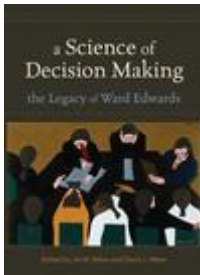


A Towering Figure in the Science of Decision Making

A review of



A Science of Decision Making: The Legacy of Ward Edwards

by Jie W. Weiss and David J. Weiss (Eds.)

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Reviewed by

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For 50 years the study of decision-making behavior was inspired and guided largely by one man. Ward Edwards is perhaps not well known to many psychologists, but his influence on everyone studying decision processes has been extensive. His broad interdisciplinary interests, and a commitment to solving real-world problems rather than building theories, may have limited his visibility to psychologists in general. Nevertheless, in a series of articles published since 1954, he initiated many developments in an area that grew in importance during his lifetime.

Two of his most recent colleagues, Jie and David Weiss, have published a collection of 29 of his most significant publications. They have added 7 new articles stemming from work he was actively engaged in at the time of his death in 2005. Their notes, as well as three obituaries written by former students and colleagues, explain the motivation underlying

his research. They also fill in the picture of Edwards as a person—energetic and dynamic, someone who loved an intellectual challenge as much as he loved good food and wine. He was known to everyone simply as Ward, and that one name still serves to identify him.

Why would anyone want to read a collection of someone's articles, some more than 40 years old and most of which can be found in other sources? Primarily because they are still worth reading, and having them available in one collection is very helpful. Knowing what inspired the articles gives them an added significance, and many of the older articles afford insights into topics that are central to the study of decision making today. The writing style is always elegant and witty. While technical language is essential for topics that are treated with mathematical precision, the technical details are accompanied by readily accessible explanations. In this review I can point to two or three of the most important articles, but all of the selections in *A Science of Decision Making: The Legacy of Ward Edwards* contain ideas that are valuable today.

Articles That Established the Agenda for Research

One can trace the origin of psychological research on decision making to a 1954 article on the theory of decision making. In this article, the first of the volume, Edwards takes the formal prescriptive models of statistical game theory and expresses them as testable, descriptive models of human behavior. More than 10 years before the so-called cognitive revolution in psychology, the article provides a model for the cognitive approach—formal models postulating unobservable constructs (utility and subjective probability) that can be quantified through well-defined measurement procedures, leading to testable hypotheses. The article still serves as a sound introduction to the topic.

His interest in statistical decision theory led Edwards to adopt the Bayesian view of statistics that was beginning to emerge at the time. When one of his students, Harold Lindman, took a course in Bayesian statistics from L. J. Savage, Edwards was inspired to work with Lindman and Savage on another groundbreaking article that introduced Bayesian ideas to psychologists. Their thesis was that traditional methods of hypothesis testing, based on assessments of the probability of data given a fixed hypothesis, provide “a misleading answer to a question which no-one is asking” (Novick & Jackson, 1974, p. 245). Traditional methods are constrained by defining probability to be the limit of a relative frequency. By defining probability instead as a degree of belief and using Bayes's theorem to assess the diagnostic value of the data, one can calculate the probability that the hypothesis of interest is true—the real question of interest.

A small number of people (I was one of them) were converted by the arguments in this article. For many years we found that persuading others to adopt a Bayesian view was a difficult sell. Gradually, though, the notion has been spreading that traditional methods are

too easy to misunderstand and misuse and Bayesian procedures provide a more rational approach to making inferences. The 1963 article is unsurpassed as an explanation of the Bayesian viewpoint. The reprinting of this article alone justifies the publication of this volume.

An exploration of Bayesian inference inevitably leads to psychological questions about human judgment processes and the degree to which they match the prescriptions of Bayes's theorem. Research on the topic was initiated in a 1966 article with Larry Phillips in which Edwards introduced the concept of *conservatism*, the tendency to underestimate the diagnostic value of probabilistic evidence. As a theoretical construct, conservatism did not emerge as an important principle, but it was the origin of a more general concern with probabilistic information processing. It also prompted Edwards to consider the practical implications of his research, which he used to guide the development of decision-aiding devices that might help people evaluate uncertain evidence. He promoted applications of his areas such as medical diagnosis and military intelligence.

Here we see also the impact of his ideas on mainstream cognitive psychology. Although he showed little interest in the broader theoretical implications of his research, some of us tried to point out the connections (Pitz, 1970). Two others working with Edwards at the time, Amos Tversky and Daniel Kahneman, began a program of research on judgment and decision making (Tversky & Kahneman, 1974) that has had a major impact on many areas of psychology and eventually led to a Nobel Prize for Kahneman.

It is interesting to note that, while taking credit for initiating Tversky and Kahneman's research program on heuristics and biases, Edwards was never enthusiastic about it. In a 1983 article he tried to debunk their emphasis on errors of judgment. He rejected the notion that humans are fundamentally irrational. He argued that too much of the research used unrepresentative tasks and that the findings simply do not apply to the judgments of experts. In this way, he anticipated many of the criticisms that Tversky and Kahneman's research elicited from others later on.

Meanwhile, though, Edwards had moved on to other interests. When Howard Raiffa and Ralph Keeney developed the formal mathematics of multiattribute utility theory (MAUT; see Keeney & Raiffa, 1976), he saw its relevance to important practical problems of decision making. In 1975 he published an article with Peter Gardiner showing how valuable MAUT can be in resolving conflicts among decision makers with opposing sets of values. Much of his subsequent research was directed at the practical problems of decision support in areas such as government policy decisions, and educational, military, and medical decision making.

MAUT offers many advantages for decision makers facing difficult decisions. Many of Edwards's later articles were concerned with the practical difficulties of using MAUT to reconcile conflicts among stakeholders and to quantify values for single stakeholders. His goal was to develop procedures that could be used by decision makers who were not experts in the arcana of mathematical decision theory. This work culminated in a 1994 article with

Hutton Barron describing SMARTER, a simple method for multiattribute measurement that can be used by almost anyone.

I cannot help but see in the Edwards and Barron article both the strengths and weaknesses of Edwards's overall approach to the study of decision making. Above all, he is concerned with improving the decision-making process, whether it be in decisions made by top-level military officials, in diagnoses made by physicians, or in the everyday choices made by all of us. He knew that there are ways to help people make these decisions. Broader questions about the psychological processes, though, are of secondary interest. What is it about the judgment process that enables SMARTER to work so well? In a sense, it doesn't matter; it suffices to know that it does. But the science of psychology will advance if we know the answer to questions of this sort. Edwards left this issue to others to investigate.

The Legacy

While a commemorative volume can capture much of what Ward Edwards had to offer to the science of decision making, it still misses some of his most important contributions. For example, from 1962 until shortly before his death, Ward hosted the so-called Bayesian Research Conference, at which anyone with an interest in decision making was invited to present his or her ideas for critical discussion. Probably no other professional group represented a broader array of interdisciplinary expertise than did that conference. There was no better way to test ideas than expose them to Ward's friendly but incisive comments and the feedback of other experts from every area of decision making.

The newly published articles that have been included in this volume illustrate the breadth of his interests in the practical problems of decision making. David and Jie Weiss provide an analysis of the problem of evaluating evidence that might be used for evidence-based medical and other decisions. Other articles discuss a variety of everyday decisions, including adolescents' choices to take up smoking, lifestyle decisions concerning diet and exercise, and "bird-in-the-hand" decisions such as those that arise with job offers.

Inspired by his studies of conservatism, Ward developed a procedure for assessing the diagnostic value of information that he referred to as PIP (probabilistic information processing), which he considered far superior to global, post hoc judgments of probabilities (POP, or posterior odds processing). On the way to his Bayesian conference one year, I saw a convertible with the license plate PIP POP. I was disappointed to find that it was not Ward's, for nothing captures better his standing in the decision research community.

The economic bad news of recent months has given additional significance to his contributions to behavioral decision theory. Commentator David Brooks recently wrote,

This financial crisis is going to amount to a coming-out party for behavioral economists and others who are bringing sophisticated psychology to the realm of public policy. At least these folks have plausible explanations for why so many people could have been so gigantically wrong about the risks they were taking. (Brooks, 2008, p. A31)

Ward would agree. He would take pride in his own role in initiating this development, and he would be working vigorously to refine procedures that would improve the decision-making skills of investors, managers, regulators, and everyone else.

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