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# Understanding trade-offs in the supplier selection process: The role of flexibility, delivery, and value-added services/support

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## ABSTRACT

In this study, we present, based on econometric choice modeling framework, how manufacturing managers/executives trade-off between cost, delivery, flexibility, and service features in the supplier selection process for commodity raw materials, given acceptable quality. Empirical data for this study was collected from manufacturing organizations in Europe (Germany, France, Italy, and UK) using a computer-based supplier selection discrete choice survey. Each survey instrument contained 16 supplier selection choice sets, which compared 23 attributes of the current suppliers with a “new” potential supplier. The attributes of new suppliers were varied across two to four levels using established factorial experimental design procedures. The resultant multinomial logit models show the relative impact of cost, flexibility, delivery and service features on supplier selection.

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## 1. Introduction

Over the last thirty years, supply chain management (SCM) and the supplier selection processes have received considerable attention in the operations management literature (Miller et al., 1981). Several scholars have emphasized the multi-disciplinary nature of supply chains and suggested that the use of economics and marketing-based methods can further increase the effectiveness of SCM (e.g. Bankar and Khoska, 1995; Karmarkar, 1996). For example, as outsourcing becomes more important in many industries, the supplier selection process does as well (Kannan and Tan, 2002; Yan et al., 2003; Choy et al., 2003, 2004; Li et al., 2006). In addition, with the rapid proliferation of information sharing across supply chains, the importance of supplier management has been ampli-

fied during recent years (e.g. Fine, 1998; Hanfield and Nichols, 1999; Kaplan and Sawhney, 2000; Simchi-Levi et al., 2000; Hall and Braithwaite, 2001). A number of empirical studies also show that managers indeed consider the role of the supplier to be critical for superior business performance (e.g. Flynn et al., 1994; Choi and Hartley, 1996; Vonderembse and Tracey, 1999; González et al., 2004).

While the academic literature is very comprehensive, the effective evaluation and selection of suppliers for important raw materials continues to be challenging in many industries. In this context, the past research shows that firms use price and a number of other dimensions such as quality, flexibility, delivery, and service in the supplier selection process (e.g. Dickson, 1966; Hirakubo and Kublin, 1998; Li et al., 2006; Sarkis and Talluri, 2002; Verma and Pullman, 1998; Wilson, 1994). Broadly speaking, supplier selection trade-offs correspond well with various competitive priorities identified by and explored extensively in the operations strategy research (e.g. Hayes and Wheelwright, 1984; Boyer and Lewis, 2002).

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The supplier selection literature is also rich in terms of conceptual models, decision support systems, simulation studies, and empirical analyses related to the vendor evaluation (e.g. Pearn et al., 2004; Bhutta and Huq, 2002; Chan, 2003; Chan and Chan 2004; Onesime et al., 2004; Basnet and Leung, 2005; Valluri and Croson, 2005; Carter and Jennings, 2004; Kamann and Bakker, 2004; Lin et al., 2005). However, relatively little work has been done to integrate market utility-based approaches in the supplier selection processes as recommended by both classic and contemporary research in operations strategy (e.g. Anderson et al., 1989; Vickery et al., 1993; Boyer et al., 1996).

Market utility-based approaches such as discrete choice analysis (DCA) (also known as choice-based conjoint) can assess the relative weights of price, quality, delivery, flexibility, and various value-added features in various managerial decision-making processes (e.g. Ben-Akiva and Lerman, 1991; McFadden, 1986; Louviere et al., 2001). These methods have seen wide applications in many social sciences including marketing, transportation planning, environmental resource economics, service design, and operations management (e.g. Green and Krieger, 1996; Pullman and Moore, 1999; Pullman et al., 2001; Verma et al., 2001). Examples of discrete choice and conjoint analysis in operations management include product line decisions (e.g., Yano and Dobson, 1998); optimal service design (Verma et al., 2001); and operations capacity planning (Pullman and Moore, 1999). In addition, Ding et al. (2007), and Victorino et al. (2005) have applied discrete choice models in a variety of operational settings. Furthermore, an emerging emphasis on incorporating behavioral aspects into manufacturing and service operations models (Bendoly et al., 2006), portends future growth of DCA and related approaches in the operations management literature.

As mentioned earlier, despite its advantages, DCA has only been used in a few papers related to supplier selection. Specifically, Verma and Pullman (1998) presented a simple illustration of DCA for supplier selection. They demonstrated that the managers' perceived importance of supplier attributes such as quality, cost, delivery, and flexibility are not consistent with their actual choices. Li et al. (2006) extended the use of DCA in supplier selection literature by comparing the attributes of an existing supplier to that of a new supplier. They also extended the theoretical framework to include supplier switching inertia. Our paper adds to the above stream of evolving literature on the use of DCA in the supplier selection process.

In this paper, we explore how executives trade-off amongst various competitive dimensions when selecting a supplier for important but commodity raw materials. The empirical context of our study is based on a commodity (aluminum profiles used in a variety of manufacturing industries) where quality is assessed as "conforming to specifications" and therefore is a necessary requirement or order qualifier for competing but is not an order winner. Based on literature review, it is our impression that supplier selection of such context has not been studied in detail before.

Hence, in this experimental empirical study (details provided later) we assess the managerial trade-offs for cost, delivery performance, flexibility, and value-added service/support in a supplier selection process using a market utility-based approach (DCA). Specifically, we address the following research issues:

*Research Objective 1:* How do managers trade-off between price and other competitive dimensions when choosing a supplier for commodity raw materials, given acceptable quality?

*Research Objective 2:* What is the relative importance of value-added service and support when choosing a supplier for commodity raw materials, given acceptable quality?

Similar research questions have been addressed in past research. However, as mentioned earlier, with the exception of two papers, a market utility-based approach has not been used to assess trade-offs in the supplier selection process. Our study also demonstrates a new approach for DCA suggested by Li et al. (2006), which allows us to compare potential new suppliers with the existing supplier, thereby isolating the associated trade-offs accurately.

Furthermore, in today's business environment with the possibility to source raw materials from almost anywhere in the world, it is possible that cultural/national differences exist with-respect-to supplier evaluation and assessment (e.g. Hofstede, 2003; Schroeder and Flynn, 2001). Therefore after conducting the primary study in one country (Germany) we collected small samples of additional data from three other countries in Europe (UK, France, Italy). The supplementary dataset will also use to explore the following research issue:

*Research Objective 3:* How do trade-offs in the supplier selection process differ across cultural/national regions?

The rest of the manuscript is structured as follows: first, we review past research in supplier selection analysis. Second, we describe the research design including an overview of the DCA followed by the results of an empirical study conducted in four languages in Europe. Finally, we discuss the research and managerial implications of our work.

## 2. Literature review

In one of the early studies based on empirical data collected from 170 purchasing managers, members of the National Association of Purchasing Managers, Dickson (1966) identified over 20 attributes which managers generally consider when choosing a supplier. Following this exploratory study, a great number of articles focused on SCM and supplier selection criteria specifically. We discuss a number of these articles in this section, starting with the conceptual and review papers, followed by empirical research, decision support system papers, simulation studies, and finally supplier evaluation and selection modeling papers.

### 2.1. Conceptual and review papers

A number of conceptual papers have been published in the last decades that emphasized the strategic importance

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