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MANAGEMENT DECISION MAKING

A major concern in management has been to understand and improve decision making. Various approaches have been proposed by psychologists, most based on a "divide-and-conquer" strategy. This strategy – also labeled "problem decomposition" – involves breaking a large decision problem into smaller parts. The idea is not new: In a "Letter to Joseph Priestly," Benjamin Franklin was one of the first to describe a decomposition strategy.

The theoretical justification for this approach was outlined by Simon (1957) in his account of "bounded rationality." This concept says that cognitive processing limitations leave humans with little option but to construct simplified mental models of the world. As Simon (p. 198) put it, a person "behaves rationally with respect to this model . . . (although) such behavior is not even approximately optimal with respect to the real world."

There have been two approaches to management decision making (Huber, 1980). The first is concerned with development and application of normative decision rules based on formal logic derived from economics or statistics. The second involves descriptive accounts of how people actually go about making judgments, decisions, and choices.

NORMATIVE ANALYSES

As initially outlined by von Neumann and Morgenstern (1947) in *Theory of games and economic behavior*, a variety of techniques have been derived for making optimal decisions. A distinction is often drawn between riskless (certain outcomes) choices and risky (uncertain outcomes) choices. Two examples of each approach are outlined here.

Certain Outcomes

Multi-Attribute Utility. This approach, abbreviated MAU, applies to decisions made with more-or-less certain outcomes. As described by Gardiner and Edwards (1975), MAU involves obtaining a utility value for each decision alternative and then selecting the alternative with the highest value. The utility for an alternative is derived from a weighted sum of separate part utilities for various attributes. The MAU approach has been successfully applied to management decisions such as new plant sitings, personnel selection, and zoning decisions.

Linear Models. Initially based on multiple-regression analyses, linear models have been used both to prescribe and to describe judgments under certainty. A major concern has been the weights assigned to the cue (or attribute) values. Research has shown that equal weights, or even random weights, do as well as optimal weights in many settings. The robustness of linear models has allowed their use in many applied tasks, such as graduate school admissions, clinical diagnosis, and medical decision making (Goldberg, 1970).

Uncertain Outcomes

Decision-Tree Analysis. "A decision tree is a graphical model that displays the sequence of decisions and the events that comprise a (risky) sequential decision situation" (Huber, 1980, p. 118).

The approach involves laying out choice alternatives, uncertain events, and outcome utilities as a series of branches (hence the name "decision tree"). For each alternative, an expected value (EV) is computed as the average outcome value over all possible events. The optimal choice is then the alternative with the highest EV. Decision trees have been used to guide risky decision making such as marketing strategy, plant expansion, and public policy planning.

Bayesian Networks. This approach combines elements of Bayesian probability theory, artificial intelligence, and graphical analysis into a decision analytic tool (Breese & Heckerman, 1999). Starting with a "fully connected" network, all possible cause -and-effect linkages between nodes for a problem space are described. Through a process of "pruning" using computer algorithms, the structure of the network is simplified to essential links between nodes. This results in an enormous reduction of problem complexity. The approach is being used to diagnose computer programming errors and to anticipate trouble spots around the world.

DESCRIPTIVE ANALYSES

Most, but not all, descriptive analyses of decision making were initially concerned with accounting for the discrepancies between normative rules (e.g., EV) and actual behavior. For instance, Edwards (1954) modified EV by substituting subjective probabilities for objective probabilities and psychological utilities for payoff amounts to produce Subjectively Expected Utility (SEU). This model has become the starting point for descriptions of risky decision behavior. However, many other approaches have been offered by psychologists.

Social Judgment Theory (SJT)

Based on the "Lens Model" proposed by Brunswik (1952), Hammond (1955) developed a comprehensive perspective on judgment and decision making. By adapting procedures from multiple regression, this approach combines elements of both normative and descriptive analyses into a single framework. Central to SJT is the distinction between analytic and intuitive modes of cognition. The approach has been used to describe decisions by highway engineers and medical doctors (Cooksey, 1996).

Information Integration Theory (IIT)

Analyses of the psychological combination rules used to combine information from multiple sources reveals that people often average stimulus inputs when making judgments. Anderson (1996) has shown repeatedly that an averaging rule is more descriptive than the adding or summing rule assumed in normative models (such as MAU). Through Functional Measurement, IIT leads to the simultaneous evaluation of processing strategy and psychological values. The IIT approach has been applied to marketing decisions, family choices, and expert judgments (Phelps & Shanteau, 1978).

Image Theory

As described by Beach (1990), "image theory views the decision maker as possessing three distinct but related images, each of which comprise a particular part of his or her decision-related knowledge" (p. 3). The *value image* consists of the decision maker's values, beliefs, and ethics that collectively are labeled *principles*. The *trajectory image* consists of the decision maker's future agenda (or *goals*). And the *strategic image* consists of various *plans* that have been adopted

to achieve the goals. Using these concepts, image theory has been applied to auditing, childbearing, and political decisions.

Heuristics and Biases

Tversky and Kahneman (1974) have argued that decisions are often made using psychological shortcuts or "heuristics." For instance, the "representativeness" heuristic refers to a tendency to make probability judgments based on the similarity of an event to an underlying source; the greater the similarity, the higher the probability estimate. Although easy to do psychologically, such heuristics often lead to "biases" in that relevant information, such as base rates, may be ignored. This approach has been used to account for suboptimal decisions in accounting, management, and marketing.

Fast and Frugal Heuristics

Simon (1957) developed "bounded rationality" to deal with two interlocking components: the limitations of the human mind, and the structure of the environment in which humans operate. For instance, "satisficing" (selecting the first option that meets acceptable standards) is a cognitively simple, but often surprisingly efficient decision strategy. These ideas have been extended by Gigerenzer and Todd (1999) to apply to various simple "fast and frugal" heuristics that take advantage of environmental constraints. These heuristics have been applied to help decision making in medicine and forecasting.

Naturalistic Decision Making

This perspective was developed by Klein (1993) to account for on-line decision making by experts in time-sensitive environments. In situations such as fire fighting, there is not enough time to apply normative choice rules. Instead, experienced decision makers frequently follow a "recognition-primed decision making" strategy – they identify a single course of action through pattern matching. The NDM approach has been applied in many real-world decisions, ranging from military commands and intelligence analysis to medical diagnosis and accounting.

Expert Decision Making

Behind much of the advances in decision research has been the need for psychologists to help professionals make better decisions. For instance, considerable effort has been extended to understand how clinical psychologists make decisions (Dawes, 1988). Although such analyses often reveal that experts are biased in their decisions, there are many domains in which surprisingly good decisions have been observed. For example, weather forecasts were reported by Stewart, et al. (1997) to make reliable and valid short-term predictions of precipitation and temperature. Similarly, auditors were found by Krogstad, et al. (1984) to have an effective grasp of what information to use in assessing the accuracy of accounting statements.

CONCLUSIONS

Using both normative and descriptive approaches, there have been many successful applications of behavioral decision theory in management, business, and other settings. In large part, these successes reflect the importance of Ben Franklin's original insight into problem decomposition: Decision making can usually be improved by breaking a problem into parts, working on the parts separately, and then combining them to make a final decision.

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