

# *: How do decision-making models relate to the design and use of DSS?*

by Dan Power

Editor, DSSResources.com

Both descriptive and prescriptive quantitative decision making models are important to understanding computerized decision support. Quantitative decision-making models can be incorporated into decision support capabilities and systems and descriptive models can help explain decision process problems and suggest options to improve decision-making. Research, design activities and conceptual thinking about computerized decision support is multidisciplinary in nature and theory is drawn from organizational, political and behavioral decision-making theory and research and decision support theory, research and practice.

This question about decision models was originally posted by a student studying DSS in Australia in 2004. He wrote "How do Decision Making Models (like Heuristics, Rationality, Garbage Can, etc.) relate to the design and use of DSS?" He further explained "I tried to search for a comprehensive explanation on the web and books, but most of them don't really specifically discuss the relationship between those models and the design/use of DSS ... Please help me out." The following paragraphs provide an overview, but this is a broad question that could be included on a Ph.D. comprehensive exam.

A quick response is that descriptive decision-making models help "fit" a specific Decision Support System to user needs and limitations. Normative or prescriptive decision-making models help DSS developers identify opportunities to intervene in decision making activities and processes and potentially improve decision-making effectiveness and other metrics of decision-making success. Some of the descriptive and normative models are at the individual level of analysis and some are at the organizational level. Exploring both levels of analysis can be useful in building computerized Decision Support Systems.

A longer answer might begin by mentioning that "models" is a very broad term. Each decision-making model has a unique history and relevance to DSS design and potentially to understanding the use of DSS. Let me touch on some of the specific "models" mentioned:

1) Heuristic models -- Quantitative heuristic models can be used to build model-driven DSS; a search heuristic model like backward chaining is used in some rule-based, knowledge-driven DSS. Heuristic is derived from a Greek word meaning "steersman for a ship". A heuristic is a rule of thumb or a decision-making guide. Some heuristics are normative guides and evidence indicates people

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use heuristics to help make decisions.

2) Rational choice model -- This concept of rationality may refer to a descriptive model of individual or organizational behavior, but rationality is also a prescription for decision-making behavior. When rationality describes behavior, goals and attitudes in a decision situation, then a DSS is more likely to be used, to be useful and to influence decision behavior. Many of us strive for rationality in our decision-making, but a variety of cognitive, environmental and behavioral decision-making models describe the limitations of rationality.

3) Garbage can decision-making model -- This is a macro-organizational behavior model (cf. Cohen, March & Olsen, 1972). The garbage can is a descriptive metaphor for how organizational decisions are made. For those situations where the metaphor seems appropriate, DSS can be used by people to bring problems and solutions together and to facilitate decisions when a decision opportunity is presented. DSS can help manage the “garbage can” if participants so desire.

The “garbage can” model is often perceived as political or anti-rational, so let's explore it in more detail. Cohen, March and Olsen's (1972) model specifies that: Problems identified in organizations usually require attention. Problems are the result of performance gaps or an inability to predict the future. Thus, problems may originate inside or outside the organization. Traditionally, it was assumed that problems trigger decision processes; if a problem is sufficiently threatening, this may happen. Usually, however, managers and other participants go through the “garbage” and look for interesting, suitable or important “problems” and “solutions”. Managers often “seek” problems.

According to Cohen et al., solutions are ideas that have been identified to “solve” one or more “problems”. Solutions are independent and distinct from the problems which they might be used to solve. In some cases, solutions are answers looking for a problem. Participants may have ideas for solutions; they may be attracted to specific solutions and volunteer to play the advocate. Choice opportunities or choice situations are occasions when people in organizations expect to produce behavior that can be called a decision, a plan or an “initiative”. “Decision opportunities” can be created by internal or external events and circumstances. Participants (people, decision makers, managers) come and go in the “garbage can”; the participation of specific decision makers varies for each problem and each solution. Participation may vary depending on the time demands of participants or on other situational factors. Also, participants may have favorite problems or favorite solutions which they promote and advocate.

Cohen et al. wrote: “An organization is a collection of choices looking for problems, issues and feelings looking for decision situations in which they might be aired, solutions looking for issues to which they might be the answer, and decision makers looking for work (1972, p. 2).”

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4) Satisficing -- Another important decision-making model was developed by Herbert Simon. He described a "satisficing" model of individual decision making. A satisficing conception of rationality denies that rational decision makers must always seek the "best" or the "optimal" means to desired ends. Rather Simon suggested that people choose the first alternative that is "good enough" or satisfies choice criteria or aspiration levels.

According to Simon, we, the "rational man" are satisficers and not an optimizers. Professor Simon (1976) wrote: "The social sciences suffer from acute schizophrenia in their treatment of rationality. At one extreme, the economists attribute to economic man a preposterously omniscient rationality. Economic man has a complete and consistent system of preferences that allows him always to choose among the alternatives open to him; he is always completely aware of what these alternatives are; there are no limits on the complexity of the computations he can perform in order to determine what alternatives are best; probability calculations are neither frightening nor mysterious to him ... At the other extreme, are those tendencies in social psychology traceable to Freud that try to reduce all cognition to affect. Thus we show that coins look larger to poor children than to rich, that pressures of a social group can persuade a man he sees spots that are not there, that the process of group problem-solving involves accumulating and discharging tensions, and so on."

In general, the development of computerized decision support assumes a rational, analytical model of individual and organizational decision-making. If another model better describes the actual behavior in a situation, for example, a garbage can model, then a decision support system may serve a very different purpose than trying to enhance rationality. In a garbage can situation, a DSS may help in rationalizing a match between a problem and a solution. The decision makers attitude and frame of reference influence the use of decision support.

### References

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Author: Daniel Power

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