Issues in decision support under preferential uncertainty and group decision making based on simple interval MAVT modelling with the WINPRE software.

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Introduction

In this presentation, we study the use of interval judgments to describe preferential and informational imprecision in multicriteria decision analysis. Our focus is on the practical issues related with the weight elicitation process with the WINPRE (Workbench for INteractive PREference Programming) software. We also discuss the use of interval judgments in group decision processes to describe the range of preferences of the different decision makers.

Details

Multiattribute value tree theory (MAVT) is a decision analytical approach to systematically evaluate a set of alternatives with multiple criteria. Interval judgments provide a convenient way to account for preferential uncertainty, or imprecision, and incomplete information (see e.g. Weber, 1987). In MAVT models, intervals can be used, for example, to describe the range of allowed variation in the weight ratio and value estimates due to imprecision. In group decision processes, intervals can be applied to include all the different preference judgments of the decision makers in the same model (see e.g. Hämäläinen and Pöyhönen, 1996).

There are different ways to apply intervals to describe imprecision. In this presentation, our focus is on the practical use of the interval SMART/SWING method (see Mustajoki et al., 2005). It generalizes the SMART (Simple Multi-Attribute Rating Technique) (Edwards, 1977; von Winterfeldt and Edwards, 1986) and SWING (von Winterfeldt and Edwards, 1986) methods to allow interval judgments. We also compare the approach with the PAIRS (Salo and Hämäläinen, 1992) method, in which imprecise judgments are given by setting constraints on every ratio between the weights of the attributes.

Interval SMART/SWING is cognitively simple to use, but from the procedural and practical elicitation viewpoints it has characteristics, which should be addressed in the determination of the weight intervals and in the analysis of the results. That is, in interval SMART/SWING the

preference comparisons are done with respect to a certain reference attribute, and with the selection of the reference attribute the DM can affect to which preference comparisons will be made. We shall discuss the implications of using different attributes as a reference. Based on the results of a simulation study, we also suggest guidelines for how to select the reference attribute. Especially in group decision support these issues should be addressed, as the overall intervals are obtained as a compound of the preference judgments of different decision makers.

We demonstrate the use of the interval SMART/SWING and PAIRS methods with the WINPRE software, which provides a visual user interface to support these methods. In WINPRE, the decision maker can immediately see the changes in the results when adjusting the intervals, which makes it possible to carry out interactive analyses. WINPRE is freely available for academic purposes on the Decisionarium Web site (www.decisionarium.hut.fi, Hämäläinen 2003). We also address the behavioral and issues related with the use of the interval methods in practice.

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