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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

organisations. In this way, a reference context was obtained with regard to the criteria from [Table 1](#). The information was obtained through focused interviews with the decision-makers involved as well as analysis of possible documents, e.g. quotations or supplier visit reports. Based upon the detailed information obtained from this case study one or more decision models were applied to some or all phases of the supplier selection process. The application of the decision models involved active participation of the decision-makers, e.g. many decision models required judgments expressed by the decision makers. We merely served as facilitators in this process, i.e. we explained the decision models and assisted the decision makers in applying the models. To influence the process as little as possible, we gave the decision makers a written (and, if necessary, oral) explanation of the use of the decision model beforehand and we minimized our intervention during execution of the process in order to assure proper execution of the decision-making models and process. After application, evaluation (post-test observation) of the decision model(s) took place. Again, this was done through an interview in which the decision models were evaluated with respect to the criteria shown in [Table 1](#).

One should keep in mind that this research is a form of preliminary research in order to find out to what extent and how decision tools might be used in supplier selection situations. Therefore, the term ‘experiment’ is used rather loosely. No formal hypothesis is defined before the actual experiments take place, nor is there a group of decision-makers to be influenced on the one hand and a control group on the other. We chose organizations from different industries that recently made supplier selections in quite different situations, but these organisations are by no means randomly chosen. However, we deliberately intervene in the process by asking the decision-makers to reconsider (part of) the decision-making process using the tools we propose. Our approach has some similarities with action research (see [Remenyi et al., 2000](#)). By intervening we try to acquire scientific knowledge on the applicability of formal decision tools for practical supplier selection problems and at the same time we try to raise consciousness of the decision makers involved in the experiments with regard to the possible merits and drawbacks of these tools. Using a pre-test post-test design, we take a static picture of the organisation before and after our intervention. However, our approach differs from action research in the sense that we are not aiming explicitly at organizational changes, nor do we work together with the decision-makers in a new and real decision-making situation. The latter might be the case in future research when we intend to take part in new supplier selection situations.

### 3. Description of the cases and experiments

As mentioned earlier, a supplier selection problem was studied in four organisations from different sectors. These organisations are: a brewery, a manufacturer of measurement and control systems, a facility service department in a university and a small hospital. The turnover of the organizations and the kind of purchase (modified rebuy, new task) differed as well as the impact in terms of financial implications and operational management. Obviously, an important and recurring problem in the experiments concerns the question which decision models to apply in each case. In our experiments we used the comprehensive assignment of supplier selection decision models to the four typical phases in supplier selection mentioned before for different typical purchasing situations. See [Table 2](#) and [De Boer et al. \(2001\)](#) for details.

The reader should keep in mind that the purpose was not to apply the ‘best’ method in a certain situation, but rather to find out whether the decision-makers find it useful to use models to help them find a solution in the supplier selection problem at hand. So, we tried to apply quite a number of different techniques. [Table 3](#) summarises information about the context of the supplier selection problem used in each experiment as well as the particular decision models used in each phase. The choice for using the particular decision models was based on the framework shown in [Table 2](#), the research discussed in [De Boer et al. \(2001\)](#) and two additional criteria: ease of use and availability of software tools.

The use of the latter criteria is defensible since it concerns a first empirical study in the field.

### 4. Evaluation of the experiments

After carrying out the experiments, structured interviews were held with the decision-makers that had been involved in both the experiments and the actual supplier selection processes. The questions asked were directly derived from the criteria in [Table 1](#). In addition, not all questions could be asked for each experiment—simply due to time restrictions.

We were particularly interested in the line(s) of reasoning that the decision-makers followed in arriving at their answers. Therefore, the decision-makers were strongly urged to elucidate and explain their judgments. In addition, as observers during the experiments we were able to compare the description of the real supplier selection process with the re-created version in each experiment. We first describe some of the most striking observations. Subsequently, we discuss a summarised analysis of the answers given by the decision-makers.

Table 2  
Overview of the literature on supplier selection models used in the experiments

	New task	Modified rebuy	Straight rebuy (routine items)	Straight rebuy (strategic/bottleneck)
Problem definition	None found			
Formulation of criteria	Mandal and Deshmukh (1994)	Mandal and Deshmukh (1994), Vokurka et al. (1996)		
Qualification	De Boer et al. (1998), Timmerman (categorical) (1986)	Barbarosoglu and Yazgaç (1997) De Boer et al. (1998)  Grando and Sianesi (1996) Gregory (1986)  Hinkle et al. (1969)  Holt (1998) Li et al. (1997) Liu et al. (2000) Min (1994) Narasimhan (1983) Ng and Skitmore (1995) Nydick and Hill (1992) Papagapiou et al. (1996) Soukup (1987) Thompson (1990) Timmerman (categorical) (1986) Vokurka et al. (1996) Williams (1984) Willis et al. (1993)	De Boer et al. (1998) Hinkle et al. (1969)  Holt (1998) Papagapiou et al. (1996) Timmerman (categorical) (1986)	Timmerman (categorical) (1986)
Choice	Barbarosoglu and Yazgaç (1997) De Boer et al. (1998)  Grando and Sianesi (1996) Gregory (1986) Holt (1998) Li et al. (1997) Min (1994) Narasimhan (1983) Nydick and Hill (1992) Sarkis and Talluri (2000) Thompson (1990, 1991)  Vokurka et al. (1996) Morlacchi (1997, 1999) Williams (1984) Willis et al. (1993)  Yoon and Naadimuthu (1993)	Akinc (1993)  Albino and Garavelli (1998) Barbarosoglu and Yazgaç (1997) Bender et al. (1985) Benton (1991) Buffa and Jackson (1983) Chaudhry et al. (1993) Current and Weber (1994) Das and Tyagi (1994) De Boer et al. (1998) Degraeve and Roodhooft (1998, 1999, 2000) Degraeve et al. (2000) Weber and Ellram (1992) Ganeshan et al. (1999) Ghoudsypour and O'Brien (1998) Grando and Sianesi (1996) Gregory (1986) Holt (1998) Morlacchi (1997, 1999) Karpak et al. (1999) Khoo et al. (1998) Li et al. (1997) Min (1994) Monczka and Trecha (1988) Narasimhan (1983) Nydick and Hill (1992) Pan (1989)	Albino and Garavelli (1998) Barbarosoglu and Yazgaç (1997) De Boer et al. (1998) Grando and Sianesi (1996) Gregory (1986) Holt (1998) Khoo et al. (1998) Li et al. (1997) Min (1994) Narasimhan (1983) Nydick and Hill (1992) Soukup (1987) Thompson (1990, 1991) Williams (1984) Willis et al. (1993)  Yoon and Naadimuthu (1993)	Barbarosoglu and Yazgaç (1997) De Boer et al. (1998)  Grando and Sianesi (1996) Gregory (1986) Holt (1998) Li et al. (1997) Min (1994) Morlacchi (1997, 1999) Narasimhan (1983) Nydick and Hill (1992) Sarkis and Talluri (2000) Thompson (1990, 1991) Williams (1984) Willis et al. (1993) Yoon and Naadimuthu (1993)

Table 2 (continued)

New task	Modified rebuy	Straight rebuy (routine items)	Straight rebuy (strategic/bottleneck)
	Petroni and Braglia (2000) Ronen and Trietsch (1988) Rosenthal et al. (1995) Sadrian and Yoon (1994) Turner (1988) Smytka and Clemens (1993) Soukup (1987) Thompson (1990, 1991) Timmerman (cost-ratio) (1986) Vokurka et al. (1996) Weber and Current (1993) Weber and Desai (1996) Weber (1991) Weber et al. (1991, 1998, 2000) Williams (1984) Willis et al. (1993) Yoon and Naadimuthu (1993)		

Table 3

Overview of decision methods used in the experiments

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Context for experiment	Qualification of suppliers of bottles for a beer brewery (case 1)	Selecting a supplier of a telephone exchange system for a university (case 2)	Qualification and selection of supplier of coils for a manufacturer of control systems (case 3)	Selecting a supplier of heating equipment for a hospital (case 4)
Phase I in supplier selection process: problem definition	Why-what's-stopping us (WWS) analysis (Basadur et al., 1994)	WWS analysis (Basadur et al., 1994)	VFT (Keeney, 1994)	Framework for formulation of alternatives (Arbel and Tong, 1982)
Phase II: formulating criteria	VFT	Not considered here	VFT	VFT
Phase III: pre-qualification	Rough sets (Slowinski, 1992) Promethee (Brans et al., 1986) Analytical hierarchy process (AHP) (Saaty, 1980)	Conjunctive screening (Hwang and Yoon, 1981)	Not considered here	Not considered
Phase IV: final selection and possibly allocating order volumes	Not considered here	AHP (Saaty, 1980)	SMART (see Goodwin and Wright, 1992) Goal programming (see Karpak et al., 1999)	Linear Assignment (see Chen and Hwang, 1991)

Some interesting differences between the outcome of the actual processes and the recreated processes in the experiments are the following:

- Although in Case 1 there is no definite ex-post information about how the supplier ultimately chosen has turned out, a comparison with the results of the experiment is still interesting. In the real case, two suppliers—let us say A and B were asked to submit a quotation from which A was then chosen.

However, using the Promethee decision model in the experiment supplier B would not have been invited at all. Instead, supplier C, who even outperformed A in the pre-qualification, could have been invited to submit a quote.

- In Case 2, the experiment resulted in choosing the same supplier as the one chosen in the real case, i.e. supplier 1. In the real case, supplier 3 was chosen as a so-called back-up supplier who should be used in case supplier 1 would drop out. However, the AHP-

analysis in the experiment suggested that supplier 2 was slightly preferable to supplier 3. Clearly, the use of AHP would at least have urged for a more thorough investigation and reconsideration of supplier 2 and supplier 3.

- After the experiment in Case 3, an interesting event took place concerning the demand for the item of which the supplier selection had been investigated. One of the company's customers placed a huge additional order for this product. Additional supply capacity was necessary. The problem definition phase in the experiment consisted of identifying supply objectives and subsequently searching and generating alternatives for achieving these objectives. The value focused thinking (VFT) model was used for this purpose. One of the objectives identified (before the additional order was placed) reads "Exploit increase in demand for the item". In a more elaborate VFT-analysis this objective would have been specified in more detail in quantitative terms (e.g. how much more volume can be purchased from our supplier?). This might already have indicated the usefulness (if not necessity) of starting up the search for a second source.

In the remainder of this section we analyse the findings from the structured interviews in order to try to extract underlying propositions as to how formal decision models for supplier selection may provide useful support to purchasing decision-makers.

Table 4 contains exemplary findings from the structured interviews held after the experiments mentioned in Table 3. The criteria C1–C13 correspond to the criteria shown in Table 1. Due to space restrictions, not all responses can be shown in Table 4. However, all except three responses can be classified as—conditionally positive. Only regarding C11 the purchaser in experiment 2 indicated that no new insights were obtained in phases 1 and 2 of the supplier selection process. The purchaser in experiment 3 indicated that the decision model applied in phase 1 did not sufficiently make use of the available information in that phase.

Based on the findings from the interviews we arrive at the following propositions:

- Decision models may improve the purchaser's insight into the decision situation by (1) scrutinising the very starting point for engaging in a supplier selection process and (2) making the purchaser's own mental picture of the decision more explicit. Applying decision models may improve the purchaser's decision-making skills in terms of (1) better defining the problem to be solved by selecting a supplier and (2) managing the decision-making process as such more efficiently. The potential usefulness of the outcomes of the models may lie in (1) achieved decision-making efficiency by guiding the decision-makers through the process and providing organisational structure (2) enhancement of the substantial quality of the decisions arrived at—recall the observations that showed differences in outcomes and (3) possibly improving the effectiveness of the (implementation) of the decision by increasing commitment from stakeholders.
- It proves easy to add or remove relevant factors or criteria or to change criteria weights and criteria scores. This flexibility facilitates the use of available information (whether explicitly documented or more tacit knowledge) and the opinions of various stakeholders. This is important since the decision-maker's acceptance of the outcome is determined by the incorporation of his personal preferences as well as his trust in the credibility of the input information.
- The flexibility of the decision models also contributes to the ability to involve various stakeholders in the process but may not guarantee consensus, as the latter will depend on the homogeneity of the opinions within the group. Still, in case of varying opinions, having a clear and explicit presentation of the differences may assist a facilitator in getting forward in resolving the differences.
- Understanding the basic mathematical and/or procedural principles underlying the decision model (including the way various types of information are aggregated) as well as understanding the function of a decision model in the whole supplier selection process is considered more important than mastering every technical detail in a particular decision model.
- In achieving a reasonable ratio between the costs and benefits of applying one or more decision techniques, two factors seem to result from the responses. Firstly, the aforementioned flexibility of individual decision techniques allows almost seamless adjustment of costs and time spent to the importance and newness of the purchasing situation. Secondly, the richness or variety of the collection of decision techniques taken together—again see for an overview De Boer et al. (2001)—allows more advanced and therefore costly techniques to be used where appropriate but also more 'quick-and-dirty' techniques where needed.
- Regarding sufficient user-friendliness, the responses from the interviews as well as the observations by the authors indicate that proper instruction and explanation of the techniques is an important condition.
- The tangible and concrete result of applying decision techniques facilitates (1) external presentation and justification of the decision as well as (2) internal communication within the group of decision-makers. Note that this corresponds with an advantage of decision models reported in more general literature about decision-support, see e.g. Goodwin and Wright (1992) and Belton and Stewart (2002).

Table 4  
Findings from interviews held after each experiment

Crite-ri- on	Responses from purchasers
C1	It keeps on being somewhat ad hoc, you don't know for sure if you focus on the right 'branch' in the hierarchy of problem formulations (Experiment 1; Phase I) As to Goal Programming: we don't do this yet but it seems to me that the information is processed correctly (Experiment 3; Phase IV)
C2	It is indeed a type of questioning that facilitates a certain depth. It turns the switch back to the zero-position: what is it really about we're trying to do? (Experiment 1; Phase I) This model obviously is applicable in rough as well as precise selections. In the latter, more criteria should be used and more effort should be put in the gathering of data (Experiment 1; Phase III)
C3	Yes, I think so, the questions are very open: there is room for everyone (Experiment 1; Phase I) You are in control of the scores you give, so...It is definitely not a rigid model, criteria can be added easily. By the way, it would be fun to approach the suppliers and ask them to provide the scores themselves (Experiment 1; Phase III)
C4	If the group would become too big, some disadvantages might occur. Everyone has an opinion, how can all these opinions be bundled? If the group is homogeneous, this may not be a problem. If the interests are more diverse, it may become difficult to keep sufficient overview (Experiment 1; Phase I) Yes. The team members had the same interests (Experiment 2; Phase II)
C5	The set-up is very flexible, any criterion could be included if desired, however at the same time, whatever you include is carried through consistently (Experiment 1; Phase III) Yes, I think so. We do not change things every month, but we could accommodate that. We could do this periodically, for example every three months (Experiment 3; Phase IV)
C6	I could use this model in this experiment, but it is not necessary. A lot of criteria are already 'in my head'. Still, others (internal customers) might start to think: "I didn't know that it (i.e. the purchase) involves so many aspects". A lot of people come in here with a tunnelvision (Experiment 4; Phase I) Yes, it provides a rational picture of the situation. Emotions must be excluded as much as possible; if one can determine the right criteria and weights, this is a very rational method. Normally, one has the criteria 'in one's head' but through this model, more structure is created (Experiment 1; Phase III)
C7	Yes, the outcomes are in accordance with my intuition (Experiment 1; Phase III) Yes, if the input data are correct, the output of this model is acceptable (Experiment 3; Phase IV)
C8	If the ultimate decision is the right one, the time investment may be range from a afternoon up to two days. In this case, it would definitely be justifiable (Experiment 1; Phase I) Yes, the method helps avoiding endless discussions (Experiment 2, Phase III)
C9	It remains to be seen whether everyone could apply this model. It does obviously require guidance and close monitoring. Not everyone could use it (Experiment 1; Phase I) Yes, once the Excel-formulas have been programmed it is no problem (Experiment 3; Phase IV)
C10	Yes, it follows from the outcomes (Experiment 2; Phase II) Yes, I think so. We don't have to understand the exact formulas, the principles of criteria scores and weighted averages are very normal and known (Experiment 1; Phase III)
C11	In general, it might be that by using this you incorporate aspects that you wouldn't incorporate if you didn't use the model. In that respect, I think it is useful (Experiment 4; Phase I) Yes, I would get a better understanding of the real critical elements of the quotation (Experiment 2; Phase III)
C12	This is convenient. It (i.e. the Promethee model) will be discussed, it is clear and concrete. You can communicate about this (Experiment 1; Phase II) Absolutely certain, very much. Especially the graphical representations of the assessments would have been used in presentations (Experiment 2; Phase IV)
C13	The first WWS-question addresses the need to achieve supply management and cost-control. Originally, we took it for granted, but why do we actually do that? I consider that (i.e. asking that question) a useful contribution (Experiment 1; Phase I) Yes. It enables you to better explicate the consequences of your preferences. In addition, it helps to technically manage and chair the discussion (Experiment 2; Phase II)

## 5. Conclusions and recommendations

Based on the foregoing, the answer to our question “To what extent and how can decision models provide useful support to purchasers when it comes to supplier selection?” is twofold.

First of all, in general the response resulting from the interviews can be described as ranging from neutral to positive with regard to the overall usefulness of decision models for supplier selection. This leads us to suggest that using decision models in supplier selection—provided that they are carefully selected and given certain conditions—may prove useful *in various ways* throughout the *whole supplier selection process* in *fundamentally different* purchasing situations. In our view, this underlines the usefulness and importance of research in this area. It also shows that the wide range of methods and techniques that has emerged during the past 50 or so years in Operations Research seems to provide the required variety of approaches required for coping with the diversity found in the purchasing practice. Furthermore, it implies the need for a shift in emphasis from developing decision models for the final selection phase to the earlier phases of problem definition and the formulation of criteria.

Secondly, the analysis reveals the importance of considering the flexibility of a decision model in relation to the function of providing structure throughout the process. An extremely flexible decision model may limit the ‘structuring’ function. Depending on the respective importance of these two aspects for the decision-maker, different decision models—or ways of using them—may be considered. Also, the nature of the input information provided by the decision-makers requires specific attention. On the one hand, the acceptability of the outcome relies on using ‘unpolished’ personal judgements while objectivity of input information is important, as the subsequent aggregation mechanisms are not always clear to the users of the decision models.

The results indicate the importance of a differentiated approach when applying decision models in supplier selection processes. For example, differences regarding the quantity and quality of available decision information and the financial impact of the supplier selection decision clearly require different types of decision models. This implies that in future research, the applicability of a novel decision model should be specified more clearly than has been the case so far.

Finally, the analysis of the evaluation of the experiments suggests that organisation-wide implementation is not a straightforward matter. Clearly, most decision-makers need to be trained in order to be able to effectively use most of the decision models. Another challenge is to strike an appropriate balance between (a) the variety of decision models required to cope with the many different purchasing situations in terms of

importance and complexity and (b) the overall cost of implementing and maintaining a set of decision models in an organisation which clearly will rise as the number of different decision models used in the firm increases. This points to two important and interrelated directions for further research on decision support for supplier selection. The first direction concerns the problem of trying to identify and develop and empirically investigate a number of small sets of different decision models per phase in the supplier selection process that may meet the challenge pointed out above. Secondly, this challenge also requires us to investigate the strong emergence of web-based provision of decision models and related know-how (see for example [Geoffrion and Krishnan, 2001](#)), which increasingly offers opportunities for buying decision support for supplier selection rather than developing all support in-house.

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