

## A literature review of decision-making models and approaches for partner selection in agile supply chains

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### ABSTRACT

The paper reviews the literature on supply partner decision-making published between 2001 and 2011, a period that has seen a significant increase in work published in this field. The progress made in developing new models and methods that can be applied to this task is assessed in the context of the previous literature. Particular attention is given to those methods that are especially relevant for use in agile supply chains. The paper uses a classification framework that enables models intended for similar purposes to be compared and tracked over time. It is also used to identify a number of gaps in the literature. The findings highlight an on-going need to develop methods that are able to meet the combination of qualitative and quantitative objectives that are typically found in partner selection problems in practice.

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### 1. Introduction

In today's highly competitive environment, enterprises need to take advantage of any opportunity to improve their performance. There has been growing recognition of the need for a firm to work closely with its supply chain partners in order to optimize its business processes. A key step in the formation of any supply chain is that of supply partner selection (Mikhailov, 2002), which is reflected in the growing research interest in this issue in recent years. De Boer et al. (2001)'s review of the literature on supply partner decision-making represented pioneering work in that it classifies supplier selection methods according to different stages of the supplier selection process. Since then two other literature review papers are particularly noteworthy. Aissaoui et al. (2007) adopted De Boer et al. (2001)'s three-stage framework in their literature review. However, their focus was on the final stage of the selection process. More recently, Ho et al. (2010) reviewed multi-criteria decision-making approaches used in supplier evaluation and selection. However, they do so relatively uncritically and without employing any specific framework. As it is nearly a decade since De Boer et al. (2001)'s paper, it now seems an appropriate time to revisit this issue.

During this time, the concept of the agile supply chain (ASC) has become increasingly important as means of achieving

a competitive edge in rapidly changing business environments (Lin et al., 2006). An ASC is a dynamic alliance of member companies, the formation of which is likely to need to change frequently in response to fast-changing markets (Christopher and Towill, 2000; Wu and Barnes, in press). Miles and Snow (1984) were amongst the first to recognize the importance of supply partners as firms increasingly adopted vertically disaggregated forms. Their description of a "dynamic network" as a combination of independent businesses, each contributing what it does best to the network as a whole, foreshadowed the type of relationships that are characteristic of ASCs. More recently, in an era of increased outsourcing, Huang et al. (2004) have emphasized the concept of the virtual enterprise as an effective and viable solution to the problem of fulfilling requirements in a global market. In ASCs, companies must align with their supply partners to streamline their operations, as well as working together to achieve the necessary levels of agility throughout the entire supply chain and not just within an individual company. The increasing importance of ASCs has focused more attention on supply partner selection.

In ASCs, decision-making about partner selection is particularly challenging, because of the complexity of putting together a network under dynamic conditions. Researchers have generally concluded that the problem of supplier selection under such conditions cannot be solved effectively and efficiently unless it is broken down into several sub-problems, which can then each be addressed and solved individually. For example, Lorange et al. (1992) developed a two-stage supply partner selection approach: first evaluating the degree of match with a candidate partner and

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then analyzing the market potential, main competitors and simulating worst-case scenarios after the formation of the partnership. De Boer et al. (2001) characterized the supply chain partner selection process as three main stages, comprising the “criteria formulation” and “qualification” stages in which suitable partners are identified, followed by the “choice” stage in which a final selection is made from amongst suitably qualified partners. Huang et al. (2004) propose a two-stage selection framework based on the distinction between hard and soft factors in affect the partner selection process. Stage one identifies potential partner candidates who can meet the criteria of timeliness, quality and price for the required products or services. Stage two focuses on the assessment of their cooperation potential. Che (2010) also developed a two-phase model. In phase 1, suppliers are clustered according to their characteristics for meeting customer needs on multiple dimensions of cost, quality and time. In phase 2, a multi-criteria optimization mathematical model is constructed on the basis of these clusters.

The aim of this paper is to review the literature on supply partner selection decision-making published between 2001 and 2011 and to place this in the context of previous work published in this field. Particular attention is given to those methods that may be especially relevant for supply partner selection in agile supply chains. In reviewing the literature published since 2001, the paper will apply the classification framework developed by Luo et al. (2009) and Wu and Barnes (in press), based on De Boer et al. (2001), identify any new trends in the literature and highlight any gaps in the literature that would benefit from future research efforts.

Classification in science has properties that enable the representation of entities and relationships in structures that reflect knowledge of the domain under consideration (Kwasnik, 1999). Classification can also be helpful for the processes of knowledge discovery and creation. In this paper, the classification method is applied to the literature on partner selection in order to advance our understanding of this field of research and to facilitate the discovery of new knowledge in the subject. In addition, classifications can also be used to enhance our ability to discover meaningful information in large amounts of literature. Recent developments in our ability to retrieve large amounts of literature have stimulated an interest in new ways of exploiting the information available to advance the knowledge in this field.

Subsequent to this Introduction, the “Methodology” section explains how the literature review was conducted and in particular how a phased model for supply partner selection in ASCs was used as the basis for the analysis. This model is then used as the basis of the structure of the next four sections, which are

dedicated to reviewing the decision models considered appropriate for each of the four phases. The “Discussion” section presents the development trends of the decision-making models and approaches for partner selection in ASCs. The “Conclusion” section draws the paper to an end by considering the contribution of the paper and pointing to future research requirements.

## 2. Methodology

Relevant papers were identified by searching ISI Web of Knowledge using the keywords “partner selection”, “supplier selection” and “vendor selection” in the fields of “Operations Research & Management Science” and “Management” date from 2001 to 2011 (up to 5 May 2011). The search returned one hundred and forty journal articles. These are listed in Appendix 1.

Once identified, the papers were classified using the framework developed by Luo et al. (2009) and Wu and Barnes (in press) based on De Boer et al. (2001). This is depicted in Table 1 and Fig. 1, and now described in more detail.

The horizontal axis of the framework categorizes the complexity and degree of uncertainty associated with purchasing and supplier selection decisions. Based on the work of De Boer et al. (2001) and Robinson et al. (1967), it characterizes three typical situations: new task, modified re-buy and straight re-buy. The new task situation involves an entirely new product or service. As there is no previous experience, this situation carries a high level of uncertainty. In a modified re-buy, a new product is purchased from a known supplier or a modified product is purchased from a new supplier. Therefore, this has a moderate level of uncertainty. Finally, the straight re-buy has the lowest level of uncertainty as the buyer has near perfect information about the product specification and the supplier.

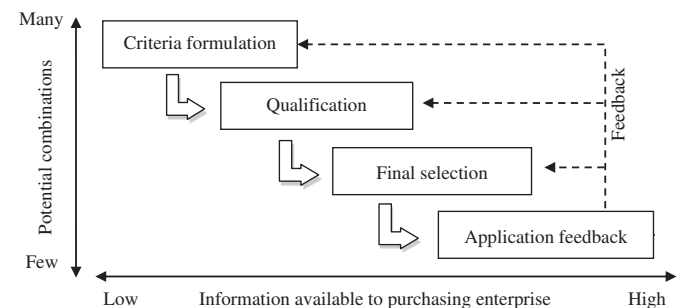


Fig. 1. The phases of the partner selection framework (based on De Boer et al., 2001; Luo et al., 2009; Wu and Barnes, in press).

Table 1  
The phases of partner selection framework (based on De Boer et al., 2001).

Phase	New task	Re-buy	
	Agile supply chain	Modified re-buy	Straight re-buy
1. Formulation of criteria	No previously used criteria available Moderate initial set of partners	Previously used criteria available Large set of initial partners	Previously used criteria available Small set of partners
2. Qualification	Sorting rather than ranking No historical records available	Sorting as well as ranking Historical data available	Sorting rather than ranking Historical data available
3. Final selection	Ranking rather than sorting Many criteria Much interaction Model used once	Ranking rather than sorting Fewer criteria Less interaction Model used again	Evaluation rather selection Moderate criteria Moderate interaction Model used again
4. Application feedback	Any new customer demands? Modifying or rebuild the models used before?	Change current supply chain structure? The performance of the current supply chain structure fulfils the demands?	Stronger the relationships? Any more alternatives?

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