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The Use of Decision Technology in Conference Planning

by Scott E. Sampson, Brigham Young University

As decision scientists, we preach the virtues of following an analytical approach to all types of business problems. We extol the merits of data and optimization and methodologies for systematically making decisions. We prescribe approaches to system design that often involve analysis, modeling, and information technology. We are confident that better managers will produce better companies as a result.

Then, for various reasons, we go to our annual meetings and other conferences. We network with other advocates of the decision sciences. We share our latest ideas and hear the ideas of others. And, we complain.

What do we complain about? We complain because the two sessions that we most wanted to attend are scheduled at the same time period, but in different rooms! We complain because when we show up two minutes after the start of an important session, we see so many people standing in the doorway that we cannot even get close enough to hear! We complain because we have an important off-site commitment the last day of the meeting, but find that the two sessions we are participating in were both scheduled for that day!

And so we may wonder if this is perhaps an opportunity to take our own decision-science medicine. We expect professional landscapers to have nice yards around their homes. We expect accountants to have balanced checkbooks. We expect auto mechanics to drive vehicles that are in good repair. Why should we not expect decision scientists to have more optimally designed conferences?

Decision Issues of Conference Planning

Conference planning is an arduous process. Just ask anyone who has chaired a DSI annual meeting. I recall visiting Mike Showalter's office in early 1994, the year he chaired the annual meeting in Hawaii. There was a stack of submissions in FedEx envelopes so tall that I am sure OSHA would have declared it a work-place hazard. Mike is a wonderfully levelheaded person, but if there were a time he would develop a nervous twitch—it would have been in 1994.

And do you think you get a lot of email messages? Just try being a program chair. (These aren't the kind of emails that say, "Have a nice day," either.) Everyone wants something from a program chair. And the messages to send! Track chairs need to be recruited and trained in the procedures. Authors need to be contacted about submissions and proceedings. Special program chairs need to be contacted about events. Imagine how difficult this process was before widespread email!

Communication technology such as email has indeed benefited the conference planning process. Further, there are great opportunities for data processing and analysis technologies to help with conference planning decisions. These decisions include addressing such issues as:

- How to best group papers into sessions?
- Which papers are best in regular sessions and which are best as table topics?
- How to best assign sessions to time periods?
- Which rooms are best for various sessions and events?
- How many time periods to allocate to program events?
- How many program events to have?

It's no wonder that conference planning can be such a stressful process. This sounds like a problem worthy of a decision science approach.

Highlights from "Early History"

People have actually been using decision technology to help with similar problems for many years. Much of the research published in this area comes under the heading of "timetabling." Often this timetabling is in the context of class scheduling or exam scheduling—problems that are closely related to conference scheduling.

The earliest journal article on exam scheduling I have found is one published in July 1964 by Cole titled: "The Preparation of Examination Time-table Using a Small-Store Computer." The term "small-store" refers to the 4096 binary words (39 bits each) of data memory available in the computer. The scheduling algorithm sorts the exam topics from those that are estimated to be most difficult to schedule to those that are least. Then, period-by-period, the exams are selected and assigned to the given exam period to avoid conflicts. (A conflict is a student group required to take more than one exam at a given time period.) It is a greedy heuristic, but likely to produce feasible solutions.

The earliest journal article I found specifically on class scheduling was published in our own *Decision Sciences* in October of 1977. Shih and Sullivan's article, "Dynamic Course Scheduling for College Faculty via Zero-One Programming," provided a timetabling formulation that was more extensive than most. They not only assign courses to time periods, but also assign them to school terms. The formulation includes 17 different *sets* of constraints, including one for "maintaining the overall level of the quality of education" by achieving a specified amount of instruction-quality rating. Unfortunately, the formulation was NP-complete. However, it does show the potential for using the methodology for timetable design.

There is another category of related problems that have been called "sectioning." The sectioning problem is to determine, for a given course timetable, how best to assign students to the various sections of multiple-section courses. I like to call this the "enrollment problem," since the objective is to enroll students in actual sections of courses. The earliest article I found solving this type of problem is "A Monte Carlo Algorithm for Assigning Students to Classes" by Macon and Walker in 1966. Their approach allows students to request specific sections of courses (such as those at desirable time periods), but does not grant some requests in order to avoid exceeding the capacity of popular sections (but still avoids student schedule conflicts).

With "sectioning" problems it is assumed that the timetable is determined *a priori*.

This leads to an interesting extension. What if we simultaneously determined the timetable *and* the enrollments? A timetable that does not consider the impact on potential enrollments will not adequately consider the needs of students. So, the idea is to generate a timetable that is both "feasible" and leads to an enrollment that allows the satisfaction of student requests for specific courses or sections. This has been called the "global" problem, and is a little bit more complex than the component problems.

The earliest journal article on the global problem in my literature search is "Conference Seminar Timetableing" by Eglese and Rand. This is one of my favorite articles on timetabling topics, and has influenced my research and articles in this area. The authors describe a 1975 national conference of the charitable organization known as the Tear Fund. The conference had 15 unique sessions offered over four distinct time periods. The individual sessions could be repeated as necessary based on meeting participant (i.e. attendee) interest. Two of the sessions had the same session leader, so they could not be scheduled in the same time period. Otherwise, the objective was the satisfaction of participant requests.

Prior to the conference, each participant was allowed to select and rank five of the 15 sessions. Since there were only four time periods, the fifth request was an alternate. Request lists were submitted by 265 participants. The final result was a conference that considered the individual interests of each participant, whereas traditional timetabling simply seeks feasibility relative to instructor conflicts or room availability. We are implementing just such a global approach with this year's meeting in San Francisco, but without repeated sessions. Although we cannot guarantee that conference attendees will get all of their top-ranked choices, we are confident that it will be a superior conference schedule than had we ignored individual preferences.

(Vicki Smith-Daniels describes the meeting in her article on page 30. Also, if any of you want my annotated bibliography and taxonomy of articles in the area, let me know. I have been meaning to consolidate it into a potential journal article—in its present form it is 80+ typewritten pages. Enough requests may be the motivation I need to budget the time to get it done.)

Enabling Technologies

I previously mentioned how beneficial email is in the conference planning process. Email is valuable because of the many people who are involved in planning a conference. The need for coordination and input goes up even more with the so-called "global" approach. This leads to a concept of distributed conference planning—where all participants have the potential to influence the conference in some way.

It would be overwhelming for the conference chair to email every conference participant requesting a ranked list of sessions, but perhaps easier than a paper-and-pencil approach. There are other Internet technologies besides email that would be more suited. For example, the World Wide Web is a natural way for allowing many individuals to provide information to a database, and is the method we will use for this year's meeting. Eventually, we can expect to have all paper submissions done over the web, further simplifying the lives of program chairs.

One challenge that DSI has relative to the 1975 Tear Fund conference is that our national meetings involve hundreds of papers and hundreds of sessions for attendees to choose from. Web database search technology will help there, allowing participants to do key-word searches of available options, ranking those of interest. These ranked preference requests can help the conference planners make a number of decisions:

- Papers with many requests in common can be grouped into sessions.
- Papers with many requests can be kept from being assigned to "table topics."
- Sessions with many requests can be assigned to larger rooms.
- Major program events with low votes can be scheduled with other alternatives.
- Development of a conference timetable with the objective of maximizing the fulfillment of participant requests.

Even though we use technology to aid the decision, it is still desirable to subject the schedule to the judgment of the program committee. Again, Internet technologies can provide assistance. For example, preliminary schedules can be posted on the web so that track chairs can check for additional changes. Then the final schedule can be distributed to everyone quite easily, as we have seen with prior meetings.

That still leaves the question of what solution methodologies to use to generate the actual schedule. That would take me well beyond any page allocation for this article. I will say that the methods are a little more sophisticated than the old "write session titles on 3x5 cards and lay them out on a table" method. For now, I must refer you to the Eglese article and other references listed below.

Even better, you can get more information by attending a special session at the November meeting in San Francisco titled "Technology-Enhanced Conferences." This session will be a panel composed of Vicki Smith-Daniels (2001 program chair), Tim Smunt (2002 program chair), Bob Jacobs (DSI president), and me. We will discuss some of the exciting approaches for the 2001 and 2002 meetings, as well as the potential future of the conference planning process. We may actually convince some of you that at some point in the future the program chair job may not be so arduous after all.

Now, if you are wondering what day, time, and location that special panel session will be, I am sorry, but I do not have that information. It will depend on who includes it in their preference rankings!

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Paradox of opportunity-threat

Ebusiness has been a boon for consumers and for productivity, but it is also a great challenge to businesses' bottom lines. Any technology that results in more transparency and more competition will lead to higher productivity and inevitably compress profit margins as well. Just as ebusiness intensifies competition and undermines traditional sources of advantage, it also makes new ways of competing possible. In particular, the Internet's two-way flow of information from, and to, the customer provides companies with a powerful tool to expand the richness of their offerings. Distribution and sales channels have always conveyed a certain amount of information back to suppliers. The bandwidth, precision, ease, real-time speed, and manageability of information flow in both directions are greatly enhanced by the Internet, leading to an unprecedented level of customization. The paradoxical implication here is that opportunity will breed threat while threat will also breed opportunity.

The Network Paradigm of ebusiness

The central theme shared by the above paradoxes is a network. Network technology is at the core of digital technology that is the key enabler of ebusiness. Social networks of intellectual contributors are critical for the creation and exchange of ideas, information and other intellectual properties, which constitute the content of ebusiness. Business networks of suppliers, customers and even competitors are shaping the new eco-system of the new economy, which is the result of ebusiness. All these factors converge to the notion of network, so we can define the emerging theme as the network paradigm. *Paradigm* is defined as a holistic, dynamic, and paradoxical integration of business model and organizational structure. *Business model* is the scope of business functionalities in a company, and *organizational structure* is the style of business relationships both within and outside a company. The network paradigm is best to address the paradoxical issues of ebusiness, as illustrated by the following discussion.

Distinction and link between e-marketplace and e-supply chain

E-marketplace is an Internet-enabled virtual market where goods and services can be bought by a wide range of buyers from a wide range of suppliers. E-marketplace is best for standardized products and services. *E-supply chain management* (e-SCM) is an Internet-enabled process of planning and implementing end-to-end process from supplier to customer, including design, logistics, marketing, and after-sale service of customized products. At the heart of e-SCM is c*ustomer relationship management*. According to the network paradigm, the distinction and link between e-marketplace and e-SCM is that the former is community-based network best for non-core business, while the latter is company-centric network best for core business. Both are needed for every firm for its ebusiness.

Distinction and link between ebusiness integration and separation

Most legacy players initially choose not to re-engineer their whole business processes, but rather to spin off a new division to experiment. Each approach has its pros and cons. For example, the advantages of spin-off include: (1) it can speed up the decision-making process; (2) it can maintain a high degree of flexibility and create an entrepreneurial culture; (3) it can attract high quality management; and (4) it can tap into the vast pool of capital available to Internet start-ups. One trouble with spin-offs is that if a big firm spins off its most innovative units, it may lose the chance to reinvent its existing business. Another difficulty is to leverage the core competencies or the assets of the remainder of the company. Very few know how to balance the above issues. According to the network paradigm, a loosely coupled internal network will resolve the problem (Li, 2001).

Distinction and link between click and brick

As for the question of which one—pure-player or legacy player—will be the future winners of ebusiness, the answer from the network paradigm is that both will be winners, but only if both are present, because both are needed for the success of ebusiness revolution. Pure players and legacy players have both advantages and disadvantages. They have to team up as partners in external alliances. Legacy players should focus on the physical (or brick) elements, while pure players should focus on the virtual (or click) elements. These two groups should exist as two independent units but work together as an integrated team.

Reference

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Kenneth E. Kendall
School of Business-Camden
Rutgers University
Camden, NJ 08102
(856) 225-6586
fax: (856) 424-6157
ken@thekendalls.org
http://www.thekendalls.org

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