

# Supplier evaluation and management system for strategic sourcing based on a new multicriteria sorting procedure

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## Abstract

Supplier selection and evaluation is increasingly seen as a strategic issue for companies. Unlike the past, an emerging trend is to select suppliers where a long-term relationship is desired and supplier involvement in product development is required and to sort suppliers into categories based on performances. This paper describes a supplier evaluation and management methodology for strategic sourcing, in which suppliers are assessed considering supplier's co-design capabilities and categorized based on overall performances, potential reasons for differences in performance of supplier groups are identified, and performances of the suppliers are improved by applying supplier development programs. A new multicriteria sorting method based on the PROMETHEE methodology is also introduced. By means of a strategic supplier selection example, we demonstrate that our methodology is a flexible and responsive decision-making tool for assessing strategic suppliers.

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*Keywords:* Supplier selection and evaluation; Product development; Multicriteria sorting

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## 1. Introduction

Supplier selection and evaluation is one of the most vital actions of companies in a supply chain. Selecting the wrong supplier could be enough to deteriorate the whole supply chain's financial and operational position. In today's highly competitive, global operating environment, it is impossible to produce low cost, high quality products successfully without satisfactory suppliers (Vokurka et al., 1996).

Over the past several years, with the recent trend on just-in-time (JIT) manufacturing philosophy, there is an emphasis on strategic sourcing that establishes long-term mutually beneficial relationship with fewer but better suppliers. (Vokurka et al., 1996; Talluri and Narasimhan, 2004; Prahinski and Benton, 2004). This long-term expectation developed between the manufacturer and suppliers can provide the opportunity for improving performance (Choy et al., 2003). As companies are increasingly outsourcing more and more activities to suppliers in order to focus their core competences, the suppliers are pushed to co-operate (Choy et al., 2005).

Strategic sourcing decisions are generally related with evaluating and selecting the potential strategic suppliers that can effectively meet the long-term

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expectations of companies, developing and implementing the strategic partnership with these suppliers by involving in supplier development programs to increase supplier performance and providing continuous feedback to the suppliers (Talluri and Narasimhan, 2004).

Supplier selection decisions are complicated by the fact that various criteria must be considered in the decision-making process (Choy et al., 2002). In today's global and open innovation economy where concurrent product and supplier development are often the rule, strategic supplier selection and evaluation decisions must not be solely based on traditional selection criteria, such as cost, quality and delivery. In strategic sourcing, many other criteria should be considered with the aim of developing a long-term supplier relationship such as quality management practices, long-term management practices, financial strength, technology and innovativeness level, suppliers' cooperative attitude, supplier's co-design capabilities, and cost reduction capabilities (Mandal and Deskmukh, 1994; Talluri and Narasimhan, 2004; Dulmin and Mininno, 2003; Dowlatshahi, 2000; De Toni and Nassimbeni, 2001; Choy et al., 2002, 2003).

Especially, the strategic role of suppliers in a supply chain is one that has been facing some changes as a result of increasing use of suppliers in innovation, more specifically in the product design stage (Croom, 2001). Today, in many industries, companies give suppliers increasing responsibilities with regard to the product design, development and engineering (Wynstra et al., 2001). Several researches have pointed out the benefits of starting long-term relationship with the suppliers at the product/process design and development stages such as fast project development times, lower development and product cost, increased the level of motivation of suppliers, increased supplier-originated innovation and better product quality (Valk and Wynstra, 2005; De Toni and Nassimbeni, 2001, Bonaccorsi and Lippardini, 1994). However, the literature have frequently emphasized that the success of involving suppliers in product development depends on the suppliers' design-based capabilities and practices. Therefore, concurrent design teams should select the suppliers that can effectively meet the varying conditions from the perspective of new product development, design, manufacturing processes and manufacturing capability (Talluri and Narasimhan, 2004). In other words, the supplier selection decision needs to incorporate design

criteria into the assessment process (Humphreys et al., 2005).

In strategic sourcing, besides long-term strategic relationship and suppliers' involvement in product development and design, reduction of supplier base should be one of the main tasks of concurrent design teams. Several important factors have caused the current shift to a reduced supplier base such as multiple sourcing prevents supplier from achieving the economies of scale based on order volume and learning curve effect, worldwide competition forces firms to find the best suppliers in the world (Shin et al., 2000), supplier development is costly—so suppliers must be limited to a manageable number, a close and long-term relationship is only achievable with a limited number of suppliers, suppliers can be expected to be involved in the developmental efforts of concurrent design teams only when the number of suppliers is reduced, etc. (Dowlatshahi, 2000).

As for flexible and efficient purchasing decisions, there is a growing trend that companies sort supplier bases into two or more categories (Choy et al., 2005): “competitive or collaborative” (Choy et al., 2005) and “strategic partners, candidates for supplier development program or pruning suppliers” (Talluri and Narasimhan, 2004).

As more firms become interested in developing and implementing strategic partnership with their key suppliers during product development, an effective tool is required to help concurrent design teams in classifying their suppliers based on their performances with the ability of continually monitoring and evaluating the suppliers' performance.

Although many methods have been proposed and used for selection and evaluation of suppliers, most of them try to rank the suppliers from the best to the worst or to choose the best supplier among others. In addition, the use of design-related criteria to assess supplier performance has largely been ignored, although it is essential in assessing the role of suppliers in product development (Humphreys et al., 2005). Up to date, comparison of the suppliers and identification of the potential reasons for differences in supplier performance have not been fully explored in the literature (Talluri and Narasimhan, 2004).

Selecting strategic suppliers from a large number of possible suppliers with various levels of capabilities and potential is inherently a multicriteria decision-making (MCDM) problem (Dahel, 2003; Kahraman et al., 2003). Because of the multiple criteria nature of the supplier selection and

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