DECISION-ANALYSIS NEWSLETTER

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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!

From the Chairperson

At the Los Angeles meeting, I had the pleasure of beginning my two-year term as the Chairperson of the Special Interest Group. The purpose of this letter is to ask for your suggestions and help in making the SIG professionally relevant and enjoyable to its members. there are three "regular" functions of the SIG: coordinating the decision analysis program at meetings, producing a newsletter, and recognizing contributions to decision analysis.

With regard to meetings, I would be interested in any suggestions for particular sessions or volun-

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Election Results

Congratulations to our newly elected Vice Chairperson/ Chairperson elect, Samuel E. Bodily, of the Colgate-Darden School, University of Virginia, Charlottesville, VA 22906 [804-924-7491], and to our new Council members: Robert T. Clemen, Dept. of Decision Sciences, College of Business Administration, University of Oregon, Eugene, OR 97403; and L. Robin Keller, Graduate School of Management, UC-Irvine, Irvine, CA 92717.

1986 Ramsey-Medal Presentation by David E. Bell and Rex V. Brown

Chairperson David Bell commenced the presentation:

"The Operations Research Society Special Interest Group on Decision Analysis has introduced an award known as the Frank P. Ramsey Medal, to honor people who have made distinguished contributions to the field of decision analysis.

"Along with the medal, the winner receives a check for $1,000 contributed again this year by the generosity of Decision Science Consortium.

"I'm honored to present the medal to Professor Ronald A. Howard of Stanford University. Through his technical publications, starting with his 1964 paper "Decision Analysis: Applied Decision Theory," to the present, he has influenced a great many people. In addition he has supervised over

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From the Chair (cont'd.)

teers of individuals to chair sessions. Innovative ideas for the productive use of time at meetings (e.g., special workshops) are welcome.

With regard to the decision analysis newsletter, Irving LaValle has done most of this major effort himself since the beginning of our SIG. Individuals who may wish to routinely produce a column or contribute in some other substantial way should be encouraged to contact Irv.

To date, the Frank P. Ramsey medal has been awarded twice to individuals who have made distingushed contributions to the field of decision analysis. The recepients have been Professor Howard Raiffa of Harvard University and Professor Ronald A. Howard of Stanford University. At the Miami meeting in October, we plan to have a student competition session for the Decision Analysis Student award. At the New Orleans meeting in May 1987, we plan to give a Decision Analysis Applications award for an outstanding application. Any members who have suggestions or contributions for any of these three awards should contact me.

The council and I are also interested in any creative suggestions for worthwhile activities. In this regard, we do have a small amount of funds available each year from our membership dues that the council could allocate to complement volunteer efforts. Our intent is to promote win-win suggestions where the volunteers spending the significant time definitely receive a benefit from their activity and the rest of the Special Interest Group also has the opportunity to benefit. One would expect the variety of such options might be great.

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Ramsey Presentation (cont'd.)

30 dissertations, and, I'm told, more than 50 of his former students regard decision analysis as their main professional activity.

"As a practitioner, and as a mentor to practitioners, Professor Howard has played a crucial role in the establishment of decision analysis as a leading growth area in operations research.

"This medal is a small token of our gratitude."

Dr. Rex Brown presented the check to Professor Howard with the following remarks.

"On behalf of Decision Science Consortium, Inc., I am happy to recognize your award of the Ramsey Medal for outstanding contributions to the field of decision analysis with our check for $1,000. Those of us who make a living in this business have a special reason to be grateful to you. More than anyone, you have established decision analysis as a thriving professional practice. Thank you, Ron, and congratulations."

Ronald A. Howard's Acceptance

"I would like to express my appreciation to the Special Interest Group on Decision Analysis for honoring me with the Ramsey medal. I thank Professor David Bell for his courtesy in arranging for and making the presentation. I also thank Dr. Rex Brown of the Decision Science Consortium for the cash prize that accompanies the honor.

"I have many others to thank for their contribution to this honor. First, I thank the late professor George E. Kimball. He served as my mentor as a young professional in the Operations Research Group of Arthur D. Little, Inc., and

(cont'd. page 3)

St. Louis-Fall 1987

Robert F. Bordley, SIG session planner for the St. Louis meeting (Oct. 26-28, 1987), writes that anyone interested in chairing a Decision Analysis session at this meeting should call him at (313) 575-3025.

Miami-Fall 1986

For the ORSA/TIMS meeting in Miami Beach, Oct. 27-29, 1986, Sam Bodily has organized a rich slate of Decision Analysis sessions, Track 30 in the meeting bulletin: Modeling Uncertainties: Decision Analysis versus Finance (Chr. - Donald L. Keefer), Plural Analysis: Developing Multiple Aproaches to Decision and Inference (Chr. - Rex V. Brown), Alternative Utility Approaches (Chr. - Samuel E. Bodily), Preference and Decision Models (Chr - Peter H. Farquhar), Vagueness about Uncertainty and Probabilities (Chr. - Robert L. Winkler), Decision Analysis Applications (Chr. - Peter A. Morris), Behavioral Studies of Risk (Chr. - Donald A. Wehrung), New Developments in Utility Theory (Chr. - Robert F. Bordley), Decision Analysis Student Competition (Chr. - Ralph L. Keeney), Probability Assessment in Decision Analysis (Chr. - Nicholas A. Zaino, Jr.), Multiattribute Utility Theory (Chr.-Charles J. Malmborg), and Panel: Making Decision Analysis Accessible to Decision Makers (Chr. - Robert D. Behn). In addition, there are numerous sessions on Artificial Intelligence and expert systems.

New Orleans,-Spring 1987

For the New Orleans TIMS/ORSA meeting, May 4-6, 1987, Irv LaValle has planned a slate of sessions including two sessions on Decision Analysis Projects, chaired by Ralph L. Keeney, for presentation of finalists in the Decision Analysis Applications prize competition, a session on Behavioral Research in Decision

(cont'd page 4)

Acceptance, (cont'd.)

later became my de facto thesis adviser. George taught me the clarity that can be provided by a simple and appropriate logical analysis.

"I thank the students with whom I have worked for almost 30 years at both MIT and Stanford. Some were with me in the early days of decision analysis at SRI. Others have started companies or assumed major responsibilities within them. Several are professional consultants. Many teach at universities around the world. And more than a few are present at this meeing. The professor who does not learn from students is in the wrong profession.

"I especially thank my friend and colleague, Dr. James E. Matheson, with whom I have worked in developing the field from the beginning, and with whom I continue to enjoy working today.

"Finally, I thank my wife, Polly, who made my work possible, and my whole family, who made my life fun."

News Items

Bruce Judd left applied Decision Analysis in the fall of 1984 to form a Decision Analysis Center at Lawrence Livermore National Laboratory. The Center conducts research, analyses, and education to support public policy decision-making. Bruce reports that the center is growing, with five full-time analysts and others who split their time between the Center and graduate work. The Center's current projects are related to nuclear safety and safeguards and arms control treaty verification.

Stan Zionts will be lecturing in Dalian, China as part of the Suny Buffalo School of Management's MBA Program again this fall (from early September to

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Theory, chaired by Franz Eisenführ and Martin Weber, and four sessions on Choice Under Uncertainty, co-chaired by LaValle and Peter C. Fishburn. These four sessions will constitute a symposium on foundations and will include many of the principal researchers on generalizations of and alternatives to the Savage-von Neumann-Morgenstern structuring. In addition, Martin Shubik is to be the plenary speaker, and peter Fishburn will give a tutorial entitled "New Models for Decision Making Under Risk and Uncertainty".

mid November) and would enjoy seeing any colleagues who are visiting the area.

Irv LaValle spent three weeks in China this May with a delegation of "systems engineers", organized by Chelsea C. White III of the University of Virginia under the auspices of the People to People Citizen Ambassador program. He was deputy head of the delegation, which met with Chinese scholars and delivered lectures in Beijing, Dalian, Wuhan, and Guangzhou.

Charles Harvey is on leave from Dickinson College and spending the 1986-7 academic year at the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. Prosit!

Craig W. Kirkwood writes that after serving as Acting Dean of the College of Business at Arizona State University for the last eight months, he is returning to his permanent position as Chairman of the Department of Decision and Information Systems. He states that it was good, practical training for a decision analyst to run a college with 11,000 students, but he is looking forward to getting back to his professional activities!

Don Kleinmuntz has performed the sun-belt migration in reverse, moving from UT Austin to M.I.T. His new address is Sloan School of Management, Massachusetts Institute of Technology, 50 Memorial Drive, Cambridge, MA 02139.

From David G. Brooks and Craig W. Kirkwood, College of Business, Arizona State University, Tempe, AZ 85287:

Decision Analysis for Microcomputer Network Selection.

A decision analysis procedure is presented for evaluating microcomputer networking strategies, and the procedure is applied to a specific network selection decision. The analysis considers local area networks that link microcomputers and peripherals which are geographically close to each other. Evaluation measures are defined to measure the performance of different strategies, and a multiattribute utility function is used to combine the evaluation measures into a single index of the overall preferability of a strategy. Uncertainties about projected performance are encoded using probabilities. Where historical data is not available to estimate probabilities, expert judgment is used.

From Peter H. Farquhar, Graduate School of Industrial Administration, Carnegie-Mellon University, Pittsburgh, PA 14213:

Applications of Utility Theory in Artificial Intelligence Research.

This paper examines recent applications in the construction of evaluation functions for intelligent computer systems. The purpose is to demonstrate the usefulness of utility theory for these research activities in artificial intelligence and to promote future exchanges between these two fields.

From Don N. Kleinmuntz, Sloan School of Management, 50 Memorial Drive, Massachusetts Institute of Techology, Cambridge, MA 02139; and James B. Thomas, Graduate School of Business, University of Texas, Austin, TX 78712 (Address requests to Dr. Kleinmuntz):

The Value of Action and Inference in Dynamic Decision Making.

The use of action- versus judgment-oriented decision strategies in a dynamic decision task is investigated. Subjects engaged in a simulated medical decision making task, where the goal is to select treatments in order to cure patients suffering from an unknown disease. The experiment manipulated two task factors that were predicted to influence the effectiveness and efficiency of action- and judgment-oriented strategies: (1) the availablity of a decision aid that promotes the interpretability of outcome feedback in the task and (2) the level of risk associated with treatment choices, which influences the opportunity for corrective actions to compensate for earlier decision errors. Results indicated that these manipulations did in fact influence performance. However, most subjects did not use action-oriented strategies even when they would have led to superior performance. Possible explanations for this finding are discussed and implications for theoretical accounts of strategy acquistion and selection are considered.

From H. V. Ravinder, University of New Mexico, Albuquerque, NM 87131, Don N. Kleinmuntz, Sloan School of Management, 50 Memorial Drive, Massachusetts Institute of Technology, Cambridge, MA 02139, and James S. Dyer, Graduate School of Business, University of Texas, Austin, TX 78712 (address requests to Dr. Kleinmuntz):

The Reliability of Subjective Probabilities Obtained Through Decomposition.

The use of decomposition as a procedure for improving the consistency of subjective probability encoding is discussed. Using a psychometric measurement model, a formula is developed that describes the random error associated with decomposition estimates as a function of characteristics of the component assessments. Decomposition is compared to direct assessment in terms of the per-cent change in measurement error that can be attributed to the use of decomposition. The potential benefits of decomposition are specified and recommendations made on how to best use decomposition to control error.

From P. L. Yu, School of Business, University of Kansas, Lawrence, KA 66045:

Second-Order Games and Habitual Domain Analysis. (Keynote speech, Fifth International Conference on Mathematical Modeling, University of California, Berkley, CA, July 29-31, 1985.)

The concepts of second-order games and habitual domains (HD's) are introduced. It is shown how an understanding and structuring of HDs can solve games and conflicts. Important outstanding research problems include (1) finding effective ways of classifying and identifying HDs, (2) understanding the interaction of different HDs, and (3) finding effective ways for moving a current HD to an ideal HD.

From P. L. Yu, School of Business, University of Kansas, Lawrence, KA 66045, and E. Takeda, Dept. of Management Science, Kobe University of Commerce, Tarumi, Kobe 655, Japan:

A Verification Theorem of Preference Separability for Additive Value Functions.

This paper offers an operational verification theorem of preference separability for additive value functions. Additive covering of the attribute index set plays a key role in the derivation. Effective ways for utilizing the theorem to derive additive value functions in terms of orthogonal square designs and progressive ways to determine the form of value functions are also discussed.

From Richard de Neufville and Philippe Delquie, Technology and Policy Program, Rm 1-138, Masschusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge, MA 02139:

Exploration of the Influence of Certainty and Probability "Effects" on the Measurement of Utility.

This study documents a model of how certainty and probability "effects" independently produce two kinds of differences between individual preferences and the expected utility model. First, the use of Certainty Equivalents in the measurement of preferences results in an effect similar to but more subtle than that previously demonstrated: the dependence of the utility functions on probability is intensified by an individual's degree of risk aversion. Secondly, both the use of certainty and individual perceptions of probability combine independently to generate preferences which concord with Kahneman and Tversky in that they are not linear in probability.

The pratical result is that the use of the Lottery Equivalent method of assessing preferences does indeed remove many of the distortions introduced by the use of Certainty Equivalents. Yet it does not appear to lead to a utility function which conforms fully to expected utility theory.

The empirical investigation used both an experimental design which tightly controlled for possible biases, and the ASSESS interactive computer program which obtains and analyses data effeciently. Statistically significant results were thus generated relatively easily.

From Richard Engelbrecht-Wiggins, College of Commerce and Business Administration, University of Illinois at Urbana-Champaign, 428 Commerce West, 1206 S. 6th St., Champaign, IL 61820:

On Optimal Reservation Prices in Auctions.

The theory of auction design examines how various factors affect the outcome of an auction. Most of the existing literature focuses on how varying the amount of information available to each bidder affects the bid-taker's expected revenue varies with changes in the auction format when such changes effect the number of bidders. Specifically, we examine how varying the reservation price or screening level affects the bid-taker's expected revenue though its effect on the number of bidders. For two simple examples, the losses associated with a reduced number of bidders outweighs any benefits that non-trivial reservation prices might have had in models with an exogonously set number of bidders.

Classes of Equivalent Auction Mechanisms: The Case Risk Neutral Bidders.

This paper addresses the question "what characteristics of an auction mechanism affect the bid taker's expected payments?" To do so, we define three variants of regret free mechanisms, mechanisms with a corresponding direct revelation game that is individually rational and is incentive compatible with respect to specified information. By conditioning the incentive compatibility on factors not explicitly included in previous studies, we establish special equivalent revenue theorems for auctions with dependent information and for multi-object auctions, as well as for a quite general family of auctions with independent information.

On the Value of Private Information in an Auction: Ignorance May Be Bliss.

Two examples illustrate that if your competitors in an auction vary their behavior with the amount of information that you have, then your obtaining additional information may reduce your expected profit. Therefore, unlike in traditional decision theoretic settings, the value of information in a competitive setting may be strictly negative.

From D. Warner North, and William E. Bolson, and Glenn Colville, Decision Focus, Inc., 4984 El Camino Real, Los Altos, CA 94022:

Representing Uncertainty Explicitly in Environmental Risk Management: An Example from Acid Deposition Policy Analysis.

Uncertainty is a major difficulty in environmental risk management. While it is desirable to base environmental management decisions on the best scientific knowledge available, scientists often cannot give precise estimates of environmental risks that are based on scientific data and models that are validated from data. In such situations where data are lacking, the methods of decision analysis are useful as a means of assessing and representing expert

judgments about the uncertainties in a form that is easily communicated to those with management responsibility and to concerned members of the public.

We describe the application of this approach to acid deposition using the Acid Deposition Decision Framework. This decision framework was sponsored by the Electric Power Research Institute to aid decision makers in comparing policy options for the control of emission that are precursors to acid deposition and for the mitigation of impacts of acid deposition. The decision framework traces the emissions of acid precursors from the source regions, their transformation and transport in the atmosphere, and the impacts at receptor locations. The decision framework is implemented as a computer model that provides three modules for summarizing scientific judgments about emissions, transport and conversion, and impacts. These modules can be thought of as simplified representations of the complex models available in each field. The model allows and encourages the user to represent scientific uncertainty about each of the three modules by specifying alternative scenarios, which may be based on alternative scientific hypotheses relating emissions to acid deposition and acid deposition to consequent impacts. The likelihood of these alternative scenarios can be specified by probabilities that reflect the judgment of experts in the appropriate areas of science.

The Acid Deposition Decision Framework was used in 1985 to carry out an evaluation of sulfur oxide control strategies affecting Wisconsin. The results of this analysis are summarized, with an emphasis on the probability assessments obtained from panel of scientific experts.

From D. Warner North, Deborah Amaral, Stephen G. Regulinski, and Don S. Wilson, Decision Focus, Inc., 4984 El Camino Real, Los Altos, CA 94022:

Application of Decision Analysis to Solid Waste Cleanup Decisions.

A risk management framework has been developed to evaluate the tradeoff between possible health and environmental risks and the costs required to reduce these risks, and to identify the best options at coal combustion by-product (CCBP) disposal sites. Based on the methodology of decision analysis, the framework combines models of leachate production, groundwater transport, chemical attenuation, human exposure, and other factors with a probabilistic representation of key uncertain engineering, hydrological, and geochemical parameters. The framework has been applied to a decision problem at a utility fly ash disposal site, and it predicted that there would be a small probability of significant groundwater contamination from trace elements in the ash. The extent of contamination predicted is sensitive to assumptions about site-specific properties, such as the pH of the groundwater and characteristics of the soil particles. The effectiveness predicted for each remedial alternative is sensitive to assumptions about the flow of groundwater through the ash. The option of making sequential decisions about remedial action at the site is shown to offer both lower costs and lower exposure risks.

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

Reconsiderations in the Foundations of Decision Under Uncertainty.

This paper reconsiders the classic confrontation between Maurice Allais and Jimmie Savage at the 1952 Paris colloquium on decision under uncertainty in light of new developments in the theory of preference for uncertain situations. We outline the theories of Savage and Allais, note their points of agreement and disagreement, and recall their famous encounter about the normative standing of independence axioms and Savage's sure-thing principle. It is suggested that their debate concerning independence can be refocused on the axiom of transitivity and the sufficiency principle (which says that preference between uncertain acts should be based solely on their probability distributions over outcomes). This refocusing ties into an alternative theory that endorses neither transitivity nor the sufficiency principle but is fully congruent with additive subjective probability and Savage's sure-thing principle. The new theory offers a resolution of the Allais-Savage disagreement that accepts points on both sides but does so at the expense of transitivity and sufficiency, which Allais and Savage regarded as normatively essential.

Nontransitive Measurable Utility for Decision Under Uncertainty.

We axiomatize a representation for preference between acts in Savage's formulation for decision under uncertainty that is based on expectation of a nonseparable utility function on pairs of consequences with respect to the decision maker's subjective probability measure over states. The representation has been discussed previously by Graham Loomes and Robert Sugden, David Bell, and the present author. The representation follows from Savage's axioms for subjective expected utility when his ordering axiom is weakening and his conditional dominance principle is added as an explicit axiom. All axioms except the Archimedean condition are necessary for the nonseparable representation.

From Peter C. Fishburn, Rm 2C-354, AT&T Bell Laboratories, 600 Mountain Avenue, Murray Hill, NJ 07974 and Irving H. LaValle, A. B. Freeman School of Business, Tulane University, New Orleans, LA 70118:

Transitivity Is Equivalent to Independence for States-Additive SSB Utilities.

The states-additive SSB utility model is a lottery-acts generalization of Savage's subjective-probability expected utility model for decision under uncertainty that presumes additive event probabilities but does not assume that preferences are transitive or satisfy traditional independence axioms. Given the states-additive SSB model, we prove that the additional axiom of transitive indifference is equivalent to the Herstein-Milnor independence axiom, provided that some event has probability strictly between 0 and 1.