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Practice and promise of formal supplier selection: a study of four empirical cases

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Abstract

In this paper an experimental study of formal decision-making models for supplier selection is described. Attention is paid to all phases of the supplier selection process: the recognition of the need for a new supplier, the formulation of decision criteria, the qualification of suitable candidates and final selection. It appears from the experiments that formal decision models may prove to be useful in various ways throughout the whole supplier selection process and in different purchasing situations.

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1. Introduction and problem statement

Academic attention for a more systematic approach to decision-making in purchasing and especially supplier selection has increased steadily over the last three decades; see [Weber et al. \(1991\)](#) and [De Boer et al. \(2001\)](#) for extensive literature overviews on methods and tools for supporting supplier selection. Almost invariably, authors on this topic justify their efforts in developing decision support tools and methods by pointing to the increased importance and complexity of purchasing and supply management in general, the crucial role of supplier selection decisions within the purchasing process and a lack of available decision tools—at least for certain specific purchasing settings (see [De Boer et al., 2001](#)). Still, while the number of decision tools seems to grow steadily, there is little empirical scientific evidence of the practical merit of such tools in the supplier selection practice. Usually, the decision tools for supplier selection are only provisionally tested on a fictitious example for illustrative purposes although usually based on input data that were gathered in practice. The few real empirical

applications (see for example [Liu et al., 2000](#); [Vokurka et al., 1996](#); [Karpak et al., 1999](#)) appear without a systematic and comprehensive analysis of such aspects as user-appreciation, costs of building the model, the availability of data, the integration in existing systems and procedures and so on. In addition, while [Lamming et al. \(1996\)](#) discuss the perceived benefits and problems of vendor assessment systems, their research essentially focuses on how the buyer and supplier may jointly assess their relationship rather than how the buyer makes individual decisions regarding suppliers. Therefore, the study presented in this paper attempts to assess more firmly the perceived merit of using formal decision tools and approaches for supplier selection in practice. More specifically, we aim to address the following basic questions: “To what extent and how can decision models provide useful support to purchasing decision makers when it comes to supplier selection?”. As reported by [De Boer et al. \(2001\)](#), a supplier selection problem typically consists of four phases, namely (1) problem definition, (2) formulation of criteria, (3) qualification of suitable suppliers and (4) final selection of the ultimate supplier(s). In each phase a different set of models is appropriate (see [Table 2](#) in the sequel). We investigate to what extent decision-makers are receptive to the use of formal tools for each of the phases by letting them apply one or more tools in the different phases of a previously solved supplier selection situation

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and letting them evaluate the possible merits and demerits of the use of these tools. So, the goal of our research is not to evaluate specific models or to develop an evaluation method, but to investigate the receptivity of decision-makers to the use of formal decision tools.

The paper is organised as follows. First, we further specify the problem statement and the methodology applied. Next, we describe four experiments in which we applied and subsequently evaluated several decision tools suggested in the existing literature. Finally, we discuss the findings from the experiments, draw general conclusions from these and give recommendations for further research.

2. Research methodology

In our discussion we use the work of [Timmermans \(1991\)](#) and [Rohrmann \(1986\)](#) on methodology for investigating prescriptive decision models. Based on an extensive survey of the literature, Timmermans summarizes the criteria for evaluating decision models into three categories, namely outcome criteria, process criteria and practical criteria. [Rohrmann \(1986\)](#) suggests the following categories of evaluation criteria: decision quality, indirect benefits, practicality, user satisfaction and economy. Although Rohrmann's listing is more elaborate than the one suggested by Timmermans, the two authors essentially suggest the same areas of evaluation, namely 'technical' or complexity-related criteria (such as number of alternatives, availability of data and level of uncertainty) as well as cost/benefit criteria (such as e.g. better insight in the decision problem at hand and usefulness of the outcome). In the evaluation of the decision models we combine the contributions of Timmermans and Rohrmann in order to assess the degree to which the models fit the complexity of the situation and seem useful from a cost/benefit perspective as well, see the criteria in [Table 1](#). As for the assessment we feel it is sensible to rely not only on the purchaser's assessment of the model but also to complement this with our observation as 'neutral' scientists (as suggested by Rohrmann too).

After specifying the criteria for the empirical evaluation of the decision models, the question remains how to carry out the process of evaluation.

The literature on methodology suggests several research strategies such as the survey, archival and historical analysis, the experiment and the case study ([Yin, 1989](#)). The use of supportive decision models among purchasers is still very exceptional and this makes it difficult to perform a survey, historical analysis or a case study only. For our purpose of empirically testing the usefulness of (new) decision models for supplier selection, we have to introduce these formal tools to the decision-makers, so a combination of a case

Table 1
Criteria for evaluation of the decision models for supplier selection

| Dimensions | Criteria |
|----------------|---|
| Complexity-fit | C1: Does the model aggregate information in a proper way? C2: Does the model sufficiently utilise available information? C3: Is it (to a satisfactory extent) possible to incorporate opinions and beliefs? C4: Is it (to a satisfactory extent) possible to achieve a fair participation of individual members in case of a group decision C5: Is the model sufficiently flexible for changes in the decision situation? |
| Cost/benefit | C6: Is the outcome of the decision model useful? C7: Is the outcome of the decision model acceptable? C8: Are the required investments justifiable? C9: Is the model sufficiently user-friendly? C10: Is the way the decision model works sufficiently clear? C11: Does the decision model increase the insight in the decision situation? C12: Does the decision model contribute to the communication about and the justification of the decision? C13: Does the decision model contribute to your decision making skills? |

study and an experiment seems an appropriate strategy. What we actually try to achieve then is a comparison of a decision situation in which a formal decision tool is used with a situation in which this is not the case. Therefore, a case study is used first to obtain a thorough picture of the actual decision-making process as it took place in a specific situation. Secondly, an experiment is performed in which the decision-makers are asked to reconsider the phases of the decision-making process once more using formal decision tools. By acting as facilitators in this process we are in control of some behavioural events and actors. After all, we cannot just present the decision model to some purchasers and expect them to understand such a model instantly and use it.

Finally, we have to decide on the research design of the experiments. We have chosen a multiple pre-test post-test approach—for two reasons. First, the literature on this specific topic advocates a pre-test post-test design ([Rohrmann, 1986](#)). Secondly, the use of multiple experiments leads to stronger conclusions through the possibility of replication ([Yin, 1989](#)).

Following this design, four organisations from different sectors (government, food, manufacturing and healthcare) were approached for participating in the experiments. The pre-test observation consisted of carefully documenting an actual supplier selection process as it had unfolded in each of the four

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