is tight.

This method is usually used in combination with quantitative methods. When using quantitative methods to select partners under industrial agglomeration, further investigate the candidate enterprises in order to reduce the possible risk of information asymmetry brought by quantitative methods.

3.2.2 Quantitative Method

3.2.2.1 Linear Weighting Method

The principle of linear weighting method is to use a simple mathematical method to select partners. The

first link is that the core enterprise formulates several criteria for selecting partners according to the market and its own situation, and determines the weights of different criteria at the same time. Then score the standards of each enterprise to be selected, determine the final comprehensive score of each enterprise by calculating the weight, and then select the enterprise with the highest comprehensive score as its partner.

This method is used when selecting ordinary partners and the selection indicators are not complex. For example, the selection of suppliers of auxiliary materials under industrial agglomeration can be adopted.

3.2.2.2 Procurement Cost Comparison Method

The principle of procurement cost comparison method is to determine the cooperation relationship by analyzing and comparing the procurement costs of different partners. Those with lower procurement costs are easier to be selected. When after-sales service, enterprise reputation, product quality and other factors meet the standards, an important reference index for core enterprises to determine partners is procurement cost. Through comparative analysis of procurement cost, more suitable suppliers can be selected.

3.2.2.3 Cost Method

ABC cost method is also regarded as activity-based costing analysis method, activity-based costing calculation method and activity-based costing accounting method. ABC cost method introduces many new concepts. Activity-based drivers include cost drivers and resource drivers, which are the basis for allocating activity-based costs and resources respectively. For the whole enterprise alliance, logistics movement not only increases value, but also increases cost, thus calling for the grasp of all cost links in procurement activities and try to remove invalid costs.

3.2.2.4 Analytic Hierarchy Process

In the mid-1970s, American operations research scientist T. L. Satty formally proposed analytic hierarchy process (AHP), which is a combination of qualitative and quantitative analysis method, with the characteristics of hierarchy and systematization. This method can effectively deal with some complex decision-making problems, and has been recognized by many countries in a short time. At present, this method has been applied in many fields, including medical treatment, talent, education, agriculture, military command, behavioral science, energy policy and distribution.

The basic idea of analytic hierarchy process is consistent with that of human beings to solve complex problems. The basic idea mainly includes the following steps: first, establish a hierarchical structure model; second, construct pairwise comparison matrix; third, calculate the weight vector and check the consistency; fourth, calculate the combination weight vector and do the combination consistency test.

This method is more scientific for determining the weight of the index system. Therefore, in this study, analytic hierarchy process is used to calculate the weight of the comprehensive index system.

3.2.2.5 Artificial Neural Network Method

Artificial neural network is a mathematical model, similar to human brain and mainly used for information processing. In academic circles, artificial neural network is also regarded as neural network. Neural network is an operation model, and its components are mainly a large number of nodes (or neurons). Each node represents a specific output function, namely the excitation function. The connection between each two nodes represents a weighted value for the signal passing through the connection, which is weight commonly referred to as memory that is regarded as the memory of artificial neural network. The output of the network varies according to the connection mode of the network, the weight value and the excitation function. The network itself is usually the approximation of some algorithm or function in nature, or the expression of a logical strategy.

Its construction concept is inspired by the operation of the function of biological neural network, and then gradually formed by continuous research and optimization using the learning methods of mathematical statistics. Therefore, artificial neural network is also a practical application of mathematical statistics methods, which means that we can use the standard mathematical methods of statistics to help us solve some complex problems. Compared with the traditional logic reasoning calculus, this method has more advantages. It is simpler and more

practical, because the artificial neural network has a thinking mode similar to human beings. When selecting partners, the artificial neural network method and inputting the evaluation data of relevant enterprises in the industrial chain into the evaluation module can effectively solve some complex problems. Because each evaluation index cannot form a unified measurement standard, the neural system module cannot quantify the evaluation index. The membership function should be used to convert the evaluation indexes into quantifiable values, and then input them into the neural network module to realize the processing of qualitative and quantitative indexes. Artificial neural network module is an important part of comprehensive evaluation of partners. In the artificial neural network process of strategic partner evaluation and selection, the network structure of one input layer, one hidden layer and one output layer is generally adopted. If the number of input layers and hidden layers is increased, the expressive ability of the network will be enhanced.

Because the artificial neural network solves the human thinking mode, and the artificial neural network will be constantly updated, which indicates that it has strong learning ability. When selecting strategic partners, it can draw on the strengths of others and absorb the suggestions and experience of relevant experts, so as to make a more objective evaluation and help enterprises choose more suitable partners.

This method is suitable for the selection of partners through limited data in the early stage of industrial agglomeration.

3.2.2.6 Data Envelopment Analysis

Data envelopment analysis (DEA) is a new research field of operations research, management science and mathematical economics. As a quantitative analysis method, it is widely used in many industries and departments, especially in multi index input and multi index output.

The application conditions of this method are relatively harsh, and it is necessary to understand the acquisition of key index data such as income and investment of cooperative enterprises. In reality, these indexes are strictly confidential, so it is only applicable to the selection of partners among mutual investment enterprises under industrial agglomeration.

3.2.2.7 Fuzzy Comprehensive Evaluation Method

Fuzzy comprehensive evaluation method originates from fuzzy mathematics, which is the object of using accurate methods to study "fuzzy" objects. Fuzzy comprehensive evaluation method is a multi-factor decision-making method that comprehensively considers multiple factors and fully analyzes various affairs in a fuzzy environment. The influence of the evaluation object is expressed by the single factor membership function, and then the weighting method is used to analyze the influence of various factors on the evaluation object, so as to determine the comprehensive evaluation of the evaluation object. This method is suitable for the evaluation of multi-level and multi-factor complex problems.

1) Construction of fuzzy comprehensive evaluation index

Only by constructing a reasonable fuzzy comprehensive evaluation index system can comprehensive evaluation be carried out. Only by mastering enough information and relevant laws and regulations, can it be possible to build a scientific and reasonable evaluation index.

2) Construction of good weight vector

It is suggested to use AHP or expert experience method to construct the weight vector.

3) Construction of evaluation matrix

The appropriate membership function is established to construct the evaluation matrix.

4) Synthesis of evaluation matrix and weight

The appropriate synthesis factor is used to synthesize it, and the result vector is interpreted.

The fuzzy comprehensive evaluation method fully considers the combination of quantitative and qualitative, scientifically quantifies the qualitative indicators, and comprehensively calculates the score of each candidate enterprise together with the quantitative indicators.

Among the above methods, the widely used methods are fuzzy comprehensive evaluation method and

analytic hierarchy process. These two kinds of evaluation methods are relatively simple, among which the more complex evaluation methods are neural network algorithm and genetic algorithm, which have a narrow application range. This study uses analytic hierarchy process to calculate the weight of each evaluation index system, and uses fuzzy comprehensive evaluation method to make selection.

4. Strategic Partner Selection Process

4.1 Target Identification

Understand the market demand and enterprises' situation. For enterprises, the driving force of any activity is the market demand. Therefore, in the process of enterprise operation and development, enterprises should always be concerned about the changes of market demand, closely follow the market demand, perform well in the analysis of their own core competitiveness, and distinguish their own core business from non-core business. After clearly distinguishing the core and non-core business, enterprises leave the part of core competitiveness to themselves, and then outsource the non-core competitiveness business in order to seek better economic benefits.

Establish partner selection objectives and types of partnerships. Generally, the purpose of choosing partners is to reduce costs, but this goal is not unique and the purpose may also be to save enterprise funds, share risks and enhance enterprise competitiveness. Different goals mean that the development path of enterprises may be different. When determining partners, it is necessary to determine the partner selection objectives and select the preferred partners.

Determine the selection scope of partners and formulate the evaluation index system for partner selection. After completing the above steps, the next step is to select the scope of partners, and then formulate a scientific relevant evaluation index system. It is required that the formulation of the evaluation index system must fully consider various factors according to the actual needs and development objectives of the enterprise.

4.2 Rough Screening of Candidate Partners

The era of information economy brings core enterprises more channels for screening partners. But core enterprises obviously cannot make evaluation on each partner, for such evaluation consumption is huge. In this case, core enterprises must adopt a more efficient method to roughly screen candidate partners first. The usual methods are optimization method, intuitive judgment method, etc.

4.3 Fine Screening of Candidate Partners

After the rough screening of candidate partners, there are still many partners to choose. In this case, effective methods should be taken to further fine screen the partners, usually data envelopment method, analytic hierarchy process, etc., are adopted.

4.4 Partner Participation and Confirmation

By implementing the above three steps, partners can be basically determined. However, in the process of determining strategic partners, selection is an important link, but it is only the first step. Next, we need to maximize the value of strategic partnership and give full play to its role. Therefore, in order to determine the cooperation intention, core enterprises can directly contact enterprises for in-depth exchange and communication, so as to meet their long-term sustainable development requirements.

4.5 Partner Tracking and Evaluation

After determining the strategic partnership under industrial agglomeration, since various factors in the industrial chain are constantly changing, such as market demand, external environment and enterprises' own strength, in order to better grasp various factors and help them make better judgments, corresponding evaluation mechanisms should be established to track and evaluate partners, and then the standards should be adjusted at any time according to the actual situation, even make reselection of partners.

5. Conclusion

The choice of strategic partners under industrial agglomeration is only a small link in industrial agglomeration, but it is of great significance for the operation of enterprise alliance under such situation. This paper studies the theory and method of strategic partner selection under industrial agglomeration. Following the principle of combining theory with practice, guided by industrial agglomeration, strategic management theory and management science, combined with the research results of other scholars, this paper establishes a complete strategic partner selection method system under industrial agglomeration.

Conflict of Interest

The authors declare that they have no conflict of interest.

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