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Editor's Note

Just a reminder that we are eager to publish abstracts of all papers in the area of Decision Analysis, broadly conceived. The only requirements for our publishing an abstract of your work are:

1) That the paper itself be available for distribution upon request; and 2) that the abstract not exceed 200 words by much.

If there is a charge, please so indicate when you send your complete paper to the editor:

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Please phone or write in any changes in your activities or employment that could be of interest to our membership.
Please Note: Inform the ORSA business office of address changes; we get mailing labels from them! Thanks!

More News Inside

From the Chairperson

Approved at the Washington meeting of the DA SIG council was a plan to publish the newsletter on the following triennial schedule Sept. 1, Dec. 1, and March 1. It was also jointly agreed with the editor of the Judgment and Decision Making newsletter that both newsletters would go out to the

Winkler Steps Down as Departmental Editor - by Donald G. Morrison

After 7 years as the Decision Analysis Departmental Editor for Management Science, Bob Winkler will be retiring at the end of 1988. Bob will continue to process all manuscripts submitted through December 1988. We hope to have a new D.E. (or possibly Co-D.E.'s) by January 1989. Any suggestions for selecting Bob's successor or for the Department in general should be sent to: Donald G. Morrison, Editor-in-Chief, Management Science, Anderson School of Management, UCLA, 405 Hilgard Avenue, Los Angeles, CA 90024-1481. At your discretion you may also send copies of the correspondence to: Robert L. Winkler, Fuqua School of Business, Duke University, Durham, NC 27706. All letters should be mailed by October 15. The Decision Analysis area has grown rapidly over the last few years. Bob will be a tough act to follow. Your input will help us pick a worthy replacement and continue the current momentum. Keep those cards and letters coming.

Ward Edwards' Acceptance Speech

I am grateful to you, Ralph, for your extremely kind words, and to the SIG for the Ramsey Medal, the most important professional honor to which I have ever aspired. I feel especially honored because I join Howard Raiffa, Ron Howard, and Peter Fishburn, the three previous recipients. These three have been among my professional idols for most of my working life. Also, not many decision analysts, or others, are averse to $1,000 checks, and I am grateful not only to the SIG but to Applied Decision Analysis, Inc., Decision Focus, Inc., Decision Sciences Consortium, Inc., and Strategic Decisions Group, Inc., for making that aspect of this ceremony feasible.

The most remarkable feature of this event from my point of view is its accidental and lucky nature. Most careers probably look accidental and lucky to those who stumble through them; mine seems to me more so than most.

I first encountered risky decision making as a research topic in psychology while a graduate student in Experimental Psychology at Harvard. In a single week in 1948, I listened to Fred Mosteller report on his experiments done with Philip Nogee to apply von Neumann and Morgenstern's ideas about measuring utility, and also read a paper on level of aspiration by the psychologist Kurt Lewin and many of his famous students presenting a less mathematical version of those same ideas. I later learned that Lewin had been in the audience when von Neumann had given his famous lectures on game theory in Berlin in 1928. The similarity of these sets of ideas suggests that they trace to von Neumann by these two different routes. At any rate, the coincidence was more than enough for a brash graduate student looking for a thesis topic, especially with Mosteller's advice and financial support. I was off and running.
(cont'd. page 3)

Mike Rothkopf at Rutgers

Michael H. Rothkopf writes that he has accepted a joint professorship between RUTCOR (the Operations Research Center) and the Business School at Rutgers. Effective September 1, 1988 his new permanent office address is: RUTCOR: Rutgers Center for Operations Research, Hill Center for the Mathematcal Sciences, Rutgers University, New Brunswick, NJ 08903 and his office phone will be (201) 932-5632. If this is not answered, messages may be left at (201) 932-3079.

Chairperson (cont'd.)

combined address list once a year, Dec. 1. Start now to prepare your material for the Dec. edition. Please provide material about two weeks ahead to Irv LaValle who has done us a great service for these many years.

The following are cluster chairs for future meetings;
Vancouver, May 8-10, 1989, Robin Keller, UC-Irvine;
Osaka International TIMS, July 23-26, 1989, Ron Howard, Stanford;
New York, Oct. 30-Nov. 1, 1989, Don Kleinmuntz, MIT.
Please contact these individuals directly about invited sessions. After New York, everything is open. Contact me to volunteer your services and help shape the future of decision analysis. Detlof von Winterfeldt has organized the sessions for the Denver meeting Oct. 24-26, 1988. Note the two-session presentation by the four Ramsey medalists which precedes our SIG meeting on Monday afternoon.

An Idea For a Casebook: I have had many people describe to me how difficult it is to obtain a complete collection of good decision analysis teaching cases. Yet many of us may have a few favorites of our own that we would be happy to share. Perhaps it would create a casebook for SIG members. It could include classic readings on practice as well. Please contact me with your thoughts on this.
(cont'd. page 3)

As I understand it, the Ramsey award is made when there seems to be some consensus that a worthy recipient has been identified, not on any periodic basis. If you have a nominee, please send it to me with any comments on why this individual should receive the award. The SIG Council uses approval voting, and then preferential voting, if necessary, to choose a winner.

Acceptance Speech (cont'd.)

My next major piece of luck was being fired from my first post-PhD job teaching at Johns Hopkins. This led to my spending four years working for Arthur W. Melton at the Air Force Personnel and Training Research Center, first in Denver and then in San Antonio. Those four years taught me that there is a real world, that people make important decisions in it, and that the ideas of decision theory might help improve those decisions. Although I have lived in academia ever since, those years cured me of being an academic. They also led to a close, highly valued personal relation with Arthur W. Melton, a great psychologist and a great man. In 1958 he brought me to the University of Michigan.

Being at Michigan was the very embodiment of good luck. C. H. Coombs had created there a strong graduate program in Mathematical Psychology, ensuring a continuing flow of top-notch graduate and post-doctural students, many of whom are now eminent decision research or practitioners. Melton, Paul Fitts, William L. Hays, and I founded the Human Performance Center, which gave experimenters on decision processes a place in which to work. Perhaps most important, the Mathematics Department lured L. J. Savage from Chicago to establish a Bayesian-flavored statistics program, later to become a Department of Statistics. The resulting collaboration with Savage

helped to mature the process of specifying the research themes that cause me to be here now.

The late 1960's and early 1970's were a heady time for decision scientists. We knew we had something new and worth studying, and we believed it to have practical uses as well. Ronald A. Howard had coined the term decision analysis, Howard Raiffa had published a book with that title, and more and more of us were eager to put on-campus ideas to off-campus use. Several of the decision analysis consulting firms were founded in this period. Especially important in the transformation of decision analysis from an academic subspecialty to a profession was the sustained, brilliantly managed program of support for all kinds of decision analytic work provided by the Defense Advanced Research Projects Agency. That DARPA program was created and managed over most of its lifetime, by Dr. Austin W. Kibler, a modest man to whom we all owe a great debt.

Now, in the 1980's, decision analysis is well-established inside and outside academia. It serves well not only the U.S. but also most Western Europeon nations. A sympton of early maturity in intellectual disciplines is reproduction by fission, and that is now in progress. Some decision analysts serve businesses, some serve governments, some focus on medical decisions, some focus on management of risks and hazards. New topics and sites of application crop up in almost every new issue of the relevant journals that I scan. We even have a cadre of academic schismatics, forcefully arguing that the notions of probability and utility embodied in current decision-analytic practice are now outmoded and in need of revision.

We are fortunate to inhabit a lively, healthy, growing field. I thank its members for honoring me in this delightful way.

Abstracts Received

From **Rabikar Chatterjee**, Krannert Graduate School of Management, Purdue University, West Lafayette, IN 47907 and **Jehoshua Eliashberg**, The Wharton School, University of Pennsylvania, Philadelphia, PA 19104.

The Innovation Diffusion Process in a Heterogeneous Population: A Micromodeling Approach

A model of the innovation diffusion process is developed using a micromodeling Bayesian decision analytic approach that explicitly considers the determinants of adoption at the individual level and incorporates heterogeneity in the population with respect to initial perceptions, preference characteristics and responsiveness to information. The approach develops a parsimonious basis for segmenting potential adopters prior to product launch, in terms of their expected timing of adoption. When combined with a prediction of the nature and extent of the information that will be generated about the information over time, the model can provide a pre-launch forecast of the diffusion curve. A pilot application study is reported that outlines procedures for data collection and estimation of the individual-level parameters, and provides a preliminary test of the model.

The micromodeling approach yields a flexible diffusion model that provides a behavioral basis for explaining a variety of diffusion patterns. It can also be a powerful tool for managerial action, for example targeting the firm's advertising effort.

From **Rabikar Chatterjee**, Krannert Graduate School of Management, Purdue Univesity, West Lafayette, IN 47907; **Jehoshua Eliashberg**, **Herbert Gatignon**, and **Leonard M. Lodish**, The Wharton School, University of Pennsylvania, Philadelphia, PA 19104:

A Pratical Bayesian Approach to Selection of Optimal Market Testing Strategies

This paper presents a methodology and a personal computer-based decision tool for selection of optimal market testing strategies. A Bayesian decision theoretic framework is employed that (a) considers a continuous probability distribution, (b) allows for updating of alternative courses of action which are not being tested directly (relaxing the assumption of independence among test outcomes) and (c) incorporates explicitly managers' attitude toward risk. the goals of the methodology are to bring managers a practical, usable tool that will help support their design of market tests, and to obtain some insights into the market testing problem. An application of the methodology is presented to illustrate the potential of the model as a practical and easily implementable marketing decision aid. The analytical insights obtained from the model are employed to summarize the influence of the various characteristics of the alternative strategies on the value of a market test and the choice of the test strategy.

From **Michael P. Wellman**, MIT Laboratory for Computer Science, 545 Technology Square, Cambridge MA 02139:

Foundations of Qualitative Probabilistic Networks

Graphical representations for probabilistic relationships have recently received considerable attention in AI. Qualitative probabilistic networks abstract from the usual numeric representations by encoding only qualitative relationships, constraints on the joint probability distribution over the variables. Although these constraints are insufficient to determine probabilities uniquely, they are designed to justify the deduction of a class of relative likelihood conclusions that imply useful decision-making properties.

Two types of qualitative relationship are defined. Qualitative influences describe the direction of the relationship between two variables. Qualitatives synergies describe interactions among influences.

The probabilistic definitions chosen justify sound and efficient inference procedures based on graphical manipulations of the network. these procedures answer queries about qualitatives relationships among variables separated in the network and determine structural properties of optimal assignments to decision variables.

From **Michael P. Wellman**[1], **Mark H. Eckman**[2], **Craig Fleming**[2], **Sharon L. Marshall**[1], **Frank A. Sonnenberg**[2], and **Stephen G. Pauker**[2] [1 = MIT Laboratory for Computer Science, 545 Technology Square, Cambridge MA 02139; 2 = Department of Medicine, Tufts University School of Medicine, 750 Washington St., Box 302, Boston, MA 02111]:

Automated Critiquing of Medical Decision Trees.

We have developed a decision tree critiquing program (called BUNYAN) that identifies potential modeling errors in medical decision trees. The program's critiques are based on the structure of a decision problem, obtained from an abstract description specifying only the basic semantic categories of the model's components. A taxonomy of node and branch types supplies the primitive building blocks for representing decision trees. BUNYAN detects potential problems in a model by matching general pattern expressions that refer to these primitives. A small set of general principles justify critiquing rules that detect four categories of potential structural problems: impossible strategies, dominated strategies, unaccountable symmetry violations, and omission of apparently reasonable strategies. Although critiquing based on structure alone has clear limitations, principled structural analysis constitutes the core of a methodology for reasoning about decision models.

From **Patrick L. Brockett**, Dept. of Finance, The University of Texas, Austin, TX 78712:

Risk Aversion is not Aversion to Variance.

A common interpretation of investor risk aversion is that a risk averse investor will choose the less risky of two investment opportunities when faced with opportunities having the same expected return. Risk aversion is modeled by the decision maker's cardinal utility function having a negative second

derivative, and the less risk opportunity is designated to be the one with the smaller variance. This paper shows that this interpretation is wrong. For an <u>arbitrary</u> utility function U with $U' > 0$, $U'' < 0$ and $U''' > 0$, and an <u>arbitrary</u> set of moments μ and σ^2, we show how to construct a pair of random variables X and Y having equal means μ and for which Variance(X) = σ^2 > Variance(Y), but for which preference is reversed: $E[U(X)] > E[U(Y)]$. Thus, independent of the utility function or moment sequence involved, there are situations in which risk averters will opt for the <u>larger</u> <u>variance</u> when choosing between opportunities with equal expected returns.

From **Barry C. Arnold**, Dept. of Statistics, University of California, Riverside, CA; **Patrick L. Brockett**, and **John W. Dalle Molle**, Dept of Finance, The University of Texas, Austin, TX 78712:

<u>Debunking some Folklore about Utility Function Properties and Moment Preferences</u>.

A common folklore in the literature of decision making under uncertainty is that a positive third derivative for a decision maker's utility function is synonymous with the decision maker having a preference for more positively skewed investment choices when selecting between two ventures having equal means and variances. This paper shows that this folklore is wrong. Additionally, we show that the caveat "ceteris paribus" which is often added when addressing such beliefs of skewness preference is vacuous since we also show that the equality of the higher order moments implies <u>identity</u> between the distributions (and hence equal means of <u>all</u> order and also equal expected utility).

From **Irving H. LaValle** and **Youngsheng Xu**, A. B. Freeman School of Business and Department of Economics, Tulane University, New Orleans, LA 70118:

<u>Information Evaluation Under Nonadditive Expected Utility</u>.

We examine the choice-of-single-stage-experiment problem (Raiffa and Schlaifer, 1961) under the assumption that the decider's (weak) preference relation $\succeq$ satisfies Schmeidler's (1984) or Gilboa's (1987) axiomatization and is thus representable by a nonadditive expected-utility functional as a Choquet integral w.r.t. a monotone probability measure on events. The basic properties of information value, certainty equivalent of information cost, net gain of information, and optimal choice of experiment that obtain (LaValle, 1968) when $\succeq$ satisfies the Anscombe-Aumann (1963) or Savage (1954) axiomatizations continues to obtain in the more general Schmeidler-Gilboa context -- provided that there is no incentive to randomize the choice of experiment. When this proviso fails, information value can in general be assigned only to the set of available experiments.

From **Charles M. Harvey**, Dept. of Mathematical Sciences, Dickinson College, Carlisle, Pa 17013:

<u>Prescriptive Models of Psychological Effects on Risk Attitudes</u>

This paper discusses models of a person's risk attitude toward financial changes when his preferences depend on psychological effects of the changes, for

example, effects on how the person is judged by himself and by others. These models represent the risk attitude of a person who due to these effects is risk averse for outcomes involving gains or the status quo but is risk prone for outcomes involving losses or the status quo. The models are prescriptive in that they exclude the heuristic biases that are studied in behavioral decision theory. They are examined from the descriptive, prescriptive, and normative perspectives. In particular, they are shown to satisfy the principles of expected utility but to violate several other normative principles.

From **Yutaka Nakamura**, Institute of Socio-Economic Planning, University of Tsukuba, 1-1-1 Tennoudai, Tsukuba, Ibaraki 305, Japan:

Savage's Utility with Non-Additive Probabilities on Finite State Space.

Schmiedler-Gilboa's representation generalizes Savage's expected utility to cope with the Ellsberg paradox, so that the probability measure over states of the world need not be additive. This paper examines a similar generalization under Savage's formulation when the set of states is finite, while Savage's states are continuously divisible. Our axiomatization requires that the set X of consequences is infinite in contrast to Savage's arbitrary X. Three representational forms are axiomatized to give non-additivity, complementary additivity, and additivity of probability measures, respectively.

Expected Utility with an Interval Ordered Structure.

This paper examines an interval ordered structure under risk, and proves that it has an expected utility representation with a threshold function. In addition to the assumption of an interval order, two independence axioms and a strong Archimedean axiom are necessary and sufficient for the representation. The threshold is given by a nonnegative linear functional. We also explore a special structure which gives a nonnegative constant threshold function.

From **Peter C. Fishburn**, Room 2C-354, AT&T Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974:

Retrospective on the Utility Theory of von Neumann and Morgenstern.

This essay offers an exegesis of the passages in von Neumann and Morgenstern (1944, 1947, 1953) that discuss their conception of utility. It is occasioned by two factors. First, as we approach the semicentennial of the publication of Theory of Games and Economic Behavior, its immense impact on economic thought in the intervening years deserves serious reflection on its authors' ideas. Second, misleading statements about their theory continue to appear. This essay will have accomplished its purpose if it helps others appreciate the genius and spirit of the theory of utility fashioned by John von Neumann and Oskar Morgenstern.