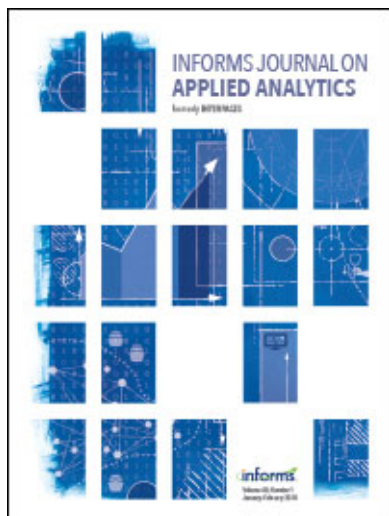




Interfaces

Publication details, including instructions for authors and subscription information:
<http://pubsonline.informs.org>

Book Reviews

To cite this article:

(2001) Book Reviews. Interfaces 31(1):125-133. <https://doi.org/10.1287/inte.31.1.125>

Full terms and conditions of use: <https://pubsonline.informs.org/Publications/Librarians-Portal/PubsOnLine-Terms-and-Conditions>

This article may be used only for the purposes of research, teaching, and/or private study. Commercial use or systematic downloading (by robots or other automatic processes) is prohibited without explicit Publisher approval, unless otherwise noted. For more information, contact permissions@informs.org.

The Publisher does not warrant or guarantee the article's accuracy, completeness, merchantability, fitness for a particular purpose, or non-infringement. Descriptions of, or references to, products or publications, or inclusion of an advertisement in this article, neither constitutes nor implies a guarantee, endorsement, or support of claims made of that product, publication, or service.

© 2001 INFORMS

Please scroll down for article—it is on subsequent pages

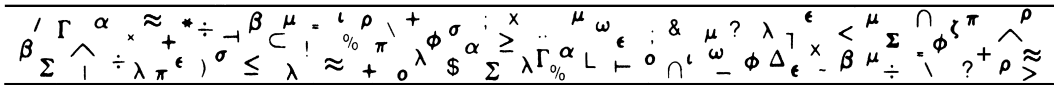


With 12,500 members from nearly 90 countries, INFORMS is the largest international association of operations research (O.R.) and analytics professionals and students. INFORMS provides unique networking and learning opportunities for individual professionals, and organizations of all types and sizes, to better understand and use O.R. and analytics tools and methods to transform strategic visions and achieve better outcomes. For more information on INFORMS, its publications, membership, or meetings visit <http://www.informs.org>

Book Reviews

BENJAMIN LEV

School of Management
The University of Michigan-Dearborn
4901 Evergreen Road
Dearborn, Michigan 48128-1491
blev@umich.edu



The range of books reviewed is wide, covering theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems (no software is reviewed). In addition, we include books in other fields that emphasize technical applications. Publishers who wish to have their books reviewed should send them to Professor Benjamin Lev. We list the books received; not all books received can be reviewed because space and time are limited. Those who would like to review books are urged to send me their names, addresses, and specific areas of expertise. We commission all reviews and do not accept unsolicited book reviews. Readers are encouraged to suggest books that might be reviewed or to ask publishers to send me copies of such books.

1998 Franz Edelman Competition

Videotapes

WEINTRAUB, ANDRES; EPSTEIN, RAFAEL; MORALES, RAMIRO; AND SERON, JORGE 1998, *Use of OR Systems in the Chilean Forest Industries*, No. 98.01.

RAJARAM, KUMAR; JAIKUMAR, R.; BEBLAU, FRANZ; VAN ESCH, FRANS; HEYNEN, CORRIE; KUTNER, ALBERT; VAN DE WEGE, IZZAK; AND KAISER, RALPH 1998, *Robust Process Control at Cerestar's Refineries*, No. 98.02.

BERTSIMIS, DIMITRIS; DARNELL, CHRISTOPHER; AND SOUCY, ROBERT

1998, *Portfolio Construction Through Mixed Integer Programming at Grantham, Mayo, Van Otterloo and Company*, No. 98.03.

TAYLOR, RAYMOND G.; VASU, MICHAEL L.; AND CAUSBY, JAMES F. 1998, *Integrated Planning for School and Community: The Case of Johnston County, North Carolina*, No. 98.04.

MUDRAGEDA, MURTHY V.; MURPHY, FREDERIC H.; AND WELCH, STEVEN E. 1998, *Developing Business Strategies for Maritrans' Business Units*, No. 98.05.

FLETCHER, L. RUSSELL; ANGELIDES, DEAN P.; HOLMEN, SCOTT P.; AND

Copyright © 2001 INFORMS
0092-2102/01/3101/0125/\$05.00
1526-551X electronic ISSN

Downloaded from informs.org by [216.73.216.139] on 13 July 2026, at 22:26. For personal use only, all rights reserved.

ETZENBOUSER, MATTHEW J. 1998, *Long-Term Ecosystem Planning at Pacific Lumber*, No. 98.06.

HONAN, DENNIS; RUTKOWSKI, STEVEN; WEIGEL, DONALD; AND CAO, BUYANG 1998, *Applying GIS and OR Techniques to Solve Sears Technician-Dispatching and Home-Delivery Problems*, No. 98.07.

Use of OR Systems in the Chilean Forest Industries

On this tape, the presenters describe three models that are used to optimize the operations of several Chilean forestry firms. The models are used for developing a long-term harvest strategy, a short-term harvest plan, and heuristics for scheduling the loading, movement, and unloading of trucks. These models were developed to balance production over time to ensure that timber of appropriate grades is available for sustained harvesting, to maximize the value of what is harvested from designated areas over the next few months, and to reduce congestion at the loading and unloading areas. The benefits from using the models for one company were \$8 million per year on \$200 million in sales. The overall benefits to the Chilean forest industry were \$22 million per year.

The long-term planning model described is a large integer program that locates roads and equipment for an efficient harvest. It contains representations of the topography down to 10-by-10 meters. It is solved using heuristics. The short-term planning model develops a harvest plan that determines what trees are to be cut and the cutting patterns for each type of log. The type depends on the height and

diameter of the tree. This model is a linear program that uses a column-generation algorithm to produce cutting patterns and that meets the demands for export logs, lumber, and pulp. The last model described is a simulation model that is used to develop complex heuristics for managing the logistics of moving the logs from where they are cut to their destinations.

The presenters describe an integrated approach to managing operations as a system and show the power of management science in a cost-driven industry. The descriptions are very clear and the explanatory graphics are excellent. The mathematical programs are detailed in the appendix to the paper. This tape would be useful in an advanced operations or case-study course to show how good analysis is valuable in improving operations. Also, the models are innovative and interesting and would show well in an introductory course on mathematical programming.

Robust Process Control at Cerestar's Refineries

Cerestar operates refineries that produce glucose and its derivatives. It operates 18 plants worldwide. These plants produce around 2,000 products, which are categorized by their use as technical, food, and pharmaceutical additives. The company's problem was that it was not a learning organization and it made the same mistakes in plant after plant; it was collecting data because it was possible to collect it without focusing on its use in decision making; and the plants had considerable process variance. Cerestar embarked on a project entitled robust process control, which it defined as using the factory as a laboratory and applying statistical methods to

manage with a minimum number of control variables. It took four steps to achieve its goals. First, the analysts simplified the processes by using network flow models to minimize rework and recycling of materials. Second, they stabilized the processes by building a nonlinear integer-programming model of the physical process. Third, they used the theory of constraints to synchronize the processes around the bottlenecks and build adequate buffers between processes. Fourth, they integrated their work into a decision-support system that links the models and actually operates the plants 95 percent of the time.

The effect was to increase profitability by 27 percent, to reduce process variance at the first plant where the new system was implemented by 60 percent, and to increase production by 20 percent without adding capacity. Cerestar has implemented the technology in several other plants with similar benefits. To institutionalize the improvements and share further improvements, the company used Lotus notes to link all of the process engineers.

Interestingly, the tape contains a clearer and more interesting presentation than the article in that it does a better job of framing the ideas and giving an overview of what was done. This presentation would be useful in an operations course because it integrates process control, scheduling, and decision support notions, and it would illustrate the power of optimization in a first course on the subject. The mathematical programs are presented in an appendix to the article.

Portfolio Construction Through Mixed-Integer Programming at Grantham, Mayo,

Van Otterloo and Company

Grantham, Mayo, Van Otterloo and Company had a value investment style that was underperforming the market. The company broadened into momentum, neglect, and cash-flow styles. This greatly increased the number of stocks that the company held and the transaction costs of managing the portfolios. Customers were losing confidence in the company because it seemed that it was losing control of its portfolio and was reducing returns because of the high transaction costs.

The company was using the standard quadratic programming models. It decided to expand its approach to distinguish each portfolio style and to capture the transaction costs while imposing constraints on the number of stocks in each portfolio in a single model. The analysts first solved a quadratic programming model for the target portfolio with no transaction costs. They then solved an integer-programming model that created a final portfolio that is close to the target portfolio while controlling transaction costs, maintaining liquidity, and keeping the number of stocks within the policy constraints.

The results were an 80 percent reduction in the number of tickets (transactions) and a 50 percent reduction in the number of stocks. Furthermore, the company maintained turnover and simplified the trades, keeping rebellious clients. The model also made it much easier to execute international trades, which are more cumbersome and in a less liquid market than domestic trades. The tool allowed it to start new small-company funds.

The tape would be useful in a quantita-

tive finance class and in an introductory course on mathematical programming. Viewers should read the paper before seeing the tape of the presentation because some of the graphics are unclear and the subject lacks the natural visuals of a production-related project.

Integrated Planning for School and Community: The Case of Johnston County, North Carolina

Johnston County is growing rapidly and has to add a new school each year. Without good analytics, the process of adding schools and changing boundaries becomes very political and can become captive to special interest groups. Because they lacked trust in the planning process, voters rejected several bond issues for new schools.

The approach planners took was to develop a forecasting model for students and optimization models for locating new schools and redrawing the boundaries of all schools. The forecasting model uses cohorts and integrates land-use studies to project school populations by districts. A spreadsheet shows which schools will run out of capacity given current boundaries. This information feeds into a graphical information system that illustrates the problems. The graphics show quickly whether capacity problems are isolated or grouped within a region. If the problem is isolated, then either a school addition must be constructed or the district boundaries must be changed. Moving the boundaries can eventually lead to a school lying outside the district it serves. If the problem is in a region, new schools must be built.

The planners then use an optimization model to minimize transportation distance

subject to constraints on the capacity of the schools, racial balance, and economic balance. They then run another model that assigns neighborhoods to schools. The models use rectilinear distance.

The benefits were greater confidence in the planning process, which led to the passage of several bond issues for new schools. The model also causes less relocation of students to different schools. The planning for transporting students to schools is also simplified.

This tape illustrates a public-policy use of management science. The dollar values are not as great as those in a commercial application because of the nature of government. The tape would be good in public policy program or in an introductory course on management science to show the broad range of applicability of the field. It would also be good for a forecasting course. One of the values of this project is that it shows the complexity of dealing with broader issues than straight operations.

Developing Business Strategies for Maritrans' Business Units

Because of the Exxon Valdez oil spill, the US government passed legislation requiring that all vessels carrying oil have double hulls. Maritrans faced the problem of the government effectively taking away its capacity to move oil and had to decide what to do. Soon after passing the legislation requiring double hulls, the government introduced a loan guarantee program to build new vessels. This program had the potential of introducing new competition and lowering rates, decreasing the available equity to reinvest in new capacity. To replace the fleet with new vessels

would cost \$450 million.

The analysts' approach to studying the problem was to build an economic equilibrium model that looked at how the market for moving oil would reconfigure with changing capacity and competitive threats from imported oil products and product pipelines. The model forecasts the pattern of oil movements and market-clearing shipping rates for tankers and tank barges. The model uses a transportation model that optimizes distribution patterns given shipping rates and an econometrically estimated relationship between capacity utilization and the rates. The volume of flows on the links can be converted into capacity needs. This means that the two models can be combined, and the market-equilibrium distribution patterns and rates can be solved for easily.

Using the results of the model, Maritrans realized that it could not build new vessels and had to figure out a way to add second hulls to its existing barges. Given this new pressure to be creative, the naval architects did this, and a \$450 million expenditure was reduced to \$150 million. The rebuilding program is under way and the costs have actually been lower than expected.

Another benefit of the approach was that an early version of the model was used successfully in discussions with the Maritime Administration in the Department of Transportation to convince them to lower the number of federal loan guarantees that they were going to give to shipowners from 19 to 12 vessels. The Maritrans analysis of the viability of the loan guarantees showed that these vessels would lose money, which proved to be

true. One of the companies that built new vessels is near bankruptcy and the other is bankrupt. By reducing some of the pressure on rates through reducing new, uneconomic capacity, profits were improved by \$60 million. Furthermore, other uneconomic investments were avoided.

Because of a lawsuit related to the government mandate for double hulls, the senior management at Maritrans decided to delay publishing the associated paper until the suit is resolved. So, the videotape currently is the only way to see what was done. The presentation would be useful for an introductory course in management science to illustrate the underlying economic concepts associated with linear programming, such as dual variables as prices and reduced costs as measures of market threats and the relationship between markets and optimization models using simple models. The tape also illustrates how one can use management science in developing strategy. The graphics are clear and communicate the modeling issues so that viewers do not need an accompanying paper.

Long-Term Ecosystem Planning at Pacific Lumber

Pacific Lumber faces the problem of changing social values affecting peoples' attitudes towards forests and lumber companies. Pacific Lumber owns 200,000 acres of prime redwood forests and has been subjected to protest against cutting its old-growth stands. The spotted owl lives on the company's land. The company decided to build a model to analyze the economic and environmental trade-offs.

It built a model with four components. The first is a geographical information sys-

tem that maps out the resources and topography. The second is a forest simulation that looks at timber growth and yield and at wildlife habitat as a function of the topography and vegetation. The optimization model has variables for harvest cycles by land type and type of harvest, for example, clear cut versus leaving patterns of trees and choosing among possible methods of removal. The allowed harvest methods are contingent on the topography of each grid described in the graphical information system. The model operates with a 120-year planning horizon. The model is run with a wide range of scenarios to examine the environmental and economic trade-offs. The results feed into a system that renders images of what the various sections of the land look like so that the results of the model can be presented to a wide audience.

The benefits are that Pacific Lumber can value trade-offs and can use the visualizations to provide better understanding of its actions to a wider audience. It can demonstrate that its harvest plans preserve the habitat for the spotted owl. It improved the protection of streams on its lands. At the same time, it has increased the value of the assets by \$400 million.

This presentation is useful for illustrating how models can be used to clarify public debates on important policy issues. It would be valuable in a quantitative public-policy program to illustrate the role models can play in public-policy analysis and corporate planning.

Applying GIS and OR Techniques to Solve Sears Technician-Dispatching and Home-Delivery Problems

Sears is the largest home-delivery busi-

ness in the US, making four million household deliveries per year with 1,000 vehicles operating daily. Sears treats home delivery as a core competence. Sears also operates a home-services business that makes 12 million calls per year, covering such areas as appliance repair, the installation of garage-door openers, and carpet cleaning.

The goals of the service business are to assign the best technician for the job, to reduce mileage and overtime, and to enhance customer service by making sure technicians arrive within the service window and by providing same-day service.

The analysts combined GIS technology with heuristics. The objective includes travel time, penalties for time-window violation, and free time for technicians with weights reflecting the trade-offs. The heuristic begins by clustering first and routing second. Then tabu search is used for a 10 percent improvement. The tape and the paper describe the details of the heuristics.

The results for the delivery area were a 10 percent reduction in mileage. The home-delivery service was consolidated from 46 to 12 facilities because local knowledge is no longer needed. The routing used to take five hours per facility. It now takes 20 minutes, saving \$30 million. On-time performance increased from 78 to 90 percent. Customer satisfaction increased from 84.7 to 87.2 percent. A typical happy Sears customer spends \$20,000 at Sears over a lifetime. Sears can notify the customer two to three days in advance of the delivery time, reducing the number of customers who cannot be at home.

In the home-services area, driving time was reduced by six percent, the company

was able to better replace canceled calls, and it increased the number of completed calls by 10 percent while reducing overtime by 15 percent. The savings were \$9 million per year.

This presentation illustrates how one can solve an important logistics problem. It would be most useful in a logistics or supply-chain course. It would also be good for motivating the problem in a combinatorics course.

Frederic H. Murphy

Fox School of Business and Management,
Temple University, Philadelphia, Pennsylvania
19122

HAMMOND, JOHN S., III; KEENEY, RALPH L.; AND RAIFFA, HOWARD 1999, *Smart Choices: A Practical Guide to Making Better Decisions*, Harvard Business School Publishing, Boston, Massachusetts, 272 pp., \$22.50.

In the last 30 years, decision analysis has advanced greatly in both its art and its science. In many respects, *Smart Choices* reflects the field's maturation. To see how, it is worthwhile comparing Howard Raiffa's [1968] classic *Decision Analysis* with his new book written with John Hammond and Ralph Keeney. The little white paperback introduced many of us to decision analysis, teaching us how to construct decision trees, calculate the value of sample information, and elicit von Neumann-Morgenstern utility functions. These concepts remain at the core of how decision analysis is taught in most OR/MS or quantitative analysis courses today.

Remarkably, most of these concepts are absent or inconspicuous in *Smart Choices*. Instead, Hammond, Keeney, and Raiffa

promote the "PrOACT" approach to decision making. PrOACT is an acronym for what the authors argue are the five core elements of virtually any decision: problem, objectives, alternatives, consequences, and trade-offs. (PrOACT seems an improvement over π -BRLT; π -BRLT, pronounced "pi-brilt" is a π basic reference lottery ticket. It is used in Raiffa's *Decision Analysis* as a way of constructing a von Neumann-Morgenstern utility evaluation from an uncertain prospect.) Three other elements—uncertainty, risk tolerance, and linked decisions—complete the eight elements of *Smart Choices*. The authors devote a chapter to each of these eight elements, intermingling concepts, tips, examples, and a whole lot of wisdom. They conclude with a chapter on psychological traps (systematic cognitive pitfalls that often lead decision makers to make poor decisions) and a summary chapter on what it takes to be a successful decision maker.

Scholars and practitioners of decision analysis may be surprised that decision trees—which are often viewed (mistakenly) as synonymous with decision analysis—appear for the first time more than half way through *Smart Choices*. The supporting role played by decision trees reflects the authors' deliberate strategy: to communicate the essential ideas of decision analysis with a minimum of technical baggage. *Smart Choices*, with its structured PrOACT approach to decision making, will appeal most to the large number of individuals who deal with hard choices day to day but may lack a mathematical background. Of course, some decisions require the more advanced "science" of multistage decision trees and backwards in-

duction (single or multiattribute), utility theory, or sampling theory. But the authors take the approach, to which I am very sympathetic, that the vast majority of decisions can be resolved by clarifying the problem or objectives, creating alternatives, describing the consequences, or balancing trade-offs, in short, by using the PrOACT framework.

Smart Choices should not be thought of as decision analysis "lite". Although the presentation is nontechnical, the book is by no means a low-fidelity rendition of decision analysis. The authors have spent more than one century (cumulatively, not individually!) studying and consulting on decision making, and it shows throughout. The wisdom culled from a century's experience is evident in the sophisticated discussion of such topics as the art of generating alternatives, identifying objectives, or defining the decision problem, and especially in the wonderful concluding chapter, "The wise decision maker." The art of decision making is too often absent in elementary and advanced decision-making texts. This excellent book is sure to inspire even the most seasoned decision-analysis scholar or practitioner.

For all its merits, *Smart Choices* is not a textbook of decision analysis. The book was not designed to be a text. However, it could serve as an excellent introductory reading if complemented by some technical notes or cases (for example, Bell and Schleifer 1995). I have used this book as such an introduction for an executive MBA course on managerial decision making at the University of Chicago. The book was so popular that I found my executives clamoring for more decision analysis!

Finally, I've pointed to many differences in style and objectives between *Smart Choices* and *Decision Analysis*. One aspect remains constant: the quality of the writing. Those familiar with the authors' other books (for example, Keeney and Raiffa 1976; Raiffa 1982) will immediately recognize the crisp exposition and wonderfully engaging style that has long distinguished their work.

References

- Bell, David E. and Schleifer, Arthur 1995, *Decision Making Under Uncertainty*, Course Technology, Cambridge, Massachusetts.
- Keeney, Ralph L. and Raiffa, Howard 1976, *Decisions with Multiple Objectives: Preference and Value Tradeoffs*, John Wiley and Sons, New York.
- Raiffa, Howard 1968, *Decision Analysis: Introductory Lectures on Choices Under Uncertainty*, Addison-Wesley, Reading, Massachusetts.
- Raiffa, Howard 1982, *The Art and Science of Negotiation*, Harvard University Press, Cambridge, Massachusetts.

George Wu

University of Chicago, Graduate School of Business, Chicago, Illinois 60637

Books Received for Review

- Anderson, David R.; Sweeney, Dennis J.; and Williams, Thomas A. 2001, *Quantitative Methods for Business*, eighth edition, South-Western College Publishing, Cincinnati, Ohio, 656 pp., \$80.95.
- Bertsimas, Dimitris and Freund, Robert M. 2000, *Data, Models, and Decisions: The Fundamentals of Management Science*, South-Western College Publishing, Cincinnati, Ohio, 530 pp., \$77.35.
- Black, Ken 2001, *Business Statistics: Contemporary Decision Making*, third edition, South-Western College Publishing, Cincinnati, Ohio, 819 pp., \$82.75.
- Blank, Jos L. T., ed. 2000, *Public Provision and Performances: Contributions from Efficiency and Productivity Measurement*, Elsevier Science, Amsterdam, The Netherlands, 412 pp.,

BOOK REVIEWS

\$95.00.

Day, George S. and Schoemaker, Paul J. H.
2000, *Wharton on Managing Emerging Technologies*, John Wiley and Sons, New York, 460 pp., \$34.95.

Harker, Patrick T. and Zenios, Stavros A., eds.
2000, *Performance of Financial Institutions*, Cambridge University Press, New York, 502 pp., \$80.00.

Heil, Gary; Bennis, Warren; and Stephens, Deborah C. 2000, *Douglas McGregor, Revisited: Managing the Human Side of the Enterprise*, John Wiley and Sons, New York, 196 pp., \$27.95.

Krass, Peter, ed. 2000, *The Book of Management Wisdom*, John Wiley and Sons, New York, 492 pp., \$29.95.

Pelosi, Marilyn K. and Sandifer, Theresa, M.
2000, *Doing Statistics for Business with Excel: Data, Inference, and Decision Making*, John Wiley and Sons, New York, 850 pp., \$78.95.