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Research on Supplier Management of Engineering Project

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Abstract: Under the background of the market economy, the project construction is advancing, and the competition among the enterprises is becoming more and more fierce. The enterprises have to seek the way to reduce the total cost of the project in order to win the bid. In the situation of enterprise space dropping the cost of management and the gradual loss of a substantial increase in cost of human resources, companies began looking for a new source of profit, which reached to the material provided by the supplier of quality through the management of suppliers, cost and delivery management, in order to control the entire project cost, quality and schedule. This paper makes summary research mainly from three aspects: the status of supplier management, supplier evaluation and supplier management strategy, to help enterprises to explore more in line with the enterprise's own actual situation of supplier management mode.

Keywords: Supplier vendor management; Engineering project; Supplier evaluation; Supplier management strategy

1. Introduction

With the continuous development of the national economy, the market competition is more and more fierce. The competition in the market is not only the competition between the core enterprises, but also the supply chain competition with the core enterprises as the core. The management of suppliers should proceed from the point of view of supply chain, with an integrated and systematic point of view. To establish a long-term and stable partnership between the supplier management under the concept of paying more attention to suppliers and core enterprises, the construction of evaluation system of enterprises pays more attention to the entry requirements, supplier and supplier management strategy.

2.1. Research background

For engineering projects, take the field of highway construction as an example. Highway projects tend to have higher total costs, but profits are very thin, and even poor management can lead to losses. In the total cost, cost of engineering materials basically accounted for the total cost of the project 60%-70%, which makes the core goal of project management mainly focus on cost control, the supplier management has become an important part of cost control, effective supplier management can not only help enterprises to reduce costs, while ensuring quality with the duration of the project.

With the global economic tide sweeping the world, engineering enterprises are more aware of the sustained competitive advantages in the world only by providing products and services at low cost and high efficiency. The formation of this advantage requires not only the core competitiveness of engineering enterprises, but also the coordination of suppliers. The rise in the era of customization, can quickly meet the personalized needs of customers to make the fundamental business survival, and is the basis for the supplier can effectively provide products and services of high quality and low cost. Therefore, more and more enterprises are paying more attention to the management of suppliers.

2.2. Research significance

Today's enterprise management universal existence the question, they put the most energy in the less than 40% of the enterprise management cost, thus ignore the to account for larger above the cost of materials, natural supplier management is ignored. In fact, the management of the material, the indirect management of the suppliers is the new source of profit for the enterprise. It is much easier to achieve profit growth by controlling suppliers and material costs than controlling the cost of corporate management. Therefore, it is the first way for enterprises to obtain profits by managing the cost of materials by doing a good supplier management.

The main research significance of this article is divided into three aspects. First of all, through the overview of supplier management status, the enterprise has a clearer understanding of its external supply environment, and expounds the importance of supplier management. Second, through the review of supplier evaluation methods, lists the supplier selection and evaluation methods commonly used for project construction enterprises to learn, enterprises can choose the appropriate method according to their own characteristics, or on the basis of the

evaluation method is more in line with their own characteristics. Third, through the review of supplier management strategy, can understand the supplier management strategy, the enterprise of the advanced development ideas, explore the supplier management strategy and create more consistent with the actual situation of the enterprise.

3. Literature Review

This chapter will review the relevant literature from three aspects of supplier management status, supplier evaluation methods and supplier management strategy.

3.1. Supplier management status

In the implementation of the project management process, from the beginning to the end are related to supplier management, supplier selection is directly related to the cost and the quality of the whole project, a key role in the development of the whole project.

Larson P.D.Buyer (2004) believes that companies should work together with suppliers to rapidly reduce unit costs and achieve long-term efficiency, quality and low cost [1]. Xu (2001) is comparing the traditional supplier management model, the supplier is the starting point of the whole supply chain, and also the starting point of the capital flow and information flow. The view of supplier management should be replaced by the viewpoint of supplier relationship management [2]. Daniel Prajogo et al. (2011) studied the multi-dimensional relationship between supplier management and enterprise performance management put forward, enterprises should pay attention to three aspects of supplier management, is a long-term strategic supplier relationship, supplier evaluation and logistics integration [3]. Ma (2014) mainly research on the supplier management problems of international construction enterprises, the risk of international engineering is large, large number of suppliers and materials needed for complex problems, put forward the management of suppliers should consider the supplier access system, control the number of suppliers and several aspects of supplier performance evaluation [4].

At this stage, supplier management is mostly from customer relationship management, through improving the relationship with customers, so as to achieve more optimized management of suppliers. Xiong et al. (2004) our study is based on the use of supplier relationship management (SRM) to improve the relationship between suppliers and customers, this method is mainly used to improve the relationship between the customer and the upstream suppliers, so as to form a long-term and close partnership with [5].

3.2. Supplier evaluation method

he supplier management of the most important job is to determine the supplier evaluation index and evaluation methods, any one enterprise to obtain a number of excellent suppliers in the procurement of goods, is an important link to guarantee the production and operation of enterprises. Therefore, in the modern engineering enterprise supplier management, the evaluation of suppliers has become an important issue, that is, how to scientifically and effectively use evaluation methods to select the appropriate suppliers.

At present, the supplier evaluation has been a lot of scholars and experts studied, there are a lot of research method of supplier evaluation, but generally summed up mainly divided into qualitative methods and quantitative methods in two categories.

Qualitative methods include visual judgment, bidding and negotiation. Chen (2013) concluded that the intuitive judgment method mainly based on the evaluation of the experience of the respondents and the method of investigation to evaluate, simple, but the proportion of executives accounted for relatively large. This method is applicable to the selection of non-major material suppliers. The bidding law is applicable to the selection of material suppliers with large quantity of material procurement. The drawback is that the bidding cycle is long and does not apply to emergency procurement. The negotiation law is applicable to the emergency procurement with small selection of suppliers and short purchasing cycle [6].

Quantitative research methods include the following 6 main methods, after several times screening, the related literature is listed as shown in Table 1.

Table 1. The Related Literature Lists

Methods	Authors Names(Time)
ABC cost method	Xu (2004), Liu et al. (2006), Chen et al. (2006), Sarokolaei, Mehdi Alinezhad, et al. (2013)
Analytic hierarchy process (AHP)	Wu et al. (2009), Koul, Saroj, and R. Verma (2011), Chakraborty et al. (2011), Li (2012),
Data envelopment analysis (DEA)	Olson (2007), Gong et al. (2012), Veni et al. (2012), Chen et al. (2013)
Network analysis (ANP)	Bayazit (2006), Gong et al. (2007), Li (2009), Xiang (2012)
Six Sigma management method	Jiao (2007), Yang, Taho, and C. H. Hsieh (2008)
Neural network algorithm	Jitendra (2010), Qian (2011), Liu (2103)

The most representative method of cost based selection is the ABC cost method. Xu (2004) analysis of the traditional methods due to the unreasonable indirect cost allocation of accounting information distortion problem, using ABC cost method to subdivide cost management in the operation level [7]. Liu et al. (2006), using the method of cost analysis of different period total cost brought by the enterprises to select suppliers, thus effectively

solved the static performance of supplier management method accidental error [8]. Chen et al. (2006) using a new perspective, namely, strategic cost method of the total cost of ownership (TCO) model, and points out that the supplier management of procurement cost should be reasonable allocation to the supply chain, so as to choose suitable suppliers to reduce costs [9]. Sarokolaei, Mehdi Alinezhad, et al. (2013) further research based on the time driven work cost, through this kind of new method of cost accounting cost drivers, the fuzzy logic can solve the problem of fuzzy time driven costing, reduced the error [10].

Analytic hierarchy process (AHP). Wu et al. (2009) analysis of the supplier complex decision problems in logistics outsourcing, combined with a variety of factors affecting the tradeoff between AHP evaluation model, and choose the best supplier from qualified suppliers, help enterprises with their own situation, to make reasonable decision [11]. Koul, Saroj, and R. Verma (2011) use fuzzy analytic hierarchy process (AHP) to analyze the supplier selection problem of time axis, and solve the problem of optimal supplier selection and the evaluation of uncertain time supply chain [12]. Chakraborty et al. (2011) the combination of AHP method and heuristic method for the analysis of multiple criteria of supplier selection, so as to get the initial solution of supplier selection problem, the results of the simulation analysis results show that the AHP method is superior to the results [13]. Li (2012) using the grey analytic hierarchy process to solve the problem of supplier selection, we use AHP to derive the weights, finally get the supplier evaluation gray weight matrix using grey analysis method, the advantage of this method is able to objectively reflect the overall level of service provider [14].

Data envelopment analysis (DEA). Olson (2007) uses the DEA method to evaluate the relative efficiency of supplier selection of multi objective model, simulate and calculate the uncertainty model under different parameters, and get the optimal scheme of supplier selection under different environments [15]. Gong et al. (2012) the introduction of AHP based on the traditional DEA method to construct preference constraint cone to obtain the improved data envelopment analysis, this scheme can be obtained through various departments evaluation of different suppliers, then the introduction of virtual providers, that each department hopes for supplier ranking, from the relative efficiency of vendor selection scheme and various suppliers value [16]. Veni et al. (2012) combine the DEA method with the AHP method, and use the DEA method to generate the weight of the AHP judgment matrix. The AHP method is used to analyze the multi criteria decision making problem of the supplier. Compare and analyze the advantages and disadvantages of the two methods [17]. Chen et al. (2013) using the super efficiency context dependent DEA model, by introducing super efficiency, attractive value and improved value, we further explain the global, efficient and locally efficient of supplier selection [18].

Network analysis (ANP). Bayazit (2006) that the most important work for the ANP method is to construct the framework of supplier selection process, by analyzing the relationship between the level of the framework, multi criteria decision making problems to solve the supplier selection and evaluation [19]. Gong et al. (2007) by analyzing the shortcomings of the independent assumption of elements in the traditional AHP method, a network analysis method (ANP) is proposed to eliminate the hypothetical defects and is more practical in choosing the actual suppliers [20]. Li (2009) using the fuzzy evaluation method of supplier evaluation supplier network processing and uncertainty, using triangular fuzzy number judgment standard construction successfully reduces the influence of subjective factors, a better solution to the decision problem of internal relation between complex evaluation [21]. Xiang (2012) in the supplier management of large engineering project, through the ANP method to get the weights of each index, using grey clustering evaluation method to quantify the actual risk for different gray level, which can be drawn from different suppliers integrated risk assessment [22].

Six Sigma management method. Jiao (2007) by the supplier management research of the electronic industry, and the analysis of the traditional ISO9000, QS9000 and total quality management (TQM) found that the application of Six Sigma method can present good methods inadequate compensation, better looking to provide low-cost high-quality goods suppliers [23]. Yang, Taho, and C. H. Hsieh (2008) research project management supplier first consider the resource constrained problem of vendor selection, which has the characteristics of fuzzy decision, the application of Six Sigma management method, combined with the standard hierarchical evaluation model, concluded that the high priority project financial revenue maximization, it should first consider the index of financial revenue supplier management [24].

Neural network algorithm. Jitendra (2010) to solve the supplier evaluation index and the index hierarchy problem by AHP method, the final evaluation using neural network combined with historical data obtained by each supplier's value, so as to avoid the AHP method for scoring subjective influence [25]. Qian (2011) by using BP neural network algorithm to solve the problem of supplier selection is non-linear relationship between the indexes, using this method can effectively evaluate the subjective effects of less and less evaluation uncertainty [26]. Liu (2103) by combining data envelopment analysis and neural network algorithm, mainly to solve the enterprise to obtain the incomplete information problem, this method can output more accurate the supplier evaluation

index to quantify the value of by training neural network [27].

In reality, many kinds of materials required for the project construction enterprises generally reach more than 100, material needs a large number of various types of materials demand differences and demand point in time is not fixed, does not determine the types of material procurement, facing the problems above, makes the enterprise for supplier management has become a complex the problem, it is difficult to form a standardized method. The supplier evaluation methods mentioned above are compared with the current mainstream supplier evaluation methods do not apply to all enterprises, the evaluation methods are more basic combination of some methods in the evaluation of form method, enterprise should according to the actual situation to choose or use the above basic methods to develop more effective supplier evaluation method.

3.3. Supplier management strategy

Muhamad Jantan et al. (2006) the research of supplier management is the supplier of technology, cost, quality and payment performance based on four respects, and supplier management strategy through quality roadmap and technology roadmap, provides a new method for supplier management [28]. Liu (2010) project will be in accordance with the trading relationship between the supplier management and supply risk evaluation index two, and using the method of information entropy to determine the weight of each index, finally suppliers are classified into four categories, respectively corresponding to four different types of supplier management strategy [29]. Zhou (2011) risk analysis problems of a Shanghai engineering company in the process of project put forward, the material classification, on the basis of classification management to improve supplier performance management, the company and the standardization of the development process of [30]. Ye (2012) combined with the market competition environment of engineering enterprises, the supplier management under the JIT system should be warned and eliminated, so as to cope with the supply risk [31].

In general, the supplier management strategy includes the formulation, the supplier access system for suppliers of technology, cost, quality and other aspects of the payment performance management and supplier incentive and elimination mechanism. Enterprises should formulate a set of relevant standards for supplier access, performance and elimination of rigorous assessment, so as to optimize the management of suppliers, and truly reduce the cost of the whole enterprise.

3.4. Literature review

In view of the existing research of project supplier management, supplier access, supplier evaluation, supplier performance evaluation, supplier rewards and penalties and elimination mechanism. Study on access management and supplier performance evaluation and supplier incentive and elimination mechanism is mainly based on theoretical research and enterprise with its own characteristics the strategy research, is the standardization of the main problems, the research of evaluation method of supplier of qualitative and quantitative methods are established, and model analysis is a common problem. As an empirical study, we should use different evaluation methods to analyze the management of suppliers according to different problems. The above summary papers provide a broad theoretical basis for the study of this paper.

4. Conclusions

Through the research of the project review of supplier management, supplier management, supplier management for enterprises to understand current insufficient attention, lack of scientific methods, to solve the above issues of supplier management should have a set of standard operation process. This paper reviews supplier evaluation methods, which are divided into two types: qualitative and quantitative methods. Most of the empirical problems are combined with many methods to make up for the deficiencies between them. There is no uniform standard for supplier evaluation, but its core principle is to reflect the actual service level of supplier objectively. Review supplier management strategies for supplier management strategy, also have different specific practices for different enterprises, the core part is the performance evaluation of suppliers to establish access mechanism, and incentive and elimination system.

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