

Decision Analysis

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Decision Analysis (DA) is the discipline comprising the philosophy, theory, methodology, and professional practice necessary to address important decisions in a formal manner. Decision analysis includes many procedures, methods, and tools for identifying, clearly representing, and formally assessing important aspects of a decision, for prescribing a recommended course of action by applying the maximum expected utility action axiom to a well-formed representation of the decision, and for translating the formal representation of a decision and its corresponding recommendation into insight for the decision maker and other stakeholders.

History and Methodology

The term decision analysis was coined in 1964 by Ronald A. Howard, who since then, as a professor at Stanford University, has been instrumental in developing much of the practice and professional application of DA.

Graphical representation of decision analysis problems commonly use influence diagrams and decision trees. Both of these tools represent the alternatives available to the decision maker, the uncertainty they face, and evaluation measures representing how well they achieve their objectives in the final outcome. Uncertainties are represented through probabilities and probability distributions. The decision maker's attitude to risk is represented by utility functions and their attitude to trade-offs between conflicting objectives can be made using multi-attribute value functions or multi-attribute utility functions (if there is risk involved). In some cases, utility functions can be replaced by the probability of achieving uncertain aspiration levels. Decision analysis advocates choosing that decision whose consequences have the maximum expected utility (or which maximize the probability of achieving the uncertain aspiration level). Such decision analytic methods are used in a wide variety of fields, including business (planning, marketing, and negotiation), environmental remediation, health care research and management, energy exploration, litigation and dispute resolution, etc.

Decision analysis is used by major corporations to make multi-billion dollar capital investments. In 2010, Chevron won the Decision Analysis Society Practice Award for its use of decision analysis in all major decisions. In a video detailing Chevron's use of decision analysis, Chevron Vice Chairman George Kirkland notes that "decision analysis is a part of how Chevron does business for a simple, but powerful, reason: it works."

Controversy

Decision researchers studying how individuals research decisions have found that decision analysis is rarely used. High-stakes decisions, made under time pressure, are not well described by decision analysis. Some decision analysts, in turn, argue that their approach is prescriptive, providing a prescription of what actions to take based on sound logic, rather than a descriptive

approach, describing the flaws in the way people do make decisions. Critics cite the phenomenon of paralysis by analysis as one possible consequence of over-reliance on decision analysis in organizations.

Studies have demonstrated the utility of decision analysis in creating decision-making algorithms that are superior to "unaided intuition". Some areas within decision analysis deal with normative results that are provably optimal for specific quantifiable decisions. For example, the optimal order scheduling in a manufacturing facility or optimal hedging strategies are purely mathematical and their results are necessarily provable. The term "decision analytic" has often been reserved for decisions that do not appear to lend themselves to mathematical optimization methods. Methods like applied information economics, however, attempt to apply more rigorous quantitative methods even to these types of decisions.

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