DAS Newsletter

Volume 17, Number 3
(December 1998)

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Content

From the Chair

Detlof von Winterfeldt

When the DAS Council met in Seattle last October, we spent a fair amount of time discussing three issues: The journal, the practice award, and the future of the Ramsey award. These issues were also discussed in two panels during the DA cluster in Seattle. I will reflect on them in more detail later.

People first

Dana Clyman and Patrick Noonan did an outstanding job organizing the DA cluster for the Seattle INFORM meeting. I was particularly impressed by the many "non-conventional" sessions. We need more clusters like this!

Greg Fischer has completed the cluster for Cincinnati and the sessions should be listed on the web by now. This cluster also looks very promising, especially with its mix of descriptive and prescriptive presentations in each session. John Lathrop has taken on the task of organizing the Philadelphia DA cluster with vigor and many exciting ideas. At this time, he has more sessions than INFORMS allotted us, so we'll probably have parallel sessions.

Thanks to all cluster chairs, session chairs, and presenters, who make the DAS cluster one of the most popular series of sessions at the INFORMS meetings.

The Journal

Elsewhere in this newsletter, Robin Keller and Don Kleinmuntz summarize the panel discussion about the DA journal that was held in a special session at Seattle. At this point, there appears to be a consensus that the DAS should start a new journal, but many implementation issues remain open. To guide the implementation, the journal needs three things: A high-visibility editor-in-chief, a small group of area editors who are committed to make this journal a success, and a stellar editorial board.

The Practice Award

We had a productive discussion about a possible practice award in Seattle as well. There was general agreement that a practice award is desirable, but some concerns were raised about whether we would receive a sufficient number of quality applications. We will try to set the threshold for applying for the practice award fairly low and the incentives for participation high. Don Keefer will issue guidelines for applying for the practice award in the next newsletter. We hope to make our first award in the fall of 1999,

The Future of the Ramsey Award

Ward Edwards has been concerned for quite some time about the future of our most prestigious award. He describes some of these issues elsewhere in this newsletter. At this time, the most important task is to define the universe of eligible candidates. One way that you can contribute to this task is by nominating a Ramsey candidate to Ward.

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The Future of the Ramsey Award

Ward Edwards

The original conception of the Ramsey Medal, the most prestigious honor that DAS can bestow, was that it was to be awarded to the leaders of decision analysis, and that those who had received it already would choose subsequent recipients. This worked well during the early days of DAS, before it became as large and as diverse as it is now. But it became progressively less workable in recent years. There were three problems:

1. The previous Ramsey winners became too large a group to make consultation among themselves easy or appealing as a selection mechanism. The obvious alternative is a committee. The creation of such a committee requires that it be told to do something, and specification of that something requires that the choice set of possible Ramsey winners be defined. In short, we came to a point at which an explicit policy was necessary.

2. A quiet but real divergence developed between distinguished DAs who thought that only members of DAS should be eligible for Ramseys, and other distinguished DAs who

thought that all DAs should be. The disagreement came to focus mainly on distinguished members of the medical decision making community, since they had eminence but were rarely members of DAS. Linked with this issue were subsidiary issues, of which the most difficult had to do with the number of Ramsey Medalists, per year or in total, that we should aspire to creating.

3. It costs about $1500 to award a Ramsey. This raises sincere concerns about any strategy for honoring non-DAS members as well as DAS members. That's a good sized chunk of dues. We might not be able to afford awarding Ramseys to all who should have them.

In the course of discussions of this topic at the Seattle INFORMS meeting, some points that had been clear before became clearer; they simplify the problem somewhat. The crucial one is that selection of a Ramsey winner is a multi-step process. Assuming the award defined and the committee to award it in place, the following steps seem necessary:

1. An informal nomination process designed to make sure that no reasonable candidate is overlooked. It is at this stage that the policy about who is eligible must be kept in mind. Only DAS members can nominate people for Ramseys.

2. A reduction of a longer list of names (say, 10) to a short list intended for serious consideration—not more than 5. All the issues listed above can and probably should enter into consideration of a non-DAS member at this level. These issues constitute hurdles that non-DAS members who might get Ramseys need to make their ways over.

3. Assembly of information (minimum: a vita and 2-5 publications) about each candidate, and distribution of that package to committee members.

4. Intra-committee debate, discussion, and eventually a selection process that reduces the 5 candidates to a lesser number, which may be 0, 1, or even 2 or 3; these higher numbers occur very rarely.

To my mind, the distinction between step 1 and step 4 is crucial to this issue. I would expect non-members of DAS to be included at Step 1. But that wouldn't guarantee that they would make it to and through Step 4. I think the Society needs to be explicit about such a policy, though. And one tough question remains unresolved. I'll use a phrasing that makes clear why I consider it permanently unresolvable. Should a non-member of DAS have to be a member of a Society that honors DAS members who are not members of the other Society, in order to be eligible for a Ramsey? The answer, I think, is obviously no.

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Announcements

News from Seattle

Winners of the annual Decision Analysis Publication Award and Student Paper Award were announced at the INFORMS Seattle Meeting, October 25-28. The Publication Award (for best paper published in the calendar year 1996) was won by **Gordon Hazen** and **James Pellesier** for their paper "Recursive Utility for Stochastic Trees" that appeared in *Operations Research*. The Student Paper Award was won by **Neil A. Stiber** (Carnegie Mellon University) for his paper "A Bayesian Belief Network Expert System for Screening Contaminated Sites."

Salt Lake City in 2000

The cluster chair for the INFORMS 2000 meeting in Salt Lake City is **Jeff Keisler** at SDG. Please contact him at (617) 478-7636 if you are interested in organizing a sponsored session for this meeting.

Updated Membership Directory Page

The DAS on-line membership directory has been enhanced to list all DAS members, including subdivision-only members. Thanks to Brian Borchers and INFORMS On-Line for providing the link to INFORMS' search engine.

DAS Council Member Seats

The Nominating Committee of DAS solicits nominations for two Council Member seats to be filled in the Spring of 1999 at the Cincinnati INFORMS meeting. While the Nominating Committee itself will propose a slate of four candidates for the two open seats, proposals for additional candidates are welcome provided they are signed by at least six DAS members.

All Council Member Nominees must be Society Members and Members of INFORMS, and must be willing to serve. In particular, they must be willing to attend all Society meetings during their three-year term if elected.

Please send petitions for nominations to:

L. Robin Keller
Nominations Committee Chair
Telephone: (949) 824-6348
Fax: (949) 824-8469

e-mail: LRKeller@uci.edu

Petitions are due by January 31, 1999.

1999 Student Paper Competition in Decision Analysis

Each year the Decision Analysis Society of INFORMS solicits student papers on decision analysis, typically (but not necessarily) based upon a Ph.D. dissertation or Master's thesis. These papers are evaluated by a panel of judges and the winner receives a cash prize of $500 and is invited to present his paper at the fall INFORMS meeting where the result of the competition is announced.

If you are a faculty member who is supervising students, would you please inform them of this opportunity? If your students are not currently members of DAS, you might also encourage them to join. If you are a student reading this, please encourage your classmates to submit a paper and to join the society. DAS is a congenial organization of close to 800 members (of which almost 200 are students) and there has been a rise in recent student participation. Joining DAS seems to be a good start toward developing a professional identity. However, students do not need to be DAS members to be eligible for the competition.

All students doing work in or related to decision analysis are encouraged to submit a paper. The work must be predominately that of the student, though faculty members or other mentors can be co-authors if appropriate. The paper should be 30 pages or less (double spaced) and in standard Management Science or Operations Research format.

To be considered for the 1999 competition, please send three copies of the paper to:

Prof. Elke Weber
Department of Psychology
The Ohio State University
1885 Neil Avenue
Columbus, OH 43210.

All submissions must be received by July 31, 1999. You can contact me at weber.211@osu.edu or 614-688-4081 if you have any questions.

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New Book

Smart Choices

To make the concepts underlying decision analysis accessible to a non-technical broad audience, **John S. Hammond**, **Ralph L. Keeney**, and **Howard Raiffa** have just published a new book titled "Smart Choices: a Practical Guide to Making Better Decisions" (Harvard Business School Press). For people interested in decision-making, *Smart Choices* offers (1) a relatively simple way to introduce and motivate the concepts of prescriptive decision-making for their students, family members, and clients; (2) easy-to-understand and easy-to-use techniques for implementing these ideas on personal or professional decisions; and (3) a book that lays the basic foundation for any course on

decision-making. Instructors can build on it by going into depth on specific topics of their choosing.

See also the related interview with Howard Raiffa on page 8 of this newsletter.

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Is This the Right Time for a New Decision Analysis Journal

Report from the Seattle Panel Discussion

L. Robin Keller and Don N. Kleinmuntz

During the recent INFORMS meeting held in Seattle in late October, there was a panel discussion on whether the Decision Analysis Society (DA Society) should work to start a new decision analysis journal. Robin Keller and Craig Kirkwood chaired the panel, with additional comments provided by panelists Vicki Bier, Dana Clyman, and Don Kleinmuntz. The session was well attended, with approximately 50 people in the audience. We had a lively discussion, and a number of important issues were raised. For the benefit of everyone who was unable to attend the meeting, we will briefly summarize the panelists' prepared remarks, then give a brief overview of the comments from the audience.

Following some introductory remarks, Craig Kirkwood presented an overview of the stakeholders who would benefit either directly or indirectly from a DA Society-sponsored journal (see Figure 1). He also described a set of evaluation considerations that we might want to use in thinking about the various alternatives (see Figure 2).

Figure 1: Journal Stakeholders

Figure 2: Evaluation Considerations

Robin Keller's discussion focused on four major alternatives: (1) continue with the STATUS QUO, (2) aggressively EXPAND scope of coverage in existing journals, (3) MODIFY an existing journal, or (4) FOUND a new journal ourselves.

The first option is self-explanatory. The second option is an incremental one, where we would work to expand the quality and quantity of decision analysis articles in one or more existing journals. Good candidates might be journals that are publishing fewer decision analysis articles than previously was the case (e.g., *Operations Research* or *IEEE Transactions on Systems, Man, and Cybernetics*). The third option would be to identify an existing journal that we would then remold into an editorial format that suits our needs.

The bulk of Robin's discussion focused on the fourth and final option, namely founding a new journal. There are a number of issues that would need to be resolved for us to move forward with this option. For instance, would the DA Society solely sponsor the journal, or would we search for additional co-sponsors? A related question is who would provide the financial backing for the initial development of the journal? One strategy would be to develop the journal under the sponsorship of INFORMS. However, we should also consider alternatives, including seeking the support of a private publisher or providing the financial backing ourselves (either as an organization or by seeking contributions from the membership). The sponsorship decision also will have a direct bearing on the selection and oversight of the editorial team. Thus, sponsorship by INFORMS will mean that the INFORMS Vice President of Publications and the INFORMS Board will have

ultimate authority to select the editorial team. A private publisher may desire to exercise similar power.

Another critical issue is whether we wish to publish a traditional printed journal versus some form of electronic publishing, whether Web-based or distributed on CD-ROM or similar media. Many journal publishers, including INFORMS, are beginning to experiment with various forms of electronic publishing, typically in tandem with traditional printed publications. Similarly, most academic libraries are just beginning to determine their approach to electronic journal subscriptions, particularly for items published in both paper and electronic forms. It is clear that the economics of electronic publishing are fraught with uncertainties, and the ultimate success of a new journal may well depend upon keeping our options open.

Robin noted that the journal would naturally reflect the diversity of decision analysis research, including theoretical, methodological, experimental, and empirical topics. One of the potential advantages of establishing a new journal is that we would also have the opportunity to shape the editorial scope and contents in a variety of ways, including creating an outlet for useful contributions that currently have limited publication outlets. Examples might include: "state of the art" reviews of sub-fields or specialized topics, histories written by pioneers of the field, computer implementation of DA algorithms, advances in DA pedagogy and practice, book and software reviews, citations to DA articles appearing in other journals, short communications or commentaries, and short practice articles highlighting a firm or a major project.

Don Kleinmuntz gave an overview of the status quo situation, providing a sense of which journals publish articles that self-identify as decision analysis. He reported results of a literature search that looked for articles published from 1994 to the present that used "decision analysis" in the title, subject keywords, or abstract (a total of 811 articles). One surprising result was that the majority of articles (over 60%) were published in medical journals. Another surprising result was the huge number of journals that publish decision analysis work (369 journals in total, 149 not including the medical journals). The good news is that decision analysis appears to be everywhere—the range of fields represented included decision, risk and management sciences, medicine and health care, environmental issues, engineering, artificial intelligence, psychology, and management, among others. Furthermore, we are obviously not having trouble getting good journals to publish our work. The bad news is that, aside from *Medical Decision Making*, there don't seem to be many journals that provide a high concentration of decision analysis articles covering the full range of theoretical and applied issues, or providing a balanced mixture of normative, descriptive, and prescriptive issues. The Decision Analysis Department at *Management Science* clearly provides a similar balance. However, there are rarely more than one or two decision analysis papers per issue, and those papers do not stand out against the full range of other fields and topics covered in that journal.

Dana Clyman focused his remarks on one area that is currently not addressed in our existing publication outlets: decision analysis teaching materials and pedagogy. He described several ideas for including articles about pedagogy from specific class sessions

to entire modules or courses. He also emphasized, however, that he believed that whenever an article was published the underlying teaching materials should also be reviewed along with the article and that they should be freely available for some period of time to whomever wishes to try them. He also noted that there is currently an effort underway at INFORMS to develop a journal on teaching management science.

Vicki Bier's remarks primarily addressed the needs and concerns of new decision analysts, particularly junior faculty members who are primarily concerned with placing publications in journals that strengthen their case for promotion and tenure. She noted that there are two factors that are particularly important to this constituency: One is whether promotion committees will view the journal as a high-quality publication. There are several features that support this perception, not the least of which is the accept-versus reject-rate at the journal. Everything else being equal, a journal with a low acceptance rate will be regarded as a more prestigious publication outlet. The other major concern faced by junior faculty is the amount of time required for the journal to reach a publication decision. Untenured faculty members place great value on getting quick turn-around time from a journal, even if the acceptance rate is low.

The audience provided a wide-ranging and lively discussion. Many individuals supplied interesting examples of what has worked (and what has not worked) with journals in other fields. There was much discussion about how to draw the boundaries for the scope and content of the journal. What work should be included and what would fall outside the boundaries of "decision analysis?" One issue that struck a chord with the audience was the insistence that whatever the form and nature of the journal, it should be of very high quality. Another issue that struck a chord was that the journal should place a great deal of emphasis on readability. The major argument that appears to have generated the most support for the idea of a journal is the need for a "flagship" journal that will represent our field to the outside world. Founding INFORMS President John Little has said we need to place a stake in the ground and claim this territory as our own with such a flagship journal.

In the coming months we will be working to develop a plan of action. If we proceed with founding a journal or modifying an existing journal, the next step is to develop a journal prospectus to present to prospective publishers. Such a prospectus should identify support from the journal from the community, plus willingness of people to commit to editorial and advisory roles, to submit papers and to provide financial and other resources. Contact Decision Analysis Society Vice Chair Robin Keller with your thoughts or suggestions on this topic. Her email address is LRKELLER@UCI.EDU.

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Downstream Decision Options and Dynamic Modeling

A Summary of the Panel Discussion at Seattle INFORMS

Jennifer Meyer

As part of the Seattle INFORMS meeting in October, the Decision Analysis Society sponsored a panel discussion on decision options (downstream decisions) and system dynamics. The panel was chaired by Ron Howard of Stanford University. Representing the system dynamics community on the panel were Jim M. Smith of General Motors OnStar and Mark Paich of Colorado College. Smith and Paich have worked together on a number of GM projects that incorporated system dynamics. The decision options perspective was represented on the panel by Marcy Conn of Strategic Decisions Group (SDG) and Jim E. Smith of Duke University, both of whom have worked on projects explicitly incorporating options. This panel discussion was a significant step toward greater dialogue between the decision analysis and system dynamics communities, and is summarized here so that more members of those communities can participate in that dialogue.

Ron Howard opened the session with some remarks about the importance of this discussion. He revisited a diagram called "The Problem Space" from an earlier publication. In this problem space, the three dimensions represent degree of uncertainty (from deterministic to probabilistic), time factor (from static to dynamic), and complexity in number of variables (from few to many). For each corner of the three-dimensional cube of this space, Howard discussed the history of solution development for the problem type and the timing of the introduction of these ideas in the modern educational system. He noted that for problem types with two of the three dimensions at a high level, almost all development has been in this century, and students typically only encounter these ideas at the graduate level (if ever). Even less developed are problems that combine high levels of all of these dimensions: dynamic problems with uncertainty and many variables. Howard pointed out that few approaches are available to solve these problems, particularly when decision making is involved.

Howard had had many discussions with Jay Forrester during his early work on system dynamics. While Forrester was interested in dynamics problems with many variables, he was not at that time overly concerned with uncertainty. The concept of uncertainty can be difficult to define in a dynamic context: is a dynamic uncertainty one that, if we could know its value, would be constant over time, or is it one that changes from period to period based on an unknown distribution? Howard looked to the panelists to shed any new light on these issues that had not been resolved in the early days of system dynamics.

Howard also noted that dynamics are often not well represented in decision analyses. Typical DAs incorporate few decision opportunities that evolve over time. Some practitioners are incorporating these decision options more effectively, but often at the expense of significantly increased computational difficulty. The question is one of bringing together good treatment of both uncertainty and dynamics. Again, Howard looked to the panelists to illuminate this question. This question is particularly

challenging since the unaided human is not good at dealing intuitively with issues of uncertainty, dynamics, or complexity, even when taken one issue at a time.

Jim M. Smith of GM OnStar and Mark Paich of Colorado College presented their work at General Motors to bring together DA and system dynamics (SD). Smith (GM) noted that a delay between action and consequences is an important characteristic of systems, and one that leads to the need for a dynamic perspective that DA practitioners tend not to have. At the same time, he acknowledged that while SD practitioners have done a better job of dealing with nonlinear relationships and "soft" variables, they tend to build overly complex models that do not deal with uncertainty. He challenged SD to become more decision relevant, and DA to become more dynamic. He emphasized that the two disciplines have much to learn from each other.

Paich stressed the importance of the DDP, or Dialog Decision Process, as the context for using SD. He described one project that involved the redefinition of GM's leasing strategy. For four years, Cadillac had pursued an aggressive leasing strategy, successfully marketing four-year leases one year, three-year leases the next, two-year leases the following year, and so on, with little realization of the downstream effects this would have on the used car market. Paich and his team built a dynamic model for the new car sales market that incorporated leasing. The team used tornado diagrams to test policy recommendations over ranges of values for various model parameters. Based on the model's prediction that the used car market was going to collapse, GM's management changed its strategy and credited the project with saving them several hundred million dollars. Paich noted that the use of tornado diagrams to test the robustness of policies made the process much more compelling.

Paich described another project in which an enhanced offering was considered for OnStar, a mobile communication system. (If a car with OnStar crashes, the system will notify the OnStar Center to dispatch paramedics to the site of the accident.) Working to broaden the approach of a "traditional" consulting firm, Smith and Paich's team moved from a spreadsheet model which did not incorporate "soft" feedback effects to a dynamic model that captured important processes such as word-of-mouth awareness. Once again sensitivity analysis and tornado diagrams were an important piece of the analysis, allowing the group to move away from the more traditional role of defending point estimates in SD models. For Paich, the application of uncertainty techniques and the consideration of how parameters evolve over time is an ongoing issue of importance, as is the improved incorporation of decision options.

Smith (GM) closed by reiterating that GM really does use SD, and finds it quite useful, but only in the context of a structured decision process.

In her comments on recognizing downstream decisions and uncertainties, Marcy Conn of SDG described two types of analysis in the DA world. One, which she called comprehensive DA, incorporates decision flexibility through multiple decision points and multiple uncertainties over a significant time horizon. The other, called simple DA here, begins with a single decision and follows that with several uncertainties. While noting

that simple DA has its place, Conn argued that there are many situations in which decision flexibility is important. She enumerated a number of decision options that can be used to increase flexibility and exploit upside value potential or mitigate downside in the evolution of a decision situation. She continued with a discussion of techniques to identify opportunities for increased value through flexibility. Careful analysis of a project timeline or creative use of backcasting can assist here. Also important is the use of simple DA evaluations which allow the dissection of tornadoes and cumulative distributions to identify key drivers and sources of value in control or information.

In an actual (disguised) example from the oil and gas industry, Conn illustrated the use of a simple DA to identify critical factors and key decision options, leading to a new decision option that reduced the downside exposure of the described co-development strategy without diminishing the upside potential. Although this example was from oil and gas, she confirmed that the same approach can work well in other industries, listing a number of projects that have applied the same techniques in other areas. She summarized by noting that identifying options can often be done effectively, but making the necessary data assessments and solving the resulting models can be more difficult.

Jim E. Smith of Duke University described his work with Kevin McCardle of Duke and other individuals from Applied Decision Analysis and Chevron. He started with a diagram of the SDG Dialog Decision Process, suggesting that the process’ focus on making a decision now has encouraged people not to explore future decision options, resulting in what he called "typical" DAs that look like the simple DAs that Howard and Conn had described. He presented two examples from his review of a number of actual projects. The first example, an offshore development project referred to as Project X, relied on sophisticated modeling for the uncertainties, but retained an uncomplicated decision structure with one decision followed by three uncertainties. The second example, an exploration play, included four decisions interspersed among seven uncertainties, and was the best example of explicit option incorporation among the projects reviewed by Smith (Duke) and his colleagues. He noted that options were probably considered in the first example, but were most likely hardwired into the assessments made for the uncertainties and values.

Smith (Duke) reiterated the point made by Conn about the value of options as a means to reduce downside exposure and increase upside potential. He suggested that the DDP should be modified to consider policies rather than decisions, encouraging a discussion about options from the outset. As a technique for facilitating that discussion, he introduced the concept of "dream trees." These trees incorporate very explicit consideration of sequencing of decisions, represented in loops of decisions and uncertainties that can be repeated several times within a single project. (The name "dream tree" was initially created as a cynical comment on the tractability of these trees.) Smith (Duke) illustrated the concept with a dream tree for Project X, which had been viewed as a price play, unattractive at low oil prices but attractive at higher prices. This dream tree contained three distinct loops in three different stages of the tree.

Smith (Duke) reported that as he and his colleagues proceeded to explore dream trees like this one, they discovered the importance of thinking carefully about learning over time. Assessments of uncertainties conditioned on a large number of previously observed uncertainties can become difficult to think about. Therefore, much of his work has centered on developing models for learning. The assumptions for these models of learning make a huge difference in assessed value for policies or strategies. For example, if one believes that a currently high oil price is an indication of a future distribution for prices centered around this high price, the value of an opportunity like Project X will be much greater than if one believes that prices will revert to a previously observed historical mean.

Assuming that one is able to resolve these assessment challenges, one is still left with the challenge of solving the complex dream tree. Smith (Duke) compared two approaches that he has used. He presented the results from simplifying the Project X dream tree and solving with an off-the-shelf DA software product. While this can be done, it is crude in its ability to represent the richness of the dream tree. He also described a solution approach utilizing decision trees in conjunction with dynamic programming. The dynamic program is defined using a small set of state variables that describe the elements of value over time. This provided greater flexibility to represent complex options, but required more complicated modeling. The result was an optimal policy that identified the appropriate course of action for any combination of the state variables. Smith (Duke) also noted that simulation may be a way to solve these dream trees in combination with the other two approaches, but that has yet to be developed.

Smith (Duke) closed by noting that while the incorporation of options can add significant value to a project, it is difficult to identify where the value will come from, as well as how much value will be added. In the detailed analysis of Project X, it was discovered that the additional value came not in waiting for higher prices, as had been expected, but rather in making the right decisions about expansion down the line. The result was a 10% boost in value rather than the 30%-40% increase that had been anticipated.

After the panelists completed their presentations, Howard invited William Leaf-Herrmann of SDG to join the panel. Leaf-Herrmann had given a paper about system dynamics in the previous session. Howard then shifted the format to a dialogue between the panelists. Several points emerged in that discussion.

Smith (GM) and Paich acknowledged that their approach to incorporating decision options in system dynamics is rather informal, focusing on creating learning and understanding about the system rather than on optimizing over those options. Paich did note that GM has expanded their use of strategy tables to incorporate a more dynamic perspective. It was agreed that optimization in a dynamic environment is an area that deserves further exploration.

In discussion of the "snake" diagram of the DDP, Conn indicated that she has not observed a tendency for people to create simple/typical DAs because of the decision wording in the diagram. She has found that the process lends itself well to discussing

policies for action under various outcomes, and that this is more productive than indicating in general that a decision needs to be reviewed several years down the line. Smith (GM) expressed a concern that the process does tend to push things down in the decision hierarchy, treating downstream events as tactical decisions for consideration later. While he indicated that this can be appropriate, it can also stifle creative thinking about options at the outset.

Smith (Duke) recognized that the applicability of dynamic programming to DA problems requires careful definition of state variables. He speculated that this would be possible in areas beyond oil and gas, such as pharmaceutical development, but this would require the development of several different model components to be integrated together. The breadth of applicability of this approach is not immediately clear.

Responding to a question about the necessary level of complexity in an SD model, Paich noted that it is important to start simple and add complexity only as necessary to generate and understand the dynamic pattern of interest. As part of this, he suggested that analysts should "simulate early and often." This also limits the number of assessments that are necessary from the experts. Since these assessments are aimed at uncovering the relationships within the system, they can be even more difficult to get than the assessments about outcomes that are more common in DA. Thus sensitivity analysis is all the more important in this context. He also reiterated an important point that is heard frequently in the SD community: system dynamics models are very often viewed as tools for learning rather than tools for optimization. This was a critical theme in the panel discussion.

Smith (GM) commented on the importance of simplicity in presenting results from SD models. His group works hard to summarize meaningful insights at a high level, without introducing the complexity of the dynamic model behind those insights. He illustrated this with a single slide illustrating the results from the leasing model.

For the last part of the session, Howard invited the audience to question the panel members.

Smith (Duke) was asked about the relative value of the dynamic programming approach, whether the additional expense of that detailed modeling was actually decision relevant, leading to a change in the strategy to be selected, or whether it simply added more value to the alternative that would have been chosen anyway. Smith (Duke) replied that particularly in bidding situations, the actual value of the chosen alternative can be as important as knowing which to choose, and suggested that the same would probably be true in other situations as well.

In a question posed to Smith (Duke) and Conn, another audience member asked whether the additional work required to incorporate decision options might lead decision makers to become too focused on those issues. Conn replied that in her experience there are many situations where ignoring options leads to an underestimation of upside potential, but does not affect the chosen decision policy. She stated that incorporating a large

number of decision options (and the associated complex assessments) can lead to attention diversion. Smith (Duke) agreed, and noted that it is a real challenge to know when it pays to model more decision options.

Another audience member raised a question about the amplification of errors that may occur in dynamic or options modeling. Smith (Duke) replied that he does not see amplification as a big concern. He noted that while feedback errors may occur, they may also be identified quickly, and the choice of not modeling dynamics leads to other errors. He reiterated Paich's comments about the importance of sensitivity analysis in this context.

Panelists were asked about the skepticism that may arise when current day strategies are driven by distant future decisions and uncertainties, given that those future events can be very difficult to model effectively. Paich agreed that skepticism can arise, but in his experience recommendations tend to be robust over a wide range of uncertainty about the future. Conn commented that the correct time frame is important in any analysis, and industries like high technology and consumer products require much shorter time frames for analysis. Smith (Duke) noted that issues of time frame are not specific to dynamic modeling, and must be addressed even in simple DAs.

As a final discussion point, each panelist was asked to comment on how we can educate our students and better prepare decision makers for thinking about dynamic problems with uncertainty and many variables. Smith (Duke) suggested that teaching dynamic programming more broadly would encourage a useful mode of thought. Conn noted the importance of integrating optimization and uncertainty in our teaching disciplines. Leaf-Herrmann encouraged more dialogues like this panel and more work like that being done at GM to bring together DA and SD. Smith (GM) supported that comment, suggesting that this needs to extend beyond GM's limited resources. Paich outlined an approach that would begin with the teaching of the DDP process. He also suggested the introduction of a few system dynamics tools to be used in the appropriate situations: causal loop diagramming, stock and flow thinking, some simulation. One challenge would be to understand the criteria that indicate when those tools might be appropriate. Paich returned to the value of integrating optimization and dynamic programming with other models, although it is not obvious how to achieve this cross-fertilization.

Howard reflected on the question of better education/preparation by highlighting some experiences at Stanford and at MIT. During the merger of the Operations Research Department and the Engineering Economic Systems Department at Stanford, the topic of dynamics was one of the most troublesome issues. People from a systems background tended to argue that it is not possible to fully understand systems without studying dynamics, while those from more mathematical backgrounds tended to view problems of dynamics as less interesting since mathematical solutions often exist. Howard had encountered a similar difference in perspectives when he was a student of electrical engineering at MIT. In his studies, dynamics were a critical part of a course on circuits, but were treated as straightforward in a course on differential equations. While mathematical solutions may be useful, a broader perspective on dynamics is necessary for

fully understanding the complexity of systems. He concluded that studying dynamics in some form should be an important part of our educational curricula.

The panel session concluded with a thank you for the panel participants and organizers.

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A Conversation with Howard Raiffa

Thomas Eppel

Dr. Howard Raiffa is a pioneer in the development of decision analysis, negotiation analysis, and the theory of games. He has taught the art and science of decision making at Harvard University for the past four decades. Throughout that time, half of his professional appointment has been at the Harvard Business School, and half has been distributed among the Division of Engineering and Applied Sciences, the Economics Department, the Kennedy School of Government, the Law School, the School of Public Health, and the Statistics Department. Dr. Raiffa has supervised nearly 100 doctoral dissertations. His writings, and his students, have influenced the teaching and practice of decision making in universities throughout the world. Among his most influential authored and coauthored books are *Applied Statistical Decision Theory*, *Games and Decisions*, *Decision Analysis*, *Decisions with Multiple Objectives*, and *The Art and Science of Negotiation*. Professor Raiffa helped negotiate the establishment of the International Institute for Applied Systems Analysis (IIASA), an international think tank in Vienna, and served as its first director. In the 1970s, its aim was to bridge the political divide between East and West through applied science; in the 1990s, its mission has become to study global environment problems.

Dr. Raiffa's newest book *Smart Choices*, coauthored with Ralph Keeney and John Hammond, has just been published. I recently had the chance to talk with Dr. Raiffa about this book. The following is a slightly edited excerpt from that conversation.

TE: What is *Smart Choices* all about?

HR: Well, it reminds me of a story that is well-known amongst decision analysts. It goes back to the time when Josef Priestley, an eminent physicist and Unitarian theologian, asked Ben Franklin for advice about what to do. Ben Franklin very wisely said: "I can't tell you *what to do*, but I can tell you *how to think about what to do*." And that's what our book is really all about. It gives practical advice about a way of thinking about making decisions.

TE: What are they key features of that process?

HR: Tom, suppose that we're giving advice to you. The idea is that you should not to jump to conclusions with answers and then try to rationalize them, but rather to think

more systematically. The first thing you should do is identify what the right problem is. One way of getting engaged in a problem is to have some external trigger, like you lose your job. You need to find a new job. But it may also be that you have a job that you are perfectly happy with but you want to be proactive and think about the ideal job that you could have and then ways about getting there. So, it's not only *problems* but also *opportunities*. Next, the prescription suggests that you take a deep look at your interests, fears, wants, desires and so on. We label all these as "objectives." And we take that very seriously. Your objectives should drive where you're going and therefore help you to create imaginative alternatives. So we go from the identification of the problem to objectives to the alternatives. Then, in order for you to choose wisely amongst these alternatives, we recommend, like decision analysis, that you consider the consequences of each of the alternatives on each of the evaluative objectives. There are some objectives that are means towards ends and there are some ends objectives that are identified as evaluative objectives. We suggest you do conditional analysis to see how well each of the alternatives fares on each of your evaluative objectives. Of course you can't have everything so you have to make tradeoffs. And we offer a systematic way for you to think about these tradeoffs.

So, that's the five-step core of our approach. Luckily it turns out there is an acronym for these steps in the word "proactive": **Pr**oblems, **O**bjectives, **A**lternatives, **C**onsequences, **T**radeoffs. And I must say, Tom, that when I keep forgetting these steps, the word "proactive" comes to mind. It's also part of our message: be proactive rather than reactive. And after introducing the core, we talk about the reality of uncertainties, risks and sequential problems. But that's not in the core. The core is PROACT.

TE: Considering where decision analysis started, it is interesting to notice that your approach does not include the analysis of uncertainty and decision trees in its core.

HR: I think the answer is that, from my perspective now, decision tree analysis starts in the middle. It leaves out the beginning and the end: the identification of the problem and what the triggers of the problem are. It takes those for granted. I recall when I did consulting in decision analysis way back I was aware of these things, but somehow it didn't get in the literature. I suppose I'm partly to blame. The decision analytic literature tends to be more mathematical and esoteric. And certain things that are very basic are ignored, unfortunately. I hope this book corrects that.

TE: Is *Smart Choices* a textbook?

HR: The book was not written as a textbook but I'm hoping that people who give courses in decision making might use it as an auxiliary book to be introduced right at the beginning. Our hope is that our book will not only be adopted by people like yourself, people in the decision analytic community, but adopted by instructors in marketing, production, finance, and so on who do case method teaching. They should realize that this is a way of structuring case problems, a way to bring coherence to the analysis. It's a way of thinking about lots and lots of different problems. It can't get more basic than:

what is the problem, what are the objectives, what are the alternatives, what are the consequences and what are the tradeoffs?

TE: Who is the intended audience of the book?

HR: I kiddingly say the book gives practical advice to practically everybody. By everybody I mean people involved in making personal choices about careers, jobs, retirement investments, and so on. And then there all these people that are constantly making choices in their jobs. People in business, in public policy positions, lawyers, doctors, and even craftsmen. So I still think "practical advice for practically everybody" captures the spirit. Our ideal purchaser would be a businessperson, running to an airplane, stops long enough to buy the book, reads it on the plane and thinks: "Gee, this is a good book to give to my teenage son or spouse" or maybe "This is how we should make decisions in our family and in my business."

TE: *Smart Choices* seems similar to decision analysis but not exactly the same. How do you see the relationship between decision analysis and the ideas put forward in *Smart Choices*?

HR: I think it's part of decision analysis. Decision analysis should incorporate what we have in this book. Maybe you might want to think of it as "basic decision analysis." It's not "beginning decision analysis" because there are profound things that have to be said in helping structuring the problem. I think *Smart Choices* describes a part of decision analysis that has been lost in the pedagogy. People who do consulting know about it but somehow it has not been codified. I hope this book will broaden the perspective of what decision analysis is considered to be about. Unfortunately, people who have taken courses on decision analysis are left with the impression that decision analysis is a collection of quantitative ideas, or mathematical ideas or analytical ideas useful in decision making. That's not really its essence – it may be part of the essence. The essence is a broad, qualitative way of thought about how to make smart choices.

TE: How does the book relate to negotiation analysis?

HR: As you know I have been working in negotiation analysis quite a bit for a few decades and so has John Hammond. The literature in negotiation analysis has not been dominated by the analytical guys. It is dominated by social science types and lawyers like Roger Fisher and others. They started off on a tack that was giving advice to almost everybody, regardless of background. And I think that we have learned something from looking at the development of negotiation analysis. What was wrong in the decision analysis literature was that it became too quickly esoteric, too quickly dominated by what's interesting in research journals and not by what's needed in practice. Now if you think of the field which I like to think of as decision sciences, as incorporating individual decision making as well as group decision making, then group decision making could in turn be divided into two parts: *strategic decision making* where individuals have to act separately but where their individual payoffs depend upon the joint actions of others (which would be the domain of game theory); and *collaborative decision making* where

groups have to negotiate what to do jointly. In group decision making, which includes game theory, negotiation theory, a lot of organization theory and so on, individual decisions have to be made. So it would be nice to have a compatibility between what *Smart Choices* attempts to do and what is recommend in more analytically oriented books in game theory and in negotiations. When Roger Fisher talks about the importance of interests, we say "yes, yes, yes" – although we call it something different. We call it objectives. So I think there should be a comfortable accommodation or a comfortable jointness in the different approaches in different fields.

TE: Let me ask you a few more general questions now. What role would you like decision analysis and ideas put forward in *Smart Choices* to play in personal and organizational decision making?

HR: I am starry-eyed at this point. I would love this material to be introduced in high schools and be a required course in general education or in the core program in universities. Decision making is the basis of what we do in life and we all should be trained in how to do it well. I don't think it should be the domain of some few experts who are mathematically oriented. That misses the point. And this book tries to correct that.

TE: I usually introduce decision analysis by asking my students how many of them play golf. Then I ask how many of them had some form of training on how to play golf. Virtually every hand that went up before goes up again. Then I ask: "How many of you make decisions?" Every hand goes up (or at least should go up). Finally I ask: "How many of you had some training in how to make decisions?" And then I get these blank and somewhat bewildered stares.

HR: That's a good example, Tom. We are giving coaching advice on how to make smart choices. Some people ask, "How can you give coaching advice to doctors? Do you know anything about medicine?" And I say, no we don't know very much about medicine, but we know a lot about the process of thinking about making choices. When we offer coaching advice, we are not saying that we are smarter than you. Even the best tennis players in the world have coaches they can easily beat, but still they can profit from advice on certain aspects of their craft. And that's what we are trying to do here.

TE: Readers of the Decision Analysis Newsletter would be very interested in any general comments that you have for teaching and applying decision analysis. What advice would you offer, in particular to young people coming out of graduate school?

HR: Well, I hope that the field of decision analysis would be more broadly interpreted. It should for example, include the thoughts of cognitive psychologists on how people make decisions on their misperceptions, on some of their sometimes inappropriate heuristics, and on how to modify some types of behavior. *Smart Choices* does some of this. *Smart Choices* is part of a package that should broaden out to a discussion of interactive decision making, strategic decision making, negotiation. There should be a bona fide subject of study that's akin to economics or to psychology. I'm hoping that in the

catalogue of a prestigious university in 25 years, there will be a field of study called decision making or decision science – I don't know what to call it – that would feature general courses and then loads and loads of specialty courses, like negotiations, organizational behavior, designing organizations that produce good decisions, even advice on how to build constitutions. It should be very broad. That's my dream. If I were a young man I would write books and give courses to broaden the perspective and make this a reality.

TE: So we need to go out and preach?

HR: Yes.

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Meetings

37th Annual Bayesian Research Conference

February 18-19, 1999

Ward Edwards

This is your invitation to come and participate in the 37th Annual Bayesian Research Conference to be held on February 18 and 19, 1999, at the Sportsmen's Lodge Hotel in Studio City, California. The format will be the same this year as in previous years. We hear 30-minute papers about research on inference, evaluation, decision processes and problems. We always strive for a blend of basic research and applications. As old hands know, the atmosphere is informal, the discussion can get intense, and many of the best debates take place during the 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.

You find a registration form on page 13 of this newsletter.

SPUDM 17

University of Mannheim, Germany

August 9 - 11, 1999

Call for Papers

The bi-annual SPUDM Conference sponsored by the European Association of Decision Making will take place in Mannheim, Germany, from August 9–11, 1999. The conference will start Monday morning, August 9th, and end Wednesday evening, August

11th. Papers are invited in any area of decision making or a related field, and may be presented within a symposium or by submitting an individual paper.

To submit a Symposium

Symposia are sessions to present and extensively discuss papers on closely related topics. Symposia are allotted 120 minutes each and must include 4 speakers and 2 discussants. Submit a title, a 100-200 word description of the intended theme of the symposium. Attach a list of intended participants including participants‘ phone number, address and email address and a brief description (100 words) of the topic of his or her talk. Please confirm the speakers’ willingness to participate prior to submitting their names. For questions, contact Joop van der Pligt:

email: sp_pligt@macmail.psy.uva.nl

To submit an Individual Paper

Submit: (1) a one-page abstract of the paper of 200 words (word limit will be strictly enforced). (2) Indicate whether you would be willing to present your paper as a poster if an individual paper slot is not available.

To submit a Poster

Submit a short abstract of no more than 100 words (word limit will be strictly enforced). You can be the first author on at most one individual paper and on one poster.

Submissions

All submissions should be done via our webpage (www.spudm99.uni-mannheim.de). In case the web is not available to you, contact us for paper forms via Mrs. Jutta Bender, University of Mannheim, Sonderforschungsbereich 504, 68131 Mannheim, Germany (email: spudm99@sfb504.uni-mannheim.de)

Time Table: Submissions

Symposia: January 11
Talks: February 15

Please, make all submissions via the web:
www.spudm99.uni-mannheim.de.

ISIPTA ’99

THE FIRST INTERNATIONAL SYMPOSIUM ON IMPRECISE PROBABILITIES AND THEIR APPLICATIONS

Ghent, Belgium

30 June - 2 July 1999

The first International Symposium on Imprecise Probabilities and TheirApplications (ISIPTA ?99) will be held at the Universiteit Gent, in Ghent, Belgium, 30 June - 2 July 1999.

Those wishing to present a paper at the symposium should submit a short paper of 4 to 10 pages by 31 January 1999. We expect electronic submissions, in Postscript format. Papers should be sent to the symposium e-mail address:

isipta99@ensmain.rug.ac.be.

Please see the symposium web site http://ensmain.rug.ac.be/~isipta99 for detailed instructions about how to submit papers.

Important dates

Submission deadline: 31 January 1999

Notification of acceptance: 31 March 1999

Deadline for revised papers: 30 April 1999

Deadline for early registration: 30 April 1999

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9th International Conference on the Foundations & Applications of Utility, Risk and Decision Theory

Theory and Decision announces that the 9th conference on the foundations and applications of utility, risk and decision theory will be held in Marrakesh (Morocco) on June 1-4, 1999. The meeting will bring together experts in the decision sciences from economics, management science, finance, mathematics, psychology and philosophy.

Those wishing to contribute a paper at the meeting should submit a two-page abstract with indication of the author's e-mail address and/or fax number before January 15, 1999 to:

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