DECISION-ANALYSIS NEWSLETTER

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Editorial

In this newsletter, we shall strive to disseminate information of interest and value to Decision Analysts in the three major areas of academe, consulting, and industry. Doing so should not pose any conflicts, in view of the relative ease of movement between these areas; but our success will depend crucially upon contributions from you, the readers and members of the Special Interest Group. We can report only what you tell us!

To be more specific, we plan to give prompt notice of newly available technical reports and working papers (thus mitigating to some extent at least the staleness caused by lengthy delays in publi--cation); to report on publication opportunities (such as forthcoming Special Issues of journals); to report on new activities and ventures of our members; to announce forth--coming SIG activities and events; and to include some commentary and anecdotes of general interest.

So, as Dean Martin said, keep those cards and letters coming, folks. Issue Number 2 will not be as long delayed as this Premiere.

-- Irving H. LaValle
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Special note: To list a new technical report or working paper in the Newsletter, send a copy of it together with an abstract not exceeding 50 words to the editor, at the above address.

Contents

Nominating Committee

A nominating committee consisting of Richard D. Smallwood (Chr), Rex V. Brown, and Ralph L. Keeney will soon submit nominations for the SIG offices of Vice Chairperson/Chairperson Elect, Secretary-Treasurer, and two members of the Council, all to be elected by secret mail ballot. Those elected will take office at the Detroit meeting, at which time Irving LaValle will be succeeded by Peter Morris as Chairperson and will move to the Council as Chairperson Emeritus, replacing Richard Smallwood who has served as the founding Council member in that capacity. The two newly elected Council members will serve for three years, replacing Rex Brown and Ralph Keeney, who are rotating off the Council so as to realize in part the constitutional requirement of staggered terms. Since these Council members are ineligible to succeed themselves, and have served the SIG so well in numerous capacities, the current Chairperson could not resist once again calling upon their good offices to serve as our first Nominating Committee.

New Venture

A newly formed consulting firm, Strategic Decisions Group, at 3000 Sand Hill Rd, Menlo Park, CA 94025, seeks to help clients solve strategic decision problems and improve their strategic management process. Directors are J. F. Foran, Ronald A. Howard, James E. Matheson, and Carl S. Spetzler. Principals are

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SIG Sessions at Future Meetings

By now you have received the bulletin of the Houston meeting, which lists ten SIG-sponsored sessions planned and coordinated by Dick Smallwood, so little of a specific nature need be said, other than thanks to Dick and to the Chairs of the sessions for providing what promises to be an outstanding offering in the area of Decision Analysis. Ralph Keeney is presenting a 90-minute tutorial on Decision Analysis which is expected to be well-attended; it should also lead to some new SIG members!

Pete Morris is coordinating the SIG-sponsored sessions for the Detroit meeting (April 18-21, 1982). A partial list of the sessions scheduled to date - and their Chairs - is:

- Probability Encoding - Thomas Rice
- Decision Analysis in the Oil and Gas Industry - Robert Marshalla
- Decision Research - Peter Farquhar
- Electric Utilities' Appli--cations of Decision Analysis - Stanley Sussman
- Decision-Analysis Methodologies: A Best Approach? [Panel] - Dennis Buede
- Decision Analysis - Ralph Keeney

Irv LaValle is coordinating the SIG-sponsored sessions for the San Diego meeting (October 25-27, 1982); sessions - and their Chairs - scheduled to date include:

- Decision Research - Peter Farquhar
- Individual Decision Makers and Organizational Design - Peter Farquhar (co-sponsored with the TIMS College on Organization)
- Utility and Attitudes Toward Risk - Charles Harvey
- Decision Analysis and Analysts in Industry [Panel] - Donald Keefer
- Energy Applications of Decision Analysis - Ralph Keeney
- Measurable Value and Preferences - Rakesh Sarin
- Negotiation Analysis - James Sebenius
- Modeling in Decision Analysis - Richard Smallwood
- Probability and Judgments - Robert Winkler

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Rex Brown is coordinating the SIG-sponsored sessions for the Spring-1983 meeting in Chicago. If you have particular ideas or suggestions for the Chicago meeting, contact Rex at Decision Science Consortium, Inc., 7700 Leesburg Pike, Falls Church, VA 22043; phone (703) 790-0510.

It should be noted that the titles of the sessions listed for Detroit and San Diego are subject to possible amendment prior to publication of the respective meeting bulletins; at this point, they should be considered indicative of the session content.

New Venture (Cont'd from Page 1)

Terry J. Braunstein and Michael M. Menke. Senior Associates are Daniel L. Owen, Patricia A. Owen, and Burke E. Robinson. Associates are Steve B. Engle and Samuel Holtzman.

Commentary

by Rex V. Brown

Professional decision analysts often find ourselves in an exquisite quandary when urging a client with some analytic training to use our services. On the basis of our most lucid exposition of what decision analysis is, he is all too easily persuaded that he can do it himself, or at least that his OR guy can. The basic idea of capturing uncertainty and value with probabilities and utilities, laying them out in a decision tree and computing the implications is so elegantly simple. It's like watching a symphony orchestra conductor waving his baton in time with the music and saying, "I can do that."

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Dedicated Issue of *Management Science* On Risk Analysis for Societal Problems

Management scientists, because of their inter-disciplinary skills, have a special role to play in developing approaches for assessing, evaluating, and managing risks to human health and environment. Accordingly, *Management Science* will dedicate an issue of its journal to the theory and practice of risk analysis for societal problems. This prospectus is a brief desription of the proposed content and editorial policies for the dedicated issue.

Proposed Content

Articles dealing with issues in any of the following four categories will be considered suitable for the dedicated issue.

The first category of articles will be concerned with policy issues. Some specific issues may be:

- how should one consider equity of risks and benefits among popul-ation groups and among gener-ations?
- what role should public experts, politicians, and the judiciary play in formulating policies for risk management?
- should public safety be treated as an economic commodity or should government ensure a level of safety for all?

The second category of articles will deal with conceptual, theor-etical, and modeling aspects of risk analysis. Some specific topics are:

- Definition of societal risk, relationship of perceived risk to the probability of death and injury, assessment of societal risk.
- Social preferences for cost/life tradeoffs and tradeoff among different population groups and among generations.
- Evaluation procedures for risks and benefits.
- Social welfare functions for risk analysis and their relation-ships with "acceptable levels of risk".
- Modeling to identify cost-effective combinations of risk-mitigation alternatives.

--continued next column

The third category of articles will contain specific applications.

- Applications of risk analysis for setting environmental quality standards.
- Application for a health-and-safety-evaluation system for determining priorities by governmental agencies such as OSHA.
- Design of regulations for fire and seismic safety, for toxic substances, and for industrial processes.

The fourth category of articles will deal with state-of-the-art reviews of risk-management activities in the chemical and nuclear industries.

Editorial Administration

The editorial administration of the dedicated issue will follow and adhere to the editorial and review policies of *Management Science*.

Four copies of the manuscript should be sent to the editor of the dedicated issue:

Rakesh K. Sarin
Graduate School of Management
University of Claifornia, Los Angeles
Los Angeles, CA 90024

The aim is to publish the dedicated issue by late 1983. It is therefore requested that all papers be submitted no later than August 15, 1982. The papers will be sent for refereeing as they are received and a sincere effort will be made to maintain a satisfactory turn-around time.

All inquiries or communications regarding the dedicated issue should be directed to Rakesh K. Sarin at the above address.

"He that leaveth nothing to chance will do few things ill, but he will do very few things."

-- Marquis of Halifax

Commentary (Cont'd from Page 1)

The next thing that happens, of course, is that he comes back to you six months later and says, "I tried it and it doesn't work!" How do we communicate that being able to build a decision model or, for that matter, completing a graduate decision-analysis course only gets you an entrance ticket to an apprenticeship? It gets you about as far as knowing musical notation and the proper--ties of musical instruments gets you to being a conductor.

Compounding the problem is the fact that the most sophisti--cated and effective analysis is usually the simplest - at least in structure. It is the inexper--ienced or inept decision analyst who tends to produce the more complex and therefore more awe-inspiring analyses. it is difficult for the onlooker to appreciate what distinguishes good from bad decision analysis - superficially they look the same. I might look like Toscanini waving my baton, but the audience will tell the difference!

Of course, we can cheat a little by showing off our command of mathematical finesse; but that's just polish on the sow's ear and will never make it into a silk purse. The skills that make a difference are those of model specification (what does the client need?) and of model management (how can the output be integrated into his decision processes?) - and these are skills whose absence or presence is almost impossible to demonstrate. It may take years of experience layered on substan--tial formal training to develop any proficiency in them. But how do we get that across with modesty and conviction?

Any ideas?

And another thing. We know (more or less) what we mean by "decision analysis". But to the potential user, it means "the analysis of decisions" and every manager and every coloration of management scientist does that all the time. So what are we offering that is new or different?

How about using the qualifier "personalist" when there is any danger of confusion? The distinctive property of "personalist decision analysis" (PDA?) is that it involves prescriptive models that quantitatively characterize human judgment. Thus it would include any analysis where probabilities or utilities are imputed to people.

Now, I expect that will spark off some lively dialogue with our readers!

[Ed. Note: Contributions for a regular commentary column are most welcome.

--continued next column

In a discussion of the famous Weston Manufacturing case (the railroad car issue) at a 'well-known Gulf South Business School', one student creatively suggested that Weston should investigate the economics of their re-laying Sheridan's track so that the car would not derail despite not being rebuilt with oscillating trucks. This suggestion prompted the topper that Weston should adopt a J. R. Ewing posture and 'rat' on Sheridan to OSHA, who would force Sheridan to repair the track themselves, whereupon Weston would cry crocodile tears about big government and end up selling them the car as is, without incurring further expense!

Personal News and Announcements

Dick Shachtman encourages individuals who have performed decision analysis related to the health-care or welfare system to submi articles to him in his capacity as Health/ Welfare Area Editor of *Operations Research*; h stresses that high-quality work need not contain new mathematical results to qualify for publication in *Operations Research*. Dick has received a Kenan leave to study validatio of stochastic models this coming Spring. His present address is: Richard H. Shachtman; Rosenau Hall 201 H; University of North

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Personal News and Announcements (cont'd)

Carolina; Chapel Hill, NC 27514.

Robert G. Batson has been named project leader on a new Independent Research and Development project, "Risk/Decision Analysis Methodology", in the Engineering Systems Analysis Division of the Lockheed-Georgia Company, Marietta, GA.

Fred Offensend has been promoted to Director of the SRI Decision Analysis Group. He has been with the Group for eight years, most recently as Program Manager for Government appli--cations. Other promotions within the SRI Group include Lee Merkhofer to Associate Director, Peter McNamee to Seminar Program Manager, and Laura Peterson to Administrative Assistant.

Different organizations seem to have slightly different approaches to Decision Analysis. SRI International has been awarded an NSF grant to explore alternative DA approaches. Interested parties should contact Lee Merkhofer, Manager of the SRI Decision Analysis Research Program, (415)859-2871.

E. V. Anderson, Vice President of Johnson & Higgins, Insurance Brokers, 95 Wall Street, NYC 10005, has performed a tally on our December 1980 SIG membership list and found that members whose apparent affiliations are primarily with Universities and consulting/contract research firms outnumber those in industry and finance by about 8 to 1. Whether this is indicative of where people who regard themselves as Decision Analysts do work, or whether it reflects our low-key publicity to date and/or different utilities for affiliation, is not clear. Where are you, you decision analysts in industry and finance? Here is Mr. Anderson's tally, by region for cross-tab fans:

	U	CON	IND	?	Tot
NE/midA	15	0	4	5	24
DC&foreign	9	6	1	2	18
SE&Texas	10	0	0	1	11
Midw&Cent	8	1	6	1	16
farW&Rockys	6	18	0	5	29.

Available Technical Reports and Working Papers

From Applied Decision Analysis, Inc., 3000 Sand Hill Rd, Menlo Park, CA 94025:

Prototype Analysis of EPRI R&D Funding, by B. R. Judd, M. R. Metcalfe, and J. C. Schaefer.

A first step was completed in the development of a quantitative framework to assist Electric Power Research Institute planners analyze R&D budgets. A methodology was produced to evaluate benefits of different total annual funding levels. Part of EPRI's budget was analyzed to demonstrate the methodology.

Quantifying the Effectiveness of an Integrated Safeguards System Consisting of Containment/Surveillance and Material Accounting, by B. Judd (ADA), R. Al-Ayat and D. Dunn (Lawrence Livermore National Laboratory).

An analytical tool is described which provides a systematic way for identifying weaknesses in integrated safeguards systems consisting of containment and surveillance (C/S) and material accountancy (MA) components. Safeguards designers can use this analytical tool to explore sensitivities, to trade-off C/S with MA components, and to perform value/impact or cost/benefit analysis. Performance measures include alarm probabilities and expected times to alarm as well as a Diversion Index and a Deterrence Index.

Aggregated Systems Model of Nuclear Safeguards.

This report describes an Aggregated Systems Model designed to assist decision in integrating and evaluating diverse factors in consistently setting performance criteria for systems which safeguard special nuclear material. It summarizes the results obtained from applying the model to safeguards-

decision making in areas such as the hardware or procedures required, substitution of electronics for human safeguards, and overall performance criteria for safeguards systems; and describes new criteria designed to measure how safeguards systems deter adversary attempts.

From Decisions and Designs, Inc., Suite 600, 8400 Westpark Drive, P.O. Box 907, McLean, VA 22101 (available at a possible reproduction charge):

Issues in the Design and Evaluation of Decision-Analytic Aids, by Leonard Adelman and Michael L. Donnell.

The three papers in this volume propose guidelines for the design, implement--tation, and evaluation of automated decision aids. The guidelines are presented in terms of the interface between the aid, the user, the user's corporate organization, and the organization's competitive environment.

Intelligence Preparation of the Battlefield: Critique and Recommendations, by Leonard Adelman, Michael L. Donnell, and Ruth H. Phelps. [# PR 80-24-304]

This paper surveys the interface problems of intelligence analysis and the causal judgments required in the five analytic steps proposed in Circulars TC30-27 and TC34-3 for Intelligence Preparation of the Battlefield. We find the circulars inadequately instruct analysts in the judgments necessary for the process. Judgment aids are recommended.

An Analysis of Investment Opportunities for Night and In-Weather Tactical Air Operations, by Roy M. Gulick, Kenneth P. Kuskey, and Dennis M. Buede. [# PR 79-25-309]

The Tactical Air Command was assisted to formulate an investment strategy for acquiring new systems to improve the night and in-weather combat effectiveness of close air support and interdiction missions during the period 1980-1990. We summarize the background of the problem, DDI's analytic approach, and the problem's solution.

Decision Analytic Support of the United States Marine Corps' Program Development: A Guide to the Methodology, by Kenneth P. Kuskey, Kathleen A. Waslov, and Dennis M. Buede. [# PR 80-26-158]

The Marine Corps (MC) program is a five-year plan for funding several hundred individual programs. By annually organizing the MC staff into working groups to evaluate subsets of programs, quantifying each group's evaluations of its programs, and mathematically combining the groups' evaluations, priorities among all programs are determined.

From Decision Science Consortium, Inc., Suite 421, 7700 Leesburg Pike, Falls Church, VA 22043:

Decision Analysis in Water Resources Planning: The Shasta Case, by Vincent N. Campbell and David A. Seaver. [Technical report 79-1]

A decision-analytic model was developed and applied to the question of whether to build a major dam in northern California to provide additional water for statewide use. Three alternative projects and the no-project option were compared using a multiattribute utility model. Each option was evaluated by scoring it on 18 specific friteria and adding the scores, weighted by the importance of the criteria.

Applications and Evaluation of Decision Analysis in Water Resources Planning, by David A. Seaver, Rex V. Brown, Vincent N. Campbell, Jacob W. Ulvila, and James O. Chinnis, Jr. [Technical Report 79-2]

Applications and evaluation of the usefulness of decision analysis in two ongoing problems are reported, together with additional description of the general techniques and uses of decision analysis that may be particularly appropriate for water resources planning. Decision analysis is generally seen as useful by planners, but many organizational constraints must be overcome to expand its actual use; suggestions are made concerning gaining acceptance.

Decision Analysis in Forest Service Planning: Treatment of the Mountain Pine Beetle, by Anthony N. S. Freeling and David A. Seaver. [Technical Report 80-8]
This report presents the results of a decision analysis to assist the Region II Firest Service in addressing the problem of what activities to undertake in combatting the mountain pine beetle in ponderosa pine forests.

Decision Analysis in Forest Service Planning: Roads, Trails, and Utility Corridors, by David A. Seaver and Anthony N. S. Freeling. [Technical Report 80-7]
Roads and trails are needed to provide both market and non-market commodities and amenities from National Forests and Grasslands, particularly timber and developed recreation. Utility corridors are needed for transportation of coal and oil shale. Yet, they may have adverse environmental impact, particularly upon wildlife and scenic quality of a region, and may be viewed as undesirable by non-motorized recreationists. This report presents the results of two analyses seeking to help balance the beneficial and adverse factors in planning for roads, trails, and utility corridors.

From Woodward-Clyde Consultants, Inc., Suite 700, Three Embarcardero Center, San Francisco, CA 94111:

Analysis to Aid Nuclear Regulation, by Ralph L. Keeney and Craig W. Kirkwood. [Jan 1980
Those with responsibility for nuclear regulation clearly wish to make responsible decisions, and it is desirable in our democratic society that these decisions be communicated to the public honestly and in an understandable fashion. Existing analysis procedures have potential to assist in these purposes. This paper presents a non-technical perspective on these procedures and their use.

Issues in Evaluating Alternative Standards, by Ralph L. Keeney. [Mar 1981]
This paper argues that standards should be specified in light of (1) the alternatives available and (2) the public values. This particular viewpoint is explained in terms of a simple example, which illustrates some important issues requiring consideration in establishing standards. We also indicate how these issues might be included in the process of evaluating alternative standards.

A Case History of Nuclear Power Plant Site Selection, by Craig W. Kirkwood [Apr 1981]
This paper discusses a multidisciplinary study conducted to select a site for a nuclear power plant. A series of screening steps were carried out to identify candidate sites for the plant, as well as caididate water sources. Multiobjective decision analysis methods were used to evaluate and rank these candidate sites and water sources; a risk analysis was carried out to determine the effects of major uncertainties. The evaluation concerns considered in the study are discussed, as well as the scales used to measure impacts with regard to these concerns.

Evaluating Computerized Geographic Information Systems Using Decision Analysis, by Vladimir M. Ozernoy, Dennis R. Smith, and Alan Sicherman. [May 1981]
An analysis was conducted to help a consulting firm select a commercial Geographic Information System. Three major objectives concerning software capabilities, harware capabilities, and vendor performance were considered. A preference model was developed to evaluate alternative information systems based on the decision maker's values. The analysis provided insights for requesting specific improvements to the preferred system. The analysis approach and the results were well received by management and were utilized in purchasing a Geographic Information System.

An Illustrative Analysis of Ambient Carbon Monoxide Standards, by Ralph L. Keeney and Vladimir M. Ozernoy. [Jun 1981]
An application of decision analysis for evaluating primary carbon monoxide ambient air quality standards is described; it incorporates human activity patterns, ambient pollutant concentrations, physiological effects given concentrations, and dose-response functions to indicate adverse health

effects of alternative ambient standards. Uncertainties are explicitly handled. Health consequences and utilities are determined for the alternative carbon monoxide standards, and sensitivity analyses examine effects of different data or value judgments.

A Technology Choice Model for Electricity Generation, by Ralph L. Keeney. [Jul 1981]
A major problem facing the utility industry involves the choice between various types of future electrical generating facilities. In each situation, the utility company concerned must select the best option, and justify its decision to regulatory and judicial agencies and to the public. The purpose of this paper is to present a model which can be of significant help to a utility facing these tasks. Specifically, we hope to improve the utility industry's ability to make complex technology choice decisions in a logically consistent manner that can be supported and defended before reviewers.

From Social Science Research Institute, University of Southern California, Los Angeles, CA 90007:

Multiattribute Utility for Evaluation: Structures, uses and problems, by Ward Edwards; in Klein, M. W., and Teilmann, K. S. (Eds.), *Handbook of Criminal Justice Evaluation*, Beverly Hills, Sage Publications, 1980.
The chapter describes the logic of program evaluation and the place of multiattribute utility measurement within it, and presents the 10 steps of the 1979 version of Edwards' SMART method. The major differences between the 1979 and previous versions include greater emphasis upon multiple stakeholders and evaluative conflict, use of linear single-dimension utility functions, and use of approximations based on ranking methods for dimension weights. It presents four examples and a list of other applications of multiattribute utility, with a brief discussion of the etiology of multiattribute utility ideas.

Functional Relationships between Risky and Riskless Multiattribute Utility Functions, by Detlof von Winterfeldt. [Dec 1979]
The paper studies relationships in its title under the assumption that the risky u and the riskless v are either additive or multiplicative, in which case u is linearly, logarithmically, or exponentially related to v, depending on which function is additive and which is multiplicative. Techniques are described to assess the parameters of u and v, and the results are discussed from a behavioral standpoint of interpreting the form and shape of multi-attribute utility functions and from a practical standpoint of simplifying multi-attribute utility assessment.

Evaluating Credit Applications: A Validation of Multiattribute Utility Techniques Against a Real World Criterion, by William G. Stillwell, F. Hutton Barron, and Ward Edwards. [Jun 1980]
22 credit officers from a major California lending institution served as subjects in a criterion validation of multiattribute utility elicitation techniques -- Holistic Orthogonal Parameter Estimation (HOPE), Simple Multiattribute Rating Technique (SMART), point distribution, and three rank weighting techniques.-- against the lender's own credit scoring model based on a statistical analysis of over 8,000 cases from the bank records. Results show that subjective judgments of importance weighting show a high degree of agreement in application selection and in total utility realized from that selection. Decomposition techniques did somewhat better than holistic techniques.

Equal Weights, Flat Maxima, and Trivial Decisions, by Richard S. John, Ward Edwards, and Detlof von Winterfeldt. [Jun 1980]
Most predictions are intended as a basis for decision making. The point of this paper is that prediction and decision require differentmethods for weighting factors under consideration.

Theoretical and Empirical Relationships between Risky and Riskless Utility Functions, by Detlof von Winterfeldt, F. Hutton Barron, and Gregory W. Fischer. [Jun 1980]

This paper presents conditions under which risky and riskless representations are related by closed-form functional relationships. We reduce functional equations relating the two representations to basic Cauchy-type equations and show that these fucctional relationships are very simple if the value function and the utility function are either additive or multiplicative. The relationships are then used to predict empirical relationships between value functions and utility functions in an experimental evaluation of hypothetical job offers. The results indicate that predictions based on the theoretical relationships are equal or better than a simple linear prediction for nine subjects out of 10.

A Comparison of Importance Weights for Multiattribute Utility Analysis Derived from Holistic, Indifference, Direct Subjective and Rank Order Judgments, by Richard S. John, Ward Edwards, and Linda Collins. [Jun 1980]

This study compares weight estimation procedures for additive, riskless four-attribute value functions with linear single-attribute values. Self-explicated (subjective) weights were assessed from direct subjective and rank order estimates of attribute importance; observer-derived weights were determined both from indifference judgments (axiomatic approach) and from holistic evaluations (statistical approach) of alternatives. Assessed weights were compared to a "true" weight vector used to generate feedback during pre-assessment learning trials (constructed with zero inter-attribute correlations). Although self-explicated weights tend to be flatter than observer-derived weights, resulting composites correlated equally well with "true" composites. Only slight differences were found in ordinal correspondence between "true" and assessed weights.

From Robert G. Bordley, Societal Analysis Dept., General Motors Research Labs, Warren, Michigan 48090:

Aggregating Individual Probability Assessments, by Robert G. Bordley. General Motors Research Publication # GMR-3321.

Using the ideas of additive conjoint measurement theory and imposing Bayesian rationality conditions, this paper shows that a decision maker receiving n different expert assessments of the probability or density function for uncertain events should aggregate them according to a specific formula derived in the paper.

Relationships Between Subjective Probabilities and other Probability Estimates, by Robert G. Bordley. General Motors Research Publication # GMR-3439.

There are many different methods for assessing probabilities which may lead to different, though internally coherent, probability assessments for the same events. This paper derives and tests a formula relating a coherent probability assessed by one method to a coherent probability assessed by a different method.

From David C. Nachman, Graduate School of Business, Columbia University, 405B Uris Hall, New York, NY 10027:

Preservation of "More Risk Averse" Under Expectations, by David C. Nachman.

The preservatuon of risk-aversion properties of utility functions under expectation and maximization operations is of interest in the study of recursion relations and derived utility functions in sequential decision problems. The purpose of this note is to present sufficient conditions for the Pratt relation "more risk averse" to be preserved under unconditional expectations.

From Jehoshua Eliashberg, J. L. Kellogg School of Management, Northwestern University, 2001 Sheridan Road, Evanston, IL 60201:

A Methodology for Goup Decision-Making, by Jehoshua Eliashberg and Robert L. Winkler. Discussion Paper # 419, Center for Mathematical Studies in Economics and Management Science, Northwestern University.

As a result of decision, a group will receive a payoff which must be divided among

the members, who have cardinal utility functions for the vector of individual payoffs. The individual utility functions are aggregated to form a group utility function for the vector of payoffs; and this function is, in turn, used to generate a group utility function for the overall group payoff and a sharing rule for dividing the group payoff into individual payoffs. Resulting group decisions are Pareto optimal.

An Investigation of Competitive Preference Structures and Posterior Performance Through a Bayesian Decision-Theoretic Approach, by Jehoshua Eliashberg. Discussion paper # 448, Center for Mathematical Studies in Economics and Management Science, Northwestern University.

Competitive decision-making situations are analyzed in terms of their preference structures and posterior performance, through a Bayesian decision-theoretic framework, in the context of a repeated two-by-teo, two-person nonzerosum game. The dynamic behavior of the competitors for classes of games, identified by their preference structures, is examined and a classification scheme is proposed. The competitors' dynamic behavior and posterior performance for some general classes of games is derived and compared to game-theoretic results.

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

Assessment of Value Tradeoffs when the Pricing Out Amounts Depend on Financial Position [Oct 1979].

The pricing out method is extended to cases in which the pricing out amounts depend on the level of the monetary attribute. Several conditions are introduced, each of which implies a special form for the multiattribute value function.

A Social Welfare Function for a Group of Indistinguishable Individuals [Feb 1980].

A model is discussed for a group decision problem in which the group consequences consist of multiattribute consequences to the individuals in the group, only the group is specified, and preferences are the same for all individuals. Strength of preference relations, risk attitudes, and equity attitudes are considered.

Difference Measurement for Multiattribute Consequences [Mar 1980].

Each of several conditions relating a decision maker's tradeoffs between consequences to his strength of preference relation on consequences is shown to imply that an additive value function determines a function representing the strength of preference relation. It is suggested that the latter function be called a worth function.

Assessment of Multiattribute Utility by Conditions on Utility and Value [Jun 1980].

A condition on utility dependence is introduced which, like conditions on utility independence, implies that the utility function has a special form in terms of conditional utility funcitons. Certain conditions on tradeoffs are shown to also have implications for the form of the utility function.

A Utility Function for a Group of Indistinguishable Individuals [Jul 1980].

Group decision models of the type specified in [Feb. 1980] above are considered. Attitudes toward risk inequity and toward catastrophe are discussed, and are shown to have implications for the form of the group utility function. These results are specialized to the case of only two possible consequences for an individual.

Stochastic Programming Models for Decreasing Risk Aversion [Aug 1980].

The risk attitude of decreasing risk aversion is formulated in a stochastic programming model with simple recourse by using an objective function that is a sum of linear fractional functions. This model is reduced to an LP model having only slightly more constraints than an LP model representing risk neutrality.

Assessment of Value Tradeoffs by Strength of Preference Comparisons [Oct 1980].

A preferential independence condition analogous to additive independence in utility theory is shown to imply that a multiattribute value function can be

obtained as a sum of functions representing strength of preference relations on the attributes. The appropriateness of the condition for tradeoffs problems is discussed.

A Value Function for a Group of Indistinguishable Individuals [Nov 1980].
Material in [Feb. 1980 above] is revised and extended. Certain conditions are shown to imply that a group value function can be determined by encoding an individual's strength of preference relations on the attributes and evaluating scaling constants between the attributes. No interpersonal comparisons of value beyond the assumption of indistinguishability are needed.

From Norman C. Dalkey, Cognitive Systems Laboratory, School of Engineering and Applied Science, University of California, Los Angeles, CA:

The Aggregation of Probability Estimates [Aug 1980]
Probability estimates (whether made by humans or derived from data) are assumed to arise from inquiry systems. With this assumption, it is shown that an aggregation p ocedure (composition of inquiry systems) exists which is constructive -- the payoff of the composition is at least as good as the payoff of any of the separate inquiry systems -- and is computable with no knowledge of the interdependencies of the separate systems. The aggregation procedure is derived by finding the solution to a game against nature, where nature and the analyst separately select a composition. The optimal composition for the analyst thus is guaranteed to have an expected payoff at least as great as the value of the game, whatever the actual dependencies happen to be.

From Decision Focus, Inc., 5 Palo Alto Square, Suite 410, Palo Alto, CA 94304:

Application of Decision Analysis to Evaluation of Alternative Strategies for Magnetic Fusion, by D. Warner North and Donald N. Stengel [Mar 1980].
This report describes a methodology based on decision analysis for addressing major program decisions in the development of complex technology, where a sequence of choices is made among multiple technical approaches under considerable performance uncertainty. The methodology is illustrated by an application to national decisions on magnetic fusion energy.

An Analysis of the Economic Value of Improved Fuels and Fire Behavior Information, by Stephen M. Barrager and David Cohan [Jul 1979].
A methodology for determining the economic value of improved fire fuels and forest fire behavior information is described. The methodology uses a decision analytic approach to evaluate the expected value of perfect and imperfect information in the context of a variety of management decisions. Insights gained through an application to a national forest in Oregon are discussed.

Commercialization of Large Wind Energy Conversion Systems, by Dean W. Boyd, Oliver E. Buckley, and Stephen M. Haas [Jun 1980].
Large wind energy conversion systems (WECS) are among the most promising solar energy technologies now under development. This report describes a decision-analytic framework for evaluating federal incentives designed to accelerate the commercialization of large WECS. The franework is applied to a variety of hypoth--etical programs similar to those currently under consideration by the federal government.

Costs and Benefits of Over/Under Capacity in Electric Power System Planning, by E. G. Cazalet, C. E. Clark, and T. W. Keelin [Oct 1978] $6.75 plus $0.75 postage.
A decision analytic methodology is presented for evaluating alternative levels of generating capacity additions in an electric utility system. Alternatives are compared on the basis of total cost to consumers, which includes discounted

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The following papers can be obtained at no charge by writing to Peter H. Farquhar, Graduate School of Administration, Voorhies Hall, University of California, Davis CA 95616.

(1) Peter H. Farquhar, "Multivalent Preference Structures," Working Paper 80-1, Graduate School of Administration, University of California, Davis (to appear in Mathematical Social Sciences).

This paper introduces the valence approach for assessing multiattribute utility functions. The valence approach partitions the elements of each attribute into classes on the basis of equivalent conditional preference orders. These partitions generate multivalent utility independence axioms that lead to additive-multiplicative and quasi-additive representation theorems for multiattribute utility functions defined over product sets of equivalence classes.

(2) Peter H. Farquhar and Peter C. Fishburn, "Equivalences and Continuity in Multivalent Preference Structures," Working Paper 80-2, Graduate School of Administration, University of California, Davis (to appear in Operations Research).

This paper establishes equivalence relations for multivalent forms of additive independence, utility independence, and fractional independence, which lead to several new representation theorems. It is also shown that some simple partitions are not possible multivalent structures when the utility function is continuous. These results should simplify the assessment of utility functions when the attributes are interdependent.

(3) Peter H. Farquhar, "Advances in Multiattribute Utility Theory," Working Paper 80-3, Graduate School of Administration, University of California, Davis (to appear in Theory and Decision).

This paper compares the existing theory on multiattribute utility decompositions with three alternate approaches: (1) multivalent preference analysis, (2) approximation methods, and (3) spanning analysis. Unlike some utility decompositions, these approaches require only single-attribute functions, thereby simplifying the assessment. The first and third approaches also provide testable axioms to justify particular utility representations.

(4) Peter H. Farquhar, "The Analysis of Implicit Attributes in Decision Problems," Working Paper 81-1, Graduate School of Administration, University of California, Davis.

This paper examines a dilemma that can occur when not all of the attributes needed to characterize the decision alternatives are considered in an initial evaluation of a problem. The main difficulty lies in the potential elimination of undominated (perhaps optimal) alternatives from further consideration if some commonly used procedures are followed. The paper illustrates practical situations where implicit attributes are frequently encountered and presents decision procedures for properly analyzing such problems.

SELECTED PUBLICATIONS

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M. W. Merkhofer, "A Procedure for Assessing Health Risks Associated with Alternative Ambient Air Quality Standards," Technical Paper 1600, 41 pages, (November 1980).

Describes a health risk assessment procedure for use by the U.S. EPA in setting national ambient air quality standards. The procedure, derived from applications of decision analysis to problems of air pollution control, involves the development and analysis of a "health effects outcome calculator," relies on formal methods of probability encoding, and makes extensive use of sensitivity analysis to direct modeling and analysis.

M. W. Merkhofer and W. M. Saade, "Decision Flexibility in a Learning Environment," Technical Report 7078, 35 pages, (December 1978).

An example is analyzed with the objective of identifying the characteristics of a decision problem that influence the desirable level of decision flexibility. The desired level of flexibility is shown to depend on uncertainty, information, the cost of retaining flexibility, and the cost of decision error. Analysis results support a concern that current methods of analysis tend to produce strategies with insufficient flexibility.

H. W. Brock, "Game Theory, Decision Theory, and Social Choice Theory in the Context of a New Theory of Equity," Technical Report 7078, 40 pages, (December 1978).

Interrelationships among game theory, axiomatic social choice theory, and ethics are set forth in the context of a new theory of equity and used to explicate alternative intuitive concepts of equity and fairness.

Carl-Axel S. Stäel von Holstein and James E. Matheson, "A Manual for Encoding Probability Distributions," Technical Report 7078, 201 pages, (August 1979). (No-cost supply limited. Additional copies available from SRI Business Intelligence Program, File No. 81-563 @ $70).

This manual describes a systematic process for encoding subjective information in the form of probability distributions. The process is the result of several major research projects and literally hundreds of applications in a wide variety of fields. Numerous examples are provided.

revenues, environmental costs, and outage costs. Future demand uncertainty and dynamic decision adjustments are represented. Results are illustrated with case studies on four actual utility systems.

Users Guide to the Over/Under Capacity Planning Model, by C. E. Clark, T. W. Keelin, R. D. Shur, and F. Warthman [Jul 1979]. $12.00 plus $1.00 postage.

This users' guide is a more detailed documentation of the Over/Under model than contained in the original report (above). Input and output tables, program operation, guidelines for case study development, and an overview and listing of the computer code are included.

EPRI Roles in Battery Commercialization, by Dean W. Boyd, Charles E. Clark, and Thomas E. Guardino [Dec 1980]. $10.00 including postage.

Successful commercialization of advances storage batteries requires interacting decisions by many parties. Potential suppliers must be willing to commit to production of battery systems and utilities must perceive batteries as cost-effective supply options and commit to purchase and installation. In addition, other parties such as EPRI and the federal government make decisions which facilitate or impede market acceptance of batteries. This analysis evaluates a variety of roles that EPRI might take in facilitating the commercialization of batteries. Using a multiparty decision analysis approach that evaluates the impact of each EPRI role on each party, we conclude that there are a number of positive alternatives for EPRI to consider.

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