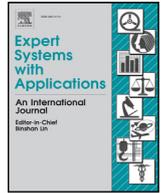




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Linking supplier development to supplier segmentation using Best Worst Method



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ABSTRACT

The strategic supplier-related activity of supplier segmentation focuses on the evaluation of suppliers, identifying different approaches, identifying the most suitable criteria and proper methods to segment the suppliers. The main aim of the evaluation of suppliers is to form different groups from the selected suppliers to create different supplier management strategies for segments involved. Supplier development is another strategic supplier-related activity designed to upgrade the performance level of suppliers in order to create and maintain a network of competent suppliers, which has a major influence on the competitive advantages of a buying company. To allocate scarce resources more efficiently, we should design different supplier development strategies for different supplier segments. This is where we actually use the evaluation for suppliers. This paper proposes an integrative approach that includes capabilities and willingness as two dimensions for evaluating and subsequently segmenting suppliers. The results of that segmentation are then used as the main basis for supplier development. The integrative approach proposed in this paper is of significant importance, as it helps companies apportion their managerial resources more efficiently. We use a new multi-criteria decision-making method called Best Worst Method (BWM) to segment suppliers. A supplier development conceptual model is proposed to develop the suppliers in the different segments. The proposed framework is further applied to a medium-sized high-tech company as input to validate the model.

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1. Introduction

With an increasing impact of suppliers on cost, quality, time and responsiveness of buying firms, supply chain management can be considered as a strategic tool which is used by firms to improve quality, customer service and competitive advantage (Tan, Lyman, & Wisner, 2002). One of the main business processes of supply chain management is supplier relationship management which is focused on the development and maintaining the relationships with suppliers (Lambert & Schwieterman, 2012). Supplier relationship management usually contains three steps: supplier selection, supplier segmentation and supplier development. Generally speaking, a number of qualitative and quantitative criteria are identified by the company to choose the most suitable suppliers (to see the methods and the criteria of supplier selection we refer to the review papers (Chai, Liu, & Ngai, 2013; De Boer, Labro, & Morlacchi, 2001; Ho, Xu, & Dey, 2010); for a sample of recent studies, see (Azadi, Mirhedayatian, & Saen,

2013; Deng, Aydin, Kwong, & Huang, 2014; Ekici, 2013; Rezaei, Fahim, & Tavasszy, 2014; You, You, Liu, & Zhen, 2015). When firms have a large number of suppliers, it is difficult to manage all the suppliers individually. For example, IKEA has 1026 suppliers in 53 countries (IKEA, 2011). Even though some companies like Philips has centralized its spending by reducing its number of active suppliers, there are still 2000 suppliers (Philips, 2007). Therefore, after the suppliers are selected, the buyer should further classify the selected suppliers in the step of supplier segmentation. Subsequently, in the step of supplier development, most suitable strategies can be formulated to deal with different segments of the selected suppliers (Dyer, Cho, & Chu, 1998). Effective supplier development helps suppliers to improve their capability and performance, which in return helps the buying company realize cost reduction, productivity improvement, quality improvement and optimal resource utilization (Krause & Ellram, 1997a; Sako, 2004; Talluri, Narasimhan, & Chung, 2010; Wouters, van Jarwaarde, & Groen, 2007; Humphreys, Cadden, Wen-Li, & McHugh, 2011). Supplier development activities require the buying company to spend considerable time, manpower, and financial and technical resources, which are scarce commodity in any company and should be allocated more efficiently and strategically (Dyer et al., 1998). This implies that for different groups of suppliers, different supplier development strategies should be formulated. To optimize purchasing

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effectiveness, supplier segmentation is introduced as a means to deal with different suppliers in a systematic way. However, there is no single systematic investigation on linking supplier development to supplier segmentation. The supplier development strategies we find in existing literature are not tailored to different types of suppliers, but treat all suppliers in the same way (Krause & Ellram, 1997a; 1997b).

Moreover, existing supplier development programs focus mostly on improving supplier capabilities. However, a strong and close buyer-supplier relationship, to a great extent depending on a supplier's willingness to collaborate, is also crucial to the buying company in achieving a lead position in the marketplace (Rezaei & Ortt, 2012). A high level of willingness on the part of both the supplier and the buyer creates mutual trust and increases the duration of the relationship (Krause, Handfield, & Tyler, 2007), which has a major impact on the buying firms' competitive advantages. Therefore, a supplier's willingness to engage in a relationship with a buyer also serves an important purpose, which should be taken into consideration. However, in existing literature, this aspect is not taken into account during the supplier development.

In order to find solution for these practical problems, the following research question is formulated:

How can the buying company segment its suppliers into different segments based on supplier capabilities and willingness, and develop different types of suppliers to improve their capabilities and/or willingness?

By answering this main research question, we contribute to the relevant research areas in the following ways.

Firstly, while existing studies on supplier development focus solely on supplier capabilities, we also look at supplier willingness, as a key dimension of supplier development. Secondly, while existing literature considers the two strategic activities (supplier segmentation and supplier development) separately, this study links the two by systematically classifying suppliers according to their capabilities and willingness, and by formulating different supplier development strategies for different supplier segments. In fact, this paper shows how supplier evaluation, which is traditionally used for the purpose of supplier selection (for the benefit of the buying company), can be of great help to suppliers as well. Thirdly, while most supplier segmentation approaches do not provide the buyer with a practical tool to implement the segmentation, we apply an efficient multi-criteria decision-making method, which is among a few applications in supplier segmentation and development fields.

This paper is organized as follows. In Section 2, a literature review on supplier segmentation and development is presented. Section 3, presents a conceptual framework to link supplier development to supplier segmentation. In Section 4, the proposed multi-criteria decision-making method (Best Worst Method: BWM) is presented. In Section 5, the proposed methodology and supplier development conceptual model are applied to a real-world case. Section 6 describes what the case company does in practice for supplier development, which is used as a validation for our conceptual framework proposed in Section 3. Finally, the conclusions and future research are discussed in Section 7.

2. Literature review

In this section we review the relevant literature on supplier segmentation, and supplier development.

2.1. Supplier segmentation

In 1983, Kraljic proposed the purchasing portfolio model in order to determine the differentiated purchasing strategies (Kraljic, 1983). With the purpose of minimizing supply risk and making the most of buying power, Kraljic, considering two dimensions supply

risk and profit impact, classifies the materials that a company purchased into four categories: bottleneck (supply risk: high; profit impact: low); non-critical (supply risk: low; profit impact: low); leverage (profit impact: high; supply risk: low); and strategic (supply risk: high; profit impact: high). Kraljic's portfolio approach has been adopted by several large companies, including Shell, Alcatel, Philips and Siemens (Gelderman & Van Weele, 2002). Later, many other researchers have made extensions or modifications to Kraljic's approach. Some researchers focused on the applications of Kraljic's approach. Gelderman and Semeijn (2006) use Kraljic's purchasing portfolio approach for managing global supply base in addition to strategies formulation. Gelderman and Van Weele (2003) deal with the measurement issues and strategic directions in Kraljic's purchasing portfolio model by investigating which measurement methods are possible and which supplier strategies are feasible, including additional strategic movements of commodities within the matrix. Gelderman and Van Weele (2005)'s study also addresses the question of whether or not the use of purchasing portfolio models is considered as a sign of purchasing sophistication. They discover that the purchasing's sophistication is a two-dimension construct: purchasing's professionalism and purchasing's position within the organization. Both of the position and the professionalism of purchasing are positively related to the greater use of purchasing portfolio models. Additionally, based on Kraljic's model, Pagell, Wu, and Wasserman (2010) developed a modified sustainable purchasing portfolio model that is suitable for sustainable supply chain management (SSCM). Caniëls and Gelderman (2007) investigated power and interdependence in each quadrant of the Kraljic portfolio matrix. According to their research, the bottleneck quadrant of Kraljic matrix is characterized by supplier dominance, while the leverage quadrant is buyer dominance. The non-critical quadrant is characterized by balanced power. The total interdependence is highest in the strategic quadrant and lowest in non-critical quadrant. Therefore the power and interdependence in different quadrants are different, which should be taken into consideration when doing purchasing and relationship management.

Some researchers focus on the evolution of supplier evaluation dimensions. Supplier segmentation is identified to have effect of leading to more effective supplier involvement in product development. Wynstra and Ten Pierick (2000)'s research classified suppliers based on two dimensions: development risk and degree of development responsibility held by the supplier. Development risk refers to the importance, newness and complexity of development of the part concerned and gives an indication of the time and effort required developing a specific part. Different communication and collaboration strategies are proposed to deal with different types of suppliers. The classification of purchase proposed by Olsen and Ellram (1997) is based on two dimensions: difficulty of managing the purchase situation and strategic importance of the purchase. Aiming at allocating different levels of resources to each group, Dyer et al. (1998) proposed a strategic supplier typology by segmenting suppliers into two primary categories: strategic partners and durable arm's-length suppliers. The inputs provided by strategic partners are high in value and closely related to buying company's core competence, while durable arm's-length suppliers only provide non-crucial products. Kaufman, Wood, and Theyel (2000) suggested to segment suppliers according to two dimensions technology and collaboration. Suppliers can therefore be categorized into four groups: commodity suppliers, collaboration specialists, technology specialists, problem-solving suppliers. Masella and Rangone (2000) proposed to segment suppliers according to the time horizon involved and on the content of relationship. The length of reference time is related to long-term relationship and short-term relationship, which depend on factors like the level of transaction-specific investments and switching costs. The content of relationship refers to logistic or strategic goals. The logistic integration contains arrangements on performance such as quality, and

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