

“Don’t Take Gurus Too Seriously”: Review of J. W. Weiss and D. J. Weiss (2009), *A Science of Decision Making: The Legacy of Ward Edwards*, Oxford University Press, 536pp, \$79.50, ISBN: 978-0-19532-298-9

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Who is Ward Edwards? If you are interested in decision-making, you probably recognize the name. What may be less obvious is the extent to which his contributions have influenced research on decision-making. He worked for more than fifty years on normative, descriptive, and prescriptive theories of decision-making. This edited book by Jie and David Weiss goes a long way towards helping the reader realize the impact of Edwards’ work on decision research. The large collection of papers included, together with the concise and well-written introductions of the editors, combine into a coherent volume that gives a comprehensive view of his work.

Two themes of Ward Edwards’ work, I argue in this review, still dominate decision research today: First, a normative theory of decision-making is used as a point of departure for asking questions about the descriptive and prescriptive theories. Second, normative theories are founded on (i) the use of all available information (the more-is-better maxim), and (ii) the making of tradeoffs. Throughout this collection, Edwards emerges as a guru of the normative, descriptive, and prescriptive aspects of more-is-better and tradeoff making. Yet, I point out that he himself wisely urged researchers: “Don’t take gurus too seriously” (Edwards, 1999). What can this quote mean for today’s mathematical modeling of decision-making? Before speculating on that, let us first discuss the collection.

1. The Collection

The book includes 35 papers, of which 22 are journal articles, six are book chapters, and seven have been written specifically for this volume. There are also three obituaries written by close associates of Edwards. Among the journal articles, there are some that are considered to be very important for decision research. The editors single out four that they call seminal: Edwards’ 1954 article that introduced economic theories of decision making to psychologists, an 1961 review where Edwards coined the term “behavioral decision theory”, a 1963 methodological piece co-authored with L. J. Savage (and Harold Lindman) where Bayesian inference was proposed as a tool for psychological research, and an empirical article published in 1966 with Lawrence Phillips where peoples’ ability to apply Bayes’ rule was investigated. Another well-known article in the collection is a 1962 conceptual piece on dynamic decision theory that also discussed mathematical methods, such as dynamic programming, for making sequential decisions. These five articles are worth reading for any student of decision-making.

The comments of the editors help to put the articles in the collection into a historical context. Already in the Introduction, we learn that Edwards was trained in perception. Consistently, when later he worked on decision-making, he expressed the conviction that strength of preference can be assessed by directly asking the subjects, just as it is done with sensory judgments in psychophysics. We also learn that Edwards’ father was an economist and Edwards himself, while a graduate student at Harvard in the late 1940s/early 1950s, heard from renowned statistician Frederick

Mosteller about expected utility theory. Presumably, it was then a small step for Edwards to propose as a research question for psychologists if human decision-making can be described by expected utility theory. On the Ann Arbor campus, Edwards became fascinated by the Bayesian approach to probability in the 1960s and developed a connection with Savage, a statistician who was then becoming renowned. Edwards' interest in how to improve human decision-making started in the 1960s and this interest helped launch what is still today the bread and butter of many researchers in reasoning, judgment, and decision-making: Introducing a book chapter written by Edwards in 1983, the Weisses, humorously and accurately, write that "In this remarkable short essay, Ward both apologized and took credit for the heuristics and biases research tradition" (p. 215). Finally, the editors see Edwards' insistence on testing models against each other, not against a null hypothesis, as having "opened the door" for the research on model selection (p. 203), since some years a popular theme in mathematical psychology and beyond.

Jie and David Weiss also feature as co-authors in a number of papers that are meant to represent the kind of projects Edwards was working on at the end of his career. These projects investigate the limits and attempt to stretch the applicability of (multi-attribute) utility theory from what Savage called "small worlds" (e.g., choices between lotteries with known outcomes and probabilities) to more challenging and ill-structured life decisions (e.g., regarding one's health).

Edwards was a prolific writer. Beyond the articles I have already alluded to, I would like to point out two more articles that not so many researchers seem to be familiar with (judging from numbers of citations in the *Web of Science*) and are included in the collection. Pages 234 to 245 present a rare exercise in which Ward Edwards discusses with David Schum and Robert Winkler the applicability of the likelihood principle of Bayesian inference when pieces of evidence are evaluated sequentially. One can only admire here the witty and clear writing of Edwards and his co-authors. Pages 422 to 438 summarize his approach on how to help people make better decisions, developed over his forty years of theorizing and practicing. With Barbara Fasolo, they make the bold prediction that "decision tools will be as important in the 21st century as spreadsheets were in the 20th".

Finally come the obituaries. They literally shout out at the reader what an experience it must have been to know and work with Ward Edwards. Lawrence Phillips (pp. 490-494) paints an especially vivid picture of Edwards as a mentor who "was a listener, working hard at trying to understand colleagues and students". Apparently, Edwards was so appreciated by his students that they wrote a letter of support for his tenure case at the University of Michigan when this seemed threatened by his "occasional colorful and forthright behavior". How many of us expect our students to do the same?

In the next three sections of this review, I will focus on three papers that are not included in the Weisses' collection. These papers are a point of departure for arguing that some themes central in Edwards' research still dominate decision research today (Sections 2 and 3), and for speculating on how decision researchers can follow Edwards' own calling not to take gurus like him, and their theories, too seriously (Section 4).

2. From Normative to Descriptive and Prescriptive Theories

It is said that Henry Poincare was the last person who had all then existing areas of mathematics under his province. If the main aspects of decision theory are the

normative, descriptive, and prescriptive ones, then Ward Edwards may well turn out to be the last person who owned decision theory.

Bell, Raiffa, and Tversky (1988) provide definitions of the normative, descriptive, and prescriptive theories of decision-making. For our purposes here, the normative theory specifies a mathematical model according to which an ideal person should make decisions; the descriptive theory explains how a real person makes decisions; and a prescriptive theory suggests a structured process according to which a real person should make decisions. Oversimplifying, the normative theory is a topic of mathematics and statistics, the descriptive theory is a topic of psychology and cognitive science, and the prescriptive theory is a topic of management and engineering.

After inspecting the professional positions that Edwards held, the awards he received, and the papers he published, it becomes obvious that he was very well versed in all three theories of decision-making. At Michigan, he directed the laboratory of engineering psychology and was involved in the mathematical psychology program; he received the Frank P. Ramsey award from the *Operations Research Society of America*; and his papers were published in journals such as *IEEE Transactions on Systems, Man, and Cybernetics*, and *Journal of Mathematical Psychology*.

So, how did Edwards do it? How did he generate normative and descriptive ideas? My hypothesis is that he first identified a normative theory developed in a discipline with a formal bent (e.g., mathematics, applied probability, statistics) and then proposed to investigate if people reason or decide according to this normative theory. His two major empirical research programs involve two of the cornerstones of the mathematics of decision-making—Bayes rule and expected value/utility. As said above, in 1954 and 1961, Edwards suggested that psychologists study peoples' adherence to expected value and utility models (see also Phillips' comments on p. 490 of the collection); and later in the 1960s, together with his colleagues at Michigan, tested if people can apply Bayes rule properly.

Using his only publication in this journal, I make the case in more detail that Edwards used normative theories as a source of questions for descriptive theories. Edwards (1965) considered the problem of optimal stopping the search for information. In most of the paper, he presents the normative solution to this problem. At the end of the paper (pp. 327-328), Edwards moves to the descriptive question and speculates on how closely could people approximate the normative solution. What is remarkable here is not that he considers this question; it is, in a way, a question that could easily come to mind. What is remarkable is that Edwards takes it *for granted* that this is a good question to ask. After the fact, one only needed to have read the title of the paper to guess that this was coming: "Optimal strategies for seeking information: Models for statistics, choice reaction times, and human information processing". This title almost says that it is a good research question to ask if the normative model and the descriptive model are the same optimal strategy.

This argument can also be made for Edwards' prescriptive theories. The aim of Edwards' decision technology (as in the Edwards and Fasolo paper) is to help people to make decisions according to Bayes rule and subjective expected utility theory. He is sure that this is the right thing to do. In Vlek (1984), Edwards writes: "No principle other than maximizing SEU deserves a moment of consideration".

The practice of taking a mathematically optimal model of a task as a source of inspiration for asking questions about what people do in that task is very much alive today in decision research. For example, Jerry Busemeyer and Tim Pleskac (2009)

edited in this journal a special issue on dynamic decision theory. Optimal control tools that have been developed in electrical engineering and computer science, such as Markov decision processes, are introduced and it is asked if they “match the way humans make decisions” (p. 126).

I am not making a value judgment on the systematic move from normative to descriptive and prescriptive theories; I just pointed out Edwards’ early use of this practice. Gigerenzer (1991) discussed a related practice, wherein methodological tools (e.g., analysis of variance) are a source of inspiration for descriptive theories of cognitive psychology. I believe that any evaluative account of the practice would need to struggle with the relative merits of “top-down” and “bottom-up” approaches to studying psychology. For decision research, some authors, such as Lopes (1986), have complained about starting psychological research from the properties of a model: “Human decision-making is rarely studied in its own right. Instead we study models”.

3. More-is-Better and Tradeoff Making

In 2007, Edwards edited posthumously a volume on the foundations and applications of decision analysis, with his long-time student and collaborator, Detlof von Winterfeldt, and Ralph Miles Jr. In the introduction to this volume, the three editors write (p. 5, emphasis added): “the traditional expected value model, the expected utility model of von Neumann and Morgenstern (1947), and the subjective expected utility model of Savage (1954) are the *dominant normative models* of rational choice”. This statement is as true today as it has been since Edwards brought these models to the attention of psychologists and pioneered their study. This is a major way in which the themes of Edwards’ work have influenced today’s decision research.

Utility-type normative models implement two principles (Katsikopoulos & Gigerenzer, 2008): they advocate that (i) all available information be used for making decisions (the *more-is-better* maxim) and that (ii) *tradeoffs* be made (e.g., in expected value theory, for an outcome that yields a low gain with a high probability, the overall “worth” of the outcome is given by multiplying gain and probability). The two principles are at a first glance normatively appealing, expressing intuitive notions of what in philosophy is called epistemic responsibility (Bishop, 2000). But, starting from the 1970s and with more intensity in the last fifteen years, it has been demonstrated that more-is-better and tradeoff making do *not always* (i) describe what people do or (ii) lead to better decisions, as measured by externally given measures of performance such as accuracy (for a summary see Katsikopoulos & Gigerenzer, 2008, pp. 36-39).

The occasional descriptive failure of the principles of more-is-better and tradeoff making would not have been a surprise to Ward Edwards. What may have been a surprise is the prescriptive failure of the two principles, at least under some conditions. Edwards et al. (2007) argue that utility models should be used in practice because they will lead to better decisions. It is not clear where this conviction is based on: The only arguments given have to do with the theoretical possibilities of “money pumps” and “Dutch books”, that is, of situations in which a person who violates axioms of expected utility theory is guaranteed to lose money. But it is clear that the statement that logical consistency always leads to external success in “real” decision problems should be evaluated empirically (Katsikopoulos, 2009).

We can then conclude that the theories of Ward Edwards, possibly *the* guru of decision making, may need to be revisited. In a very satisfying twist, however, it does seem that he would have been the first one to agree with this.

4. “Don’t Take Gurus Too Seriously”

In 1999, J. Shanteau, B. A. Mellers, and D. Schum edited a Festschrift for Ward Edwards. The last word (exactly so titled) in the book goes to Edwards himself. This short chapter reveals the strength of Edwards’ “research personality”. The chapter is wonderfully written and culminates, on p. 430, with a section called “Don’t take gurus too seriously”. There are some gems here as the advice to junior researchers to collaborate with the “best researchers or scientists available” but also to “make sure that they aren’t too senior”. The point of this section is that one should avoid getting entrenched into established ideas, especially if the ideas come from their favorite gurus. Reading the Weisses’ collection suggests that some main themes of decision research today—using the normative theories of statistics such as utility theory and Bayes rule as descriptive and prescriptive theories in psychology and engineering—are indeed ideas that we have inherited from decision gurus such as Ward Edwards.

This research strategy is heavily followed in the mathematical modeling of decision-making today. It is reasonable to ask for an alternative research program that explores mathematical decision models that are not an outcome of this strategy. It is all too predictable for me to suggest that recent research on simple heuristics affords such an opportunity, and that heuristics should be axiomatized, and also analyzed in a Bayesian framework (and some work like that has been done already), but then again, why not?

5. Buy this Book

Ward Edwards was a great personality of decision research. Two of his latter-day collaborators, Jie and David Weiss, put together a great collection of his work. It is a very informative and enjoyable book and I strongly recommend it to anyone interested in decision-making.

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