DECISION ANALYSIS NEWSLETTER

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Editor' 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 not have appeared in print yet; 2) that it is available for distribution upon request; and 3) 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:

Irving H. LaValle
A. B. Freeman School of Business
Tulane University
New Orleans, LA 70118
(O) (504) 865-5484
(H) (504) 899-8110

Please phone or write in any changes in your activities or employment that could be of interest to our membership.

Please Note: (1) Inform the ORSA business office at Mount Royal and Guilford Avenues, Baltimore, MD 21202 of address change; we get our mailing labels from them! Thanks! (2) To be included on the mailing list, you should join the Special Interest Group on Decision Analysis: send letter to ORSA office and $3 ($5) for a ORSA (non)member.

News from Anaheim

At the SIG Membership meeting, it was announced that Patricia Regan-Cirincione was the winner of the sixth annual Decision Analysis Student Paper Competition [see story, p.3, and abstract, p.16], and that *Choice Under Uncertainty: Annals of Operations Research, vol. 19*, edited by Peter C. Fishburn and Irving H. LaValle, had won the 1991 Decision Analysis Publication Award.

SIG Chair Bob Winkler congratulated Donald L. Keefer and Kathryn B. Lashey on their election to the Council and noted that the terms of Allan Murphy and Ross Shachter on the Council will expire this May. He called for nominations for these positions and also for the position of Vice Chair - Chair Elect. Ballots will go out with the March Newsletter. (Continued - Page 2.)

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Concerning upcoming national meetings, Winkler noted that Kevin McCardle and Bob Nau have organized our sessions for the Spring '92 meeting in Orlando; Bill Balson at Decision Focus is organizing sessions for the Fall '92 meeting in San Francisco and, at this time, was identifying session chairs as well as volunteers to present papers. Gordon Hazen and Don Keefer are organizing sessions for the Spring '93 meeting in Chicago and the Fall '93 meeting in Phoenix respectively.

Patricia Reagan-Cirincione Wins the Sixth Annual Decision Analysis Student Paper Competition

by Dennis M. Buede

Dr. Patricia Reagan-Cirincione won the sixth annual ORSA Decision Analysis Special Interest Group's Student Paper Competition with his paper, "Combining Group Facilitation, Decision Modeling, and Information Technology to Improve the Accuracy of Group Judgment". Dr. Reagan-Cirincione received her Ph.D. at the Rockefeller College of the State University of New York at Albany. Her dissertation advisor was Professor John Rohrbaugh.

Dennis Buede was the Chair of the 1991 Student Paper Competition. The other judges for the competition were Professor David Bell, Professor Frederick Buoni, Professor Kofi Kissi Dompere, Professor Jehoshua Eliashberg, Dr. John Lathrop, Professor Jennifer Rowley, Professor Richard Soland, Professor Donald Steinwachs, and Dr. Joseph Tatman. A total of nine papers were received for this year's competition and the quality of the papers was very high.

The winner was announced at the ORSA/TIMS meeting in Anaheim, November 3, 1991. Inquiries about the competition may be addressed to Professor Dennis M. Buede, Department of Systems Engineering, George Mason University, Fairfax, VA 22030-4444 (703-993-1727).

CALL FOR PAPERS

MORS WG24 - DECISION ANALYSIS

MILITARY OPERATIONS RESEARCH SOCIETY 60'TH SYMPOSIUM NAVAL POSTGRADUATE SCHOOL, MONTEREY, 23-25 JUNE 1992

WG24 encourages presentations and discussions of decision analysis methodologies and their application in military planning and operations.

Applications of interest to WG 24 include but are not limited to force and weapon requirements determination and program prioritization, resource allocation, tactical decision-making, and technology and design trade studies. Methodologies of interest include multiattribute utility (MAUT) and multicriteria decision making (MCDM) approaches, as well as multiobjective programming, the Analytic Hierarchy Process (AHP), and heuristic techniques. Also of interest are reports of decision support systems and of methods for eliciting probabilities and preferences and using judgmental inputs.

If you have or will have a paper or an issue you would like to discuss at this classified, by-invitation-only symposium, we would like to hear from you before 14 January 1992: Fritz Brinck, chair, NSWC, 301-394-1635; Dick Feldmann, NCSC, 904-234-4122; Mitch Robinson, IDA, 703-845-2412; LtCol Bruce Smith, AFHQ 703-697-9848.

The Operations Research Society of America
Special Interest Group on Decision Analysis
Announces
The Seventh Annual

Decision Analysis Student Paper Competition

For the seventh consecutive year, the ORSA Special Interest Group on Decision Analysis solicits entries in a competition among papers written by students. In the past, submissions have spanned a wide range of decision analysis topics and research methods, including both theoretical and applied work. We encourage entries from all aspects of decision analysis, as reflected in the sessions sponsored by the Special Interest Group at recent ORSA/TIMS national meetings.

To enter, send **five** copies of your written paper by **July 15, 1992** to

Prof. Ross D. Shachter
Department of Engineering-Economic Systems
Terman Engineering Center — Phone: (415) 723-4525
Stanford University — Internet: shachter@bayes.stanford.edu
Stanford, CA 94305-4025

Please include a cover letter with your current address, telephone number, and current employer. Also state the academic institution at which the work was performed, degree, graduation date, and supervising faculty.

Conditions. The paper should be less than thirty double-spaced, typewritten or word-processed pages. Papers may be coauthored with a faculty member provided they are based on the student's work while a student (such as dissertation or thesis) and the student is listed as the first author. Individuals who graduated in or before June, 1991 are not eligible.

Judging. A panel of judges chaired by Prof. Shachter will judge the papers using the criteria described in the editorial policy of *Operations Research*. The panel can elect not to award the prize if none of the papers submitted is considered a sufficient contribution to decision analysis. The competitors will be notified of the outcome by the end of September, 1992.

Presentation and Award. The winner will be scheduled to present his or her paper at the ORSA/TIMS Joint National Meeting in San Francisco, CA, November 1-4, 1992. The winner will also receive a five hundred dollar cash award and an invitation to a celebratory dinner with representatives of the Special Interest Group. It is hoped that the winner's employer will provide travel funds so that the winner can attend the meeting.

Please contact Prof. Shachter if you have any questions or comments.

UNIVERSITY OF SOUTHERN CALIFORNIA
SOCIAL SCIENCE RESEARCH INSTITUTE
UNIVERSITY PARK
LOS ANGELES, CALIFORNIA 90089-1111
(213) 740-4252
FAX (213) 746-2977

November 25, 1991

Memorandum to: Scientists and practitioners interested in Bayesian research, inference by people, machines, or a blend, evaluation and decision making by the same, decision support systems, expert systems for inference and/or decision, and the like

From: Ward Edwards

Subject: **30th Annual Bayesian Research Conference**

This is your invitation to come and participate in the 30th Annual Bayesian Research Conference. The dates this year are **February 13 and 14, 1992**. We will meet again this year at the Sportsmen's Lodge, at the intersection of Ventura Boulevard and Coldwater Canyon Boulevard in Studio City, California.

Our format and purpose will be the same this year as in recent previous years. We will give 30-minute papers to one another about research on inference, evaluation, decision processes and problems. We always strive for a blend of basic research and applications. A mixture of behavioral and normative interests has characterized us over the years. This means that decision analysts and behavioral decision theorists will be talking to one another. In recent years a number of members of the Normative AI Systems community have been attending. So, in addition to more familiar topics like utility, probability, cognitive illusions, and the like, we will also hear about influence diagrams, formal representations of uncertainty, utility theory as a basis for control, normative systems as competitors to expert systems, and similar topics. Our liaison with the Audit Research community continues, so audit judgment is likely to be a topic. (The School of Accounting's Audit Judgment Symposium is in Marina del Rey on February 17 and 18. If you want an invitation, you could call Ted Mock at 213-740-4861, or write him at the School of Accounting, University of Southern California, Los Angeles, CA 90089-1421.) We are as ecumenical about topics as about people; new topics that surprise me turn up each year.

As old hands know, the atmosphere is informal, the discussion can get intense, and many of the best debates take place during coffee breaks or in the hospitality suite at the end of the day. This Conference is a good place to try out your latest, wildest set of ideas on a kindly, knowledgeable, and critical audience. It is not a good place to make once again the speech for which you have received plaudits for the last two years.

To get to the Sportsmen's Lodge, if you are driving, get to the Ventura Freeway, turn East from the San Diego Freeway or West from the Hollywood Freeway, exit at Coldwater Canyon Boulevard, drive South to Ventura Boulevard, and you are there; it is on the NE corner of that intersection.

Those not driving have various options. If you fly into Burbank Airport and have a reservation, simply phone the Sportsmen's Lodge and they will send a van to pick you up, if it is before 10 pm. If you fly into LAX, City Shuttle, Primetime or Super Shuttle will, for a price, take you from LAX to the Sportsmen's Lodge. Flyaway Bus Service will get you to Van Nuys, which is pretty close; from there you can take a cab.

The Conference will have a registration fee of $40 per person. There will be a hospitality room on Wednesday and Thursday nights. Those who choose to stay over Friday evening will find other colleagues who do the same; we usually have a good time.

If you indicate on the questionnaire that you must talk or want to talk, you should assume that you are on the program. If you check "schedule me if time permits," bring your viewgraphs but don't be hurt if time doesn't permit. I will, as usual, rewrite the title of your talk in an effort to make it funny unless you save yourself from my often inept ministrations by making it funny in the first place.

Please let us know as soon as you can whether or not you can come. We need answers by **January 27**, in order that the Sportsmen's Lodge can know how many rooms to hold.

If I have missed someone who should have been invited, either let me know or simply Xerox this and pass it on.

I'll see you in the Hospitality Suite on Wednesday evening, February 12, at 6:00 pm or any time after that. Do come Wednesday evening. It's a good time to visit with old friends, meet new ones, and prepare yourself for the following day's stimulation.

Registration Form

Bayesian Research Conference

February 13 and 14, 1992

Name:_____

Affiliation:_____

PLEASE FILL OUT AND RETURN BY JANUARY 27 TO:

Ward Edwards, Director
Social Science Research Institute
University of Southern California
Los Angeles, CA 90089-1111

1. Will you attend:

_____Yes

_____No

2. What accommodations would you prefer:

_____Sportsmen's Lodge Hotel
____ Single Room $80.00
____ Double Room $84.00

_____I will make my own accommodations

3. Reservation request:

_____Wednesday and Thursday (nights of Feb. 12 and 13)

_____Wednesday, Thursday, & Friday (nights of Feb. 12, 13, 14)

_____Thursday and Friday (nights of Feb. 13 and 14)

_____Wednesday night only (Feb. 12)

_____Other (please specify)

4. Will you speak? Topic?

_____

_____

_____

_____

5. Check one:

_____I must speak to have trip financed

_____I must speak

_____I would like to speak

_____Schedule me only if time permits

6. Audio/Visual equipment needed:

_____

_____

7. Additional comments: (Other appropriate invitees, please include address, special arrangements, etc.)

_____

_____

_____

_____

_____

Please note that once again in order to hold block reservations, the registration form must be returned no later than **JANUARY 27**. A total count of reserved rooms must be guaranteed to the hotel two weeks prior to the meeting. Your promptness will be greatly appreciated.

Registration fee is $40.00. Please return checks made payable to Ward Edwards along with this form.

Receipts will be available at the conference.

THE SPRING 1991 AWARDEES FROM THE JOINT NSF PRIVATE SECTOR RESEARCH OPPORTUNITIES INITIATIVE

The Decision, Risk, and Management Science Program has announced five more awards under the National Science Foundation's Joint NSF/Private Sector Research Opportunities Initiative (for a total of eight awards since the program's inception). This initiative provides for joint funding of research proposals by industry and NSF to encourage research that is soundly grounded in a knowledge of private sector problems. Interested research investigators should submit an NSF proposal (using the NSF guidelines in Grants for Research & Education in Science and Engineering) accompanied by a letter of support from a sponsoring private sector organization(the Cooperating Organization). This letter agrees to commit one or more individuals to work activity with the investigator and expresses interest in providing funding for the work. If NSF decides the proposal is of substantial theoretical and operational value, they may award the investigator up to $25,000. In the first year of the grant, NSF may also agree to match $1 for every $2 contributed by the cooperating organization up to a maximum NSF matching of $50,000 (for a possible total NSF grant of $75,000 the first year). In the second year of the grant, NSF may agree to match $1 for every $1 contributed by the cooperating organization up to a maximum second year matching of $75,000. Those interested should call the DRMS program office at (202) 357-7417(or -7569) for more details.

In Spring 1991, DRMS received several proposals for funding under the private sector initiative. After extensive mail reviews and a review by the distinguished DRMS Advisory Panel, the DRMS Program Directors, Dr. Robert F. Bordley(202-357-7417) and Dr. L.Robin Keller(202-357-7569) recommended the following five awards:

ADVANCING THE NETWORKED ORGANIZATION WITH GROUP DECISION SUPPORT SYSTEMS

INVESTIGATORS: Dr. Gerardine DeSanctis
Assoc. Professor of Bus.Administration
Fuqua School of Business; Duke University

Dr. Scott Poole
Assoc. Professor of Bus. Administration
Fuqua School of Business; Duke University

COOPERATING ORGANIZATION: Texaco, Inc.
KEY CONTACT PERSONS: Brad Jackson, Senior Consultant
Ed McDonald, Division Manager
Information Technology Department

In response to pressures associated with sharply fluctuating customer demand, accelerating technological innovation, acquisitions or joint venture arrangements, and the emergence of global markets, many large organizations are replacing

hierarchical and matrix forms of management with a 'dynamic network' design. Dynamic networks are a combination of functional-organization and flexible structures such that the major components of the organization can be assembled and reassembled in order to meet complex and changing competitive conditions. The University of Minnesota and Texaco propose to undertake a joint study of the role of group decision support systems(GDDS's) and related information technologies in facilitating a corporation's transition to a dynamic network form. The project will involve:

(a) design and implementation of GDSS prototypes for use in decision rooms and in local and wide-area networks.
(b) studies of GDSS use within and between work teams.
(c) studies of GDSS impacts on individuals, teams, and larger business units. GDSS will be studied as one aspect of a larger set of changes, including quality programs, self-managed teams and advanced information technologies.

Several propositions related to GDSS design, use and impacts will be explored.

ARCHITECTURE OF HYBRID DECISION SUPPORT SYSTEM FOR RISK MANAGEMENT OF OFFSHORE PLATFORMS

INVESTIGATOR: Dr. Elizabeth Pate-Cornell
Assoc.Professor of Industrial Engineering
& Engineering Management
Stanford University

Dr. Jean-Claude Latombe
Assoc.Professor of Computer Science
Stanford University

COOPERATING ORGANIZATIONS:Bureau Veritas
CONTACT PERSON: Mr. Pierre Besse

Risk management on offshore platforms requires real-time adaptation of procedures to existing conditions. These conditions can be caused by environmental factors (e.g., storms or ice), on-board incidents(e.g., a fire), boat collisions, or degradation of the platform and its capacity(e.g., by corrosion.) In situations of risk, the operators generally follow procedures that have been predesigned, but some specific circumstances may not have been foreseen in the design of the procedures. An experienced operator can generally estimate the severity of a situation similar to one he has experienced previously and take appropriate measures. In some instances, however, more information is needed about the current risk situation, potential deterioriation of this condition, applicable procedures, and alternative options before action can be taken. The object of this research is to combine the powers of analytical methods (probabilitic risk assessment based on systems analysis) and artificial intelligence (expert systems based on recommendations of experienced operators and on operating/emergency procedures) in a hybrid real-time decision support system for risk management

on board platforms. A key theoretical issue is the aggregation of these two types of information. A prototype will be developed. One possible option for this prototype is to address the problem of safety management for a redundant platform when the weather conditions may both delayed and immediate maintenance hazardous.

DETECTION OF PROCESS CHANGE

INVESTIGATOR: Dr. Stephen Pollock
Professor of Industrial & Operations Engineering
U. of Michigan, Ann Arbor

COOPERATING ORGANIZATION: General Motors Research Labs
CONTACT PERSONS: Dr. Jeff Alden
Staff Research Engineer
Production Systems Section

Detecting the occurrence of an underlying change in a process, when observations are only related probabilistically to the state of the process, has long been a problem of concern to statisticians, engineers, economists, epidemiologists, etc. In this proposal, we use the context of machine monitoring, although applications to areas such as quality control, health, military surveillance or economic analysis, should be readily apparent. We propose to address four issues:

(1) Rather than focussing on the expected time until the first false alarm is raised, given the system remains 'in control', we propose the use of the more practical concept of 'false alarm rate', the expected number of false alarms per unit time during the entire monitoring process.
(2) Rather than focussing on the expected time to detect the system as out of control, given it is out of control, we focus on the expected time between when the system goes out of control and when it is detected as out of control in the course of the monitoring policy.
(3) We propose to investigate various exact and approximate ways to compute system operating characteristics.
(4) We propose to examine the sensitivity of operating characteristics to changes in expected time between system failures, relative discriminatory power of sampling devices and the existence of natural times at which to monitor and take actions.

THE ROLE OF TRUST IN RISK PERCEPTION AND RISK MANAGEMENT

PRINCIPAL INVESTIGATOR: Dr. Paul Slovic
Dr. Sarah Lichtenstein
Dr. Donald MacGregor
Dr. Robin Gregory
Decision Research

COOPERATING ORGANIZATION: Electric Power Research Institute
CONTACT PERSON: Dr. Gordon Hester

Trust is important for all forms of human social interaction and lack of trust appears to be a critical factor in creating the divisive controversies that surround the management of risks from modern technologies. Over the past 25 years, our society has witnessed a steady erosion of trust in the technical, legal, governmental and institutional systems that are called upon to manage risks. This proposal describes research designed to understand the nature of trust, its role in risk management, and the individual, technical, and organizational behaviors that are needed to build and maintain it. Specific studies are planned to determine the multiple facets or characteristics of trust, analogous to the characteristics that have been found to underlie perceive risk. Additional studies are designed to illuminate the events and processes that create and destroy trust in risk management.

PRODUCT LINE AND PRODUCTION PLANNING IN AN ENVIRONMENT OF HIGH PRODUCT VARIETY

Principal Investigator: Marshall L. Fisher
Professor of Decision Sciences
The Wharton School, Univ.of Pa.

Anjani Jain
Asst.Professor of Decision Sciences
The Wharton School, Univ.of Pa.

Cooperating Organization: General Motors Research Labs
Contact Person: Dr. William C. Jordan, Manager
Logistics Section

Economies of scale achieved through mass production of a limited number of products has been the cornerstone of successful manufacturing throughout this century. For most industries, this strategy is rapidly becoming obsolete as the competitive emphasis shifts to producing an enormous variety of products at costs approaching the efficiency of mass production. This trend to variety competition is driven by many factors. This proposal describes a program of research to develop models and algorithms for designing the products in a productline and for designing and managing the production process in an environment of high product variety. The first component of our research is concerned with developing detailed sequencing models and algorithms appropriate for managing the mixed-model transfer lines that will soon become the dominant production process for automobiles. The second component is developing strategic planning models and algorithms that integrate product planning, technology choice and design of production lines.

The DRMS Program is currently reviewing proposals submitted for the Fall 1992 competition of the private sector initiative. Future deadlines are August 15th and January 15th of each year.

We urge all interested researchers to contact either one of the Program Directors for more information at 202-357-7417/7569

Bob Bordley N. John Castellan

PAPERS RECEIVED

Please request copies directly from the author, not the Newsletter Editor

From **David E. Bell**, The Harvard Business School, Soldiers Field, Boston, MA 02163:

Risk, Return, and Utility

Expected utility theory is widely regarded as the appropriate normative criterion for selecting among risky alternatives. Many people prefer to frame such choices as tradeoffs between risk and return. We identify those utility functions which are compatible with a risk-return interpretation and show that they are precisely the set of one-switch utility functions. The results offer implications for the measurement of risk, and for the approximation of utility functions.

From **Elchanan Ben Porath** and **Itzhak Gilboa**, Dept. of Managerial Economics and Decision Sciences, J. L. Kellogg Graduate School of Management, Northwestern University, Evanston, IL 60208:

Linear Measures, the Gini Index and the Income-Equality Tradeoff

The paper provides an axiomatization of linear inequality measures as a representation of a binary relation on the subspace of income profiles having the same total income. Interpreting the binary relation as a preference (of, say, a policymaker), we extend the axioms to the whole space of income profiles, and find that they characterize linear social evaluation functions. The axiomatization seems to suggest that a policymaker who has a linear measure of inequality on a subspace should have a linear evaluation on the whole space. In particular, we find that an extension of the preferences reflected in the Gini index to the whole space is represented by a linear combination of total income and the Gini index.

From **Ivy E. Broder**, Dept. of Economics, The American University, Washington, DC 20016, and **L. Robin Keller**, Graduate School of Management, University of California, Irvine, CA 92717:

Fairness of Distribution of Risks with Applications to Antarctica

We consider distributional fairness issues in decision making regarding health, safety, and environmental risks in Antarctica. Alternative safety improvements or operating procedures can result in different risk distributions among different groups of individuals at risk in Antarctica. The focus of this chapter is on the insights for modeling fairness gained by examining the potential application of models incorporating fairness to Antarctic policy making. Illustrative examples of alternative Antarctic policies are used to motivate the discussion of the implications for fairness modeling.

From **William J. Burns**, University of Iowa, Iowa City, IA 52242, and **Robert T. Clemen**, College of Business Administration, University of Oregon, Eugene, OR 97403:

Covariance Structure Models and Influence Diagrams

Statisticians use covariance structure modeling as a comprehensive tool for modeling and testing theory. The models that result provide rich descriptions of stochastic systems. We show how covariance structure models are related -- mathematically, conceptually, philosophically, and practically -- to Gaussian influence diagrams as described by Shachter and Kenley (1989). In particular, we show how the descriptive value of covariance structure modeling can be used to advantage in the prescriptive domain of decision analysis. The paper includes an example, relating to the management of hazardous materials, in which a covariance structure model is converted to an influence diagram for use in a prescriptive analysis.

From **Samuel E. Bodily**, Darden Graduate Business School, University of Virginia, Box 6550, Charlottesville, VA 22906, and **Laurence R. Weatherford**, College of Business, Univeristy of Wyoming, Box 3275, Laramide, WY 82071:

Perishable-Asset-Revenue Management: Yield Management and Pricing

In any situation of fixed capacity and a perishable service or product, firms want to avoid spoilage of the service or product and receive the most revenue possible in the face of uncertain demand. Stimulation of demand from price-sensitive customers, however, through discount prices to customers that reserve early can help fill capacity; this is attractive if non-price-sensitive customers can be prevented from diverting to the lower rates. This paper provides generic results for deciding how many discount units to sell (the so-called yield-management problem) and extends the generic problem in several ways: (1) no bumping of customers, (2) combined yield management and overbooking, (3) diversion with more than two price classes, and (4) optimal discount prices under a variety of assumptions about demand and diversion.

From **Robert T. Clemen** [see address on above-listed abstract] and **Robert L. Winkler**, Fuqua School of Business, Duke University, Durham, NC 27706:

In many decision situations information is available from a number of different sources. Aggregating the diverse bits of information is an important aspect of the decision-making process but entails special statistical modeling problems in characterizing the information. Prior research on this area has relied primarily on the use of historical data as a basis for modeling the information sources. We develop a Bayesian framework that a decision maker can use to encode subjective knowledge about the information sources in order to aggregate point estimates of an unknown quantity of interest. This framework features a highly flexible environment for modeling the probabilistic nature and interrelationships of the information sources and requires straightforward and intuitive subjective judgments using proven decision-analysis assessment techniques. Analysis of the constructed model produces a posterior distribution for the quantity of interest. An example based on health risks due to ozone exposure demonstrates the technique.

From **Itzhak Gilboa** [see address on above-listed abstract]:

Rationality and Ascriptive Science

This paper suggests definitions for two closely related terms which are (or could be) used in the social sciences. First, "rationality" is defined as a behavior which will not be altered as a result of awareness to its analysis. Next, an "ascriptive theory" is defined to be a descriptive theory which may become common knowledge among its subjects, yet remain valid. The relation between these concepts--as well as between them and others--is studied, and an "impossibility theorem," due to Dostoyevsky, is discussed.

From **L. Robin Keller** [see address on above-listed abstract], **Uzi Segal**, and **Tan Wang**, both at Dept. of Economics, University of Toronto, 150 St. George Street, Toronto, Ontario M5S 1A1, Canada:

The Becker-DeGroot-Marschak Mechanism and Generalized Utility Theories: Theoretical Predictions and Empirical Observations

Karni and Safra [8] prove that the Becker-DeGroot-Marschak mechanism reveals a decision maker's true certainty equivalent of a lottery if and only if he satisfies the independence axiom. Segal [17] claims that this mechanism may reveal a violation of the reduction of compound lotteries axiom. This paper empirically tests these two interpretations. Our results show that the second interpretation fits better with the collected data. Moreover, we show by means of some nonexpected utility examples that these results are consistent with a wide range of functionals.

From **Craig W. Kirkwood**, Department of Decision and Information Systems, Arizona State University, Tempe, AZ 85287-4206:

Notes on Attitude Toward Risk Taking and the Exponential Utility Function

This paper summarizes useful concepts for analyzing attitude toward risk taking in decision analysis practice. Particular attention is given to the exponential utility function which is widely used in applications. Conditions are reviewed under which this utility function form is appropriate. Tables are presented which aid in using the exponential utility function, including finding the value of the risk tolerance. The use of the exponential utility function is considered in analyzing portfolio decisions and determining the value of perfect information. The accuracy is considered of an approximate formula for determining certainty equivalents when the exponential utility function holds. Exercise on this material are also included, along with solutions.

Computer Programs for Multiattribute Decision Analysis

This software package includes three programs that provide basic multiatrribute decision analysis computational capabilities. The software runs on IBM-compatible personal computers operating under MS/PC-DOS Version 2 or later with any display and at least 256K memory. The Multiattribute Value Calculator handles situations with no uncertainty using a weighted-additive multiattribute value function and either exponential or piecewise linear single-attribute value functions. The Power-Additive Multiattribute Utility Calculator (PMC) and the Multiplicative Multiattribute Utility Calculator (MMC) handle situations with uncertainty. PMC uses a power-additive utility function and either exponential or piecewise linear single-attribute value functions.

MMC uses a multiplicative utility function and either exponential or piecewise linear single-attribute utility functions. Arbitrary discrete probability distributions can be specified for each attribute of each alternative. Analysis of probabilistic dependence among attributes is not supported.

This software is copyrighted; however, an *instructional license* grants permission to make copies for direct instructional use by the person authorizing the copying provided that no fee is charged for the copies (other than a nominal amount to cover copying expenses) and that no financial gain accrues to the person authorizing the copying, either directly or indirectly. A single user license costs $30.00 and includes one copy of the software and one bound copy of the manual. An instructional license costs $60.00 and includes one copy of the software, one bound copy of the manual, and one unbound copy of the manual. An add-on of an instruction license for a registered single user is $40.00. A 5.25 inch 360K diskette is furnished unless a 3.5 inch 720K diskette is requested. Make check payable to "DIS Department Gifts and Grants Account." Sorry, no credit cards or purchase orders. Send order to: Craig W. Kirkwood, Department of Decision and Information Systems, College of Business, Arizona State University, Tempe, AZ 85287-4206.

ADAM2: An Algebraic Decision Analysis Modeling System for Research

This paper is a user guide for ADAM2, an Algebraic Decision Analysis Modeling System which assists with formulating and solving decision tree models. This system is primarily intended for use in research on formulating and solving large decision analysis models. Thus it does not have some of the "bells and whistles" that are included in commercial software. However, someone who understands the underlying theory and has some knowledge of the Pascal programming language can use ADAM2 to prepare and quickly solve a computer model representing a large decision tree model. In addition to the material furnished on the diskette which accompanies the paper, a user must have access to a Turbo Pascal compiler for an IBM compatible personal computer. The user prepares a model specification file which includes an algebraic representation of the decison tree model, as well as instructions for the desired analysis of the model. This is used to create a Pascal source program which is then compiled to form a program which is run to conduct the analysis. This system will solve large decision tree models rapidly. For example, a tree model with 25,000 endpoints can be solved in approximately 10 seconds on a 25 MHz 80386 computer with math coprocessor.

From **Patricia Regan-Cirincione**, Rm. 300, Milne Hall, State University of New York - Albany, 135 Western Avenue, Albany, NY 12222:

Combining Group Facilitation, Decision Modeling, and Information Technology to Improve the Accuracy of Group Judgment

Interacting groups fail to make judgments as accurate as those of their most capable group members due to problems associated with both interaction processes and cognitive processing. Group process techniques and decision analytic tools have been used with groups to combat these problems. While such techniques and tools do improve the quality of group judgment, they have not enabled groups to make more accurate judgments than their most capable members. A new intervention procedure that integrates group facilitation, decision modeling, and information technology was developed to overcome more fully the problems typically associated with interaction processes and cognitive processing. The intervention was evaluated by testing the hypothesis that groups using this new procedure can establish judgment policies for cognitive conflict tasks that are more accurate than the ones produced by any of their members. An experiment involving 16 four- and five-member groups was conducted to compare the accuracy of group judgments with the accuracy of the judgments of the most capable group members. Results indicated that the process intervention

enabled small, interacting groups to perform significantly better than their most capable members on decomposed judgment tasks ($p < .05$). The findings suggest that group decision support systems that integrate facilitation, decision modeling, and information technology should be used to improve group accuracy on important judgment tasks.

From **Rakesh K. Sarin**, Anderson Graduate School of Management, University of California, Los Angeles, CA 90024, and **Peter P. Wakker**, Dept. of Mathematical Psychology, University of Nijmegen, P.O. Box 9100, 6500 HE Nijmegen, The Netherlands:

A Simple Axiomatization of Nonadditive Expected Utility

This paper provides an extension of Savage's subjective expected utility theory for decisions under uncertainty. It includes in the set of events both unambiguous events for which probabilities are additive as well as ambiguous events for which probabilities are permitted to be nonadditive. The main axiom is cumulative dominance which adapts stochastic dominance to decision making under uncertainty. We derive a Choquet expected utility representation and show that a modification of cumulative dominance leads to the classical expected utility representation. The relationship of our approach with that of Schmeidler who uses a two-stage formulation to derive Choquet expected utility is also explored.

From **Prakash P. Shenoy**, School of Business, Summerfield Hall, University of Kansas, Lawrence, KS 66045-2003:

Independence in Valuation - Based Systems

This paper introduces the notions of independence and conditional independence in valuation-based systems (VBS). We define independence and conditional independence in terms of factorization of the joint valuation. The definitions of independence and conditional independence in VBS generalize the corresponding definitions in probability theory. Our definitions apply not only to probability theory, but also a Dempster-Shafer's belief-function theory, Spohn's epistemic-belief theory and Zadeh's possibility theory. In fact, they apply to any uncertainty calculi that fit in the framework of valuation-based systems.

From **Glenn G. Shephard**, School of Business, San Jose State University, San Jose, CA 95192-0069, and **Craig W. Kirkwood**, Department of Decision and Information Systems, Arizona State University, Tempe, AZ 85287-4206 [address requests to Professor Kirkwood]:

The Process of Eliciting a Judgmental Probability Distribution

This paper presents an annotated transcript of the elicitation of a judgmental (subjective) probability distribution by a decision analyst. The theoretical basis for judgmental probabilities is well established, but research has shown that there are common errors that people make when informally determining probabilities. This paper demonstrates the application of a formal protocol to the elicitation of a judgmental probability distribution for a senior executive in a large aerospace company. Two videotape recordings were made of the elicitation interview, and these recordings were analyzed to identify the steps taken by the decision analyst to address elicitation errors.

From **Robert L. Winkler** [see address on above-listed abstract] and **Roy M. Poses**, Medical College of Virginia. [address requests to Professor Winkler].

Evaluating and combining Physicians' Probabilities of Survival in an Intensive Care Unit

In this paper, probabilities of survival assessed by physicians for patients admitted to an intensive care unit are studied. The probabilities from each of four types of physicians are evaluated on an overall basis and in term of specific attributes, and the groups are compared. The physicians with the most experience and expertise perform better overall. All four groups appear to be reasonably well calibrated, and the key factor in relative overall performance is the level of discrimination provided by the probabilities. Averages of two, three, and four probabilities for each individual patient are also analyzed. As the number of the probabilities in the average increases, performance improves on average on all dimensions, although the best overall performance is exhibited by a combination of probabilities from the two physician types performing best individually. Some comparisons are made with previous studies, and implications for probability assessment and combination in medicine and more generally in other areas of application are discussed briefly.

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