A Method for Systematic Artifact Selection Decision Making

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INTRODUCTION

Decision Making

Artifact selection decisions typically involve the selection of one from a number of possible/candidate options (decision alternatives). In order to *support* such decisions, it is important to identify and recognize relevant key issues of problem solving and decision making (Albers, 1996; Harris, 1998a, 1998b; Jacobs & Holten, 1995; Loch & Conger, 1996; Rumble, 1991; Sauter, 1999; Simon, 1986).

Sauter classifies four problem solving/decision making styles: (1) left-brain style, (2) right-brain style, (3) accommodating, and (4) integrated (Sauter, 1999). The *left-brain style* employs analytical and quantitative techniques and relies on rational and logical reasoning. In an effort to achieve predictability and minimize uncertainty, problems are explicitly defined, solution methods are determined, orderly information searches are conducted, and analysis is increasingly refined. Left-brain style decision making works best when it is possible to predict/control, measure, and quantify all relevant variables, and when information is complete. In direct contrast, *right-brain style* decision making is based on intuitive techniques—it places more emphasis on feelings than facts. *Accommodating* decision makers use their non-dominant style when they realize that it will work best in a given situation. Lastly, *integrated style* decision makers are able to combine the left- and right-brain styles—they use analytical processes to filter information and intuition to contend with uncertainty and complexity.

When selecting one artifact from among many candidate artifacts (i.e., solving a selection problem), one must first identify assumptions that establish selection boundaries. Assumptions provide a framework that limits and simplifies a problem and reflect values that should be maintained in the solution (Harris, 1998b). Once delineated, a problem must be represented in a manner that facilities its solution (Albers, 1996; Jacobs & Holten, 1995; Simon, 1986). According to Simon (1986), the representation of a problem influences the quality of the solution found. Harris (1998b) and Sauter (1999) suggest that models are used to present problems in ways that allow people to understand and solve them: by seeing a problem from a different perspective it is often easier to gain the insight necessary to find a solution. Models can represent problems visually, physically, mathematically, or metaphorically (Harris, 1998b). A *decision matrix* (mathematical model), for example, enables a problem solver to "*quantify subjectivity*" (Harris, 1998b) and ensure that all criteria are taken into account to the desired degree. Once modeled, a problem is solved by deciding between different solutions. Making a decision implies that there are a number of choices to be considered and the principal aim should be to choose the one that best fits with identified goals and values (Albers, 1996; Harris, 1998a; Jacobs & Holten, 1995).

Decisions are made within decision environments—that is, the collection of information, options, values, and preferences available at the time of the decision. Decision making is the process of sufficiently reducing (it would not be feasible to eliminate) uncertainty and doubt about the options to allow a reasonable choice to be made from among them. This stresses the importance of the information-gathering function of decision making (Harris, 1998a; Sauter, 1999) and of identifying different options. Decision makers typically tend to seek more information than is required to make a good decision (Harris, 1998a) which, in turn, often leads to: (a) delay in the decision given the time required to collect and process the extra information—the effectiveness of the decision is ultimately impaired; (b) information overload which leads to a decline in decision making ability; (c) selective use of information to support preconceived solutions; (d) mental fatigue which returns slower and poorer quality work; and (e) decision fatigue which typically results in careless decisions or even decision paralysis (Harris, 1998a). Decision options are typically rated according to the degree to which they meet identified criteria and, in essence, it is these criteria that determine the information that needs to be collected for each candidate option.

Several strategies for decision making have been documented—for example, optimizing and satisficing (Harris, 1998a; Simon, 1986). *Optimizing* involves identifying as many different options as possible and choosing the best. How thoroughly this can be performed depends on the importance of the problem, the time available for solving it, availability of resources and knowledge, and the value or desirability of each outcome. *Satisficing*, on the other hand, centers around a process of goal adjustment and trade-offs whereby lower-level goals are substituted for maximized goals such that the first satisfactory, rather than the best, option is selected. Although perhaps ideal, optimized decision making often proves to be impracticable and, in reality, satisficing is often used.

Decisions can be good or bad. A *good* decision is logical, based on available information, and reflects context-sensitive values set for the problem solution (Beynon, Rasmequan, & Russ, 2002; Harris, 1998a). A *bad* decision, on the other hand, is based on inadequate information and does not reflect intended values (Harris, 1998a). The quality of a decision is not necessarily reflected in its outcome—a good decision can have either a good or a bad outcome; a bad decision can still benefit from a good outcome. Decision quality is judged according to whether or not the decision (a) meets the objectives as thoroughly and completely as possible, (b) meets the objectives efficiently with concern for cost, energy, and side effects, and (c) takes into account valuable bi-products or indirect advantages (Harris, 1998a).

To achieve a good decision, it is essential that the context for which the decision is being made is considered during the decision making process. The choice that might perhaps be obvious to a decision maker might not function in the ultimate environmental context due to cost, time, and/or lack of acceptance. Problem solving and decision making changes when an individual is asked to assume an organizational role to make a decision not for himself, but for others. In these circumstances, decision makers are required to adapt their goals and values to their responsibility (Simon, 1986)—the decision context. Without an adequate model of the defining context, decision makers are prone to reverting to their individual preferences and goals (Lumsden, 2004). It is therefore important to identify and adequately model the context of use for the selected artifact so that it can be considered when rating candidate artifacts against selection criteria during the decision making process. Additionally, by identifying the context-sensitive criteria to be considered during the decision making process, it may be possible to focus information-gathering for artifact selection and thereby potentially prevent the hazards of excess information discussed previously.

When an artifact is being selected for use by *people*, a selection decision must always be made in light of the characteristics of the people who will be required to use the artifact (Harris, 1998a); those who must use the selected artifact must accept it if it is to be used effectively and efficiently. Acceptance is critically important in problem solving—an artifact that only reflects the preferences of the evaluator or decision maker may be "*sociologically stupid*" with respect to the anticipated artifact users and would, therefore, not represent a good decision (Simon, 1986). To increase acceptance of a selected artifact within a specific context of use, the people who will have to use the selected artifact should be considered when making the decision. Acceptance is further increased if the drawbacks of the selected artifact are outlined in addition to the projected benefits—users are more likely to accept a decision if they understand the risks and believe that they have been given due consideration (Harris, 1998a; Rumble, 1991). A good quality artifact selection decision, based on identified criteria and context of use, should be adequately substantiated to make the presentation of these facts possible (Sauter, 1999). In relation to this, there needs to be a mechanism by which to record this context during the selection process, and to explicitly represent its influence over the suitability of any given artifact.

Decision Support Systems

Over the last 40 years, computer-based systems known as decision support systems (DSS) have increasingly been developed to support (typically managerial (Arnott & Pervan, 2005)) decision makers (Eom & Kim, 2006). Often using models, such systems typically focus on effectively facilitating the decision process (rather than its efficiency) and can be used to solve problems with varying levels of structure (Arnott & Pervan, 2005; Eom & Kim, 2006). A model-driven DSS is, by definition,