Multi-Criteria Decision Analysis

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Multi-Criteria Decision Analysis (MCDA) or Multi-Criteria Decision Making (MCDM) is a discipline aimed at supporting decision makers faced with making numerous and sometimes conflicting evaluations. MCDA aims at highlighting these conflicts and deriving a way to come to a compromise in a transparent process.

Background

Unlike methods that assume the availability of measurements, measurements in MCDA are derived or interpreted subjectively as indicators of the strength of various preferences. Preferences differ from decision maker to decision maker, so the outcome depends on who is making the decision and what their goals and preferences are. For example, the European Parliament may apply MCDA to help assess whether the introduction of software patents in Europe would help or harm the European software industry. Since MCDA involves a certain element of subjectiveness, the morals and ethics of the persons implementing MCDA play a significant part in the accuracy and fairness of MCDA's conclusions. The ethical point is very important when one is making a decision that seriously impacts on other people, as opposed to a personal decision.

There are many MCDA / MCDM methods in use today. However, often different methods may yield different results for exactly the same problem. In other words, when exactly the same problem data are used with different MCDA / MCDM methods, such methods may recommend different solutions even for very simple problems (i.e., ones with very few alternatives and criteria). This raises the fundamental issues of how to evaluate and compare various MCDA / MCDM methods. Choosing the best MCDA / MCDM method is itself a multi-criteria decision making problem, in which the alternatives are the methods themselves and the decision criteria are the various evaluative ways for comparing them. Finding the best MCDA / MCDM method requires using the best MCDA / MCDM method on this fundamental problem. This leads to a decision making paradox.

The choice of which model is most appropriate depends on the problem at hand and may be to some extent dependent on which model the decision maker is most comfortable with. A question with all the above methods, and also methods not included in this list or even future methods, is how to assess their effectiveness. The role of rank reversals in decision making when these methods are used on certain test problems, plays a crucial role in this regard. However, this is a highly debatable issue as the near continuous emergence of new methods indicates.

Classification

A classification is often made, based on the size of the set of strategies:

MADM (multi-attribute decision making), concerned with a finite set of alternatives. The results can be expressed in the form of a selection of the most appropriate alternative, a ranking of the

alternatives from the best to the worst or a classification into predefined performance classes.

and

MODM (multi-objective decision making), concerned with choosing from a large, infinite, or uncountable number of alternatives.
MCDA's are also often classified based upon the type of aggregation or the nature of the input data.