Decision Making Methods

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INTRODUCTION

First priority in making a decision is to establish who are the decision-maker(s) and stakeholders in the decision - the audience for the decision. Identifying the decision-maker(s) early in the process cuts down on disagreement about problem definition, requirements, goals, and criteria. Although the decision-maker(s) seldom will be involved in the day-to-day work of making evaluations, feedback from the decision-maker(s) is vital at four steps in the process:

1. Problem definition.
2. Requirements identification.
3. Goal establishment.
4. Evaluation criteria development.

When appropriate, stakeholders should also be consulted. By acquiring their input during the early steps of the decision process, stakeholders can provide useful feedback before a decision is made. Usually the decision support staff should include the help of skilled and experienced analysts/facilitators to assist with all stages of the decision process. Expert facilitation can help assure that all the steps are properly performed and documented. Their experience and expertise will help provide transparency to the decision making process and help avoid misunderstandings that often lead to questions about the validity of the analyses which ultimately slow progress.

BACKGROUND

Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Making a decision implies that there are alternative choices to be considered, and in such a case we want not only to identify as many of these alternatives as possible but to choose the one that best fits with our goals, objectives, desires, values, and so on.(Harris,1980) According to Baker et al. (2001), decision making should start with the identification of the decision maker(s) and stakeholder(s) in the decision, reducing the possible disagreement about problem definition, requirements, goals and criteria.

MAIN FOCUS

The chapter mainly focuses on an eight step decision-making process and descriptions of specific decision making methods.

Decision-Making Process

1. **Define the Problem:** This process must, as a minimum, identify root causes, limiting assumptions, system and Organizational boundaries and interfaces, and any stakeholder issues. The goal is to express the issue in a clear, one-sentence *problem statement* that describes both the initial conditions and the desired conditions. Of course, the one-sentence limit is often exceeded in the practice in case of complex decision problems. The problem statement must however be a concise and unambiguous *written* material agreed by all decision makers and stakeholders. Even if it can be sometimes a long iterative process to come to such an agreement, it is a crucial and necessary point before proceeding to the next step.

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2. **Determine Requirements:** Requirements are conditions that any acceptable solution to the problem must meet. Requirements spell out what the solution to the problem must do.. In mathematical form, these requirements are the constraints describing the set of the feasible (admissible) solutions of the decision problem. It is very important that even if subjective or judgmental evaluations may occur in the following steps, the requirements must be stated in exact quantitative form, i.e. for any possible solution it has to be decided unambiguously whether it meets the requirements or not.

3. **Establish Goals:** Goals are broad statements of intent and desirable programmatic values. Goals go beyond the minimum essential must haves (i.e. requirements) to wants and desires.. In mathematical form, the goals are objectives contrary to the requirements that are constraints. The goals may be conflicting but this is a natural concomitant of practical decision situations.

4. **Identify Alternatives:** Alternatives offer different approaches for changing the initial condition into the desired Condition. Be it an existing one or only constructed in mind, any alternative must meet the requirements. The infeasible ones must be deleted (screened out) from the further consideration, and we obtain the explicit list of the alternatives. If the number of the possible alternatives is infinite, the set of alternatives is considered as the set of the solutions fulfilling the constraints in the mathematical form of the requirements.

5. **Define Criteria:** Decision criteria, which will discriminate among alternatives, must be based on the goals. It is necessary to define discriminating criteria as objective measures of the goals to measure how well each alternative achieves the goals.. Since the goals will be represented in the form of criteria, every goal must generate at least one criterion but complex goals may be represented only by several criteria. It can be helpful to group together criteria into a series of sets that relate to separate and distinguishable components of the overall objective for the decision. This is particularly helpful if the emerging decision structure contains a relatively large number of criteria. Grouping criteria can help the process of checking whether the set of criteria selected is appropriate to the problem, can ease the process of calculating criteria weights in some methods, and can facilitate the emergence of higher level views of the issues. It is a usual way to arrange the groups of criteria, subcriteria, and sub-subcriteria in a tree-structure (UK DTLR,2001).

According to Baker et al. (2001), criteria should be

- Able to discriminate among the alternatives and to support the comparison of the performance of the alternatives.
- Complete to include all goals.
- Operational and meaningful.
- Non-redundant.
- Few in number.

In some methods, see Keeney and Raiffa (1976), non-redundancy is required in the form of independency.

6. **Select a Decision Making Tool:** There are several tools for solving a decision problem. Some of them will be briefly described here, and references of further readings will also be proposed. The selection of an appropriate tool is not an easy task and depends on the concrete decision problem, as well as on the objectives of the decision makers. Sometimes 'the simpler the method, the better" but complex decision problems may require complex methods, as well.

7. **Evaluate Alternatives Against Criteria:** Every correct method for decision making needs, as input data, the evaluation of the

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