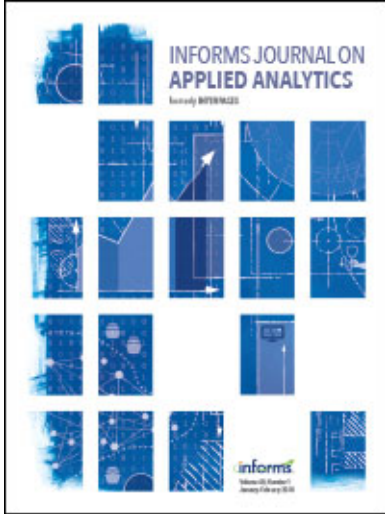




Interfaces

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Book Reviews

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To cite this article:

Benjamin Lev, (1992) Book Reviews. Interfaces 22(1):173-182. <https://doi.org/10.1287/inte.22.1.173>

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Book Reviews

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The range of books reviewed is wide, covering theory and applications in operations research, statistics, 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 and proceedings reviewed should send them to Professor Benjamin Lev, School of Management, The University of Michigan-Dearborn, 4901 Evergreen Road, Dearborn, Michigan 48128-1491. We list the books and proceedings 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.

ROSENHEAD, JONATHAN , ed. 1989, *Rational Analysis for a Problematic World: Problem Structuring Methods for Complexity, Uncertainty, and Conflict*, John Wiley and Sons, Chichester, England, 386 pp., \$47.95.

In operations research's early days, it was not uncommon for an analyst to fight shy of a potential client who knew exactly what the problem was and merely wanted a technician to derive the right solution to it. Experience had shown that the client's

diagnosis was usually far enough off the mark to make work centered on it unproductive. Rather, analysts preferred to respond to vaguely stated problem situations for which clients were willing to help with the early explorations and problem structuring. Sometimes the early inquiries yielded enough information and data to identify remediable causes and suggest courses of beneficent action, but often the difficulties lay deeper and needed the sort of model building and calculation that later

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0091-2102/92/2201/0173\$01 25

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came to be thought of as the characteristic approach of operations research.

In recent decades, particularly in academia and in MS/OR journals, attention has been focused largely on models and algorithms. Little attention has been paid to the activities and craft skills involved in the preliminary explorations and problem-setting activities that enable analysts to ascertain that they are using their technical methods on the right problems. Thus, not much attention has been paid to developing structural principles that might assist these early inquiries.

Recently some analysts—particularly a number working in the United Kingdom—have turned their attention to structuring these initial explorations, paying careful attention to the complexities, uncertainties, and conflicts that are usually found in complex problem situations. This book discusses six of these approaches. Each consists of an introductory, descriptive chapter written by the principal developer(s) of the approach, followed by a chapter describing an application to an actual case.

(1) Colin Eden discusses cognitive mapping for strategic options development and analysis (SODA); he and Peter Simpson describe how this approach was used to help a company established to provide computer and electronic employment opportunities in nondefense work.

(2) Peter Checkland offers a concise overview of his well-developed soft systems methodology (SSM) and describes how it was applied to the information and library function of a successful, well-managed UK company in a science-based field. (A more recent book, Checkland and Scholes, *Soft Systems Methodology in Action*,

presents the interesting recent evolution of this approach.)

(3) John Friend describes what he calls “the strategic choice approach”; Allen Hickling shows how it was applied in the Netherlands to the problem of formulating a national policy for storing, handling, and transporting liquefied petroleum gas.

(4) Jonathan Rosenhead offers an overview of robustness analysis and describes how it was used to help his teenage step-daughter choose a course of study that would keep open desirable future employment opportunities.

(5) Nigel Howard describes the meta-game approach to analyzing cooperation and conflict and discusses how it could be applied to alleviate a labor-management conflict.

(6) Peter Bennett, Steve Cropper, and Chris Huxham show how they model interactive decision processes by what they call “the hypergame focus.” They describe how this approach was used successfully to solve scheduling and cooperation difficulties that arose in connection with a world-championship boat-racing competition.

Each of these well-developed and illuminating approaches to problem structuring is described and illustrated by its principal developer(s) and most experienced exponent(s). Readers can find quick and economical preliminary understandings to these approaches by consulting this book and can gain further information by consulting the authoritative references cited for each chapter, where descriptions of the supporting computer programs can also be found.

Some of the most important aspects of

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these chapters are the insights they offer into the craft skills involved in applications.

In each of the cases described, the approach used yielded a solution to the problem situation with which the investigation started. However, in more complicated situations, these problem-structuring methods could yield objectives or possible courses of action calling for traditional MS/OR modeling and calculations. Indeed, some of the discussions mention this possibility.

In addition to the 12 chapters describing and illustrating the six approaches, the editor has contributed introductory and closing chapters. Unfortunately, these two chapters, which the reader might expect to constitute a magisterial overview of MS/OR and the place of these newer approaches in extending its domain, do not live up to this expectation. Rather, on a number of points the editor's characterizations of the fundamental nature of MS/OR practice are more likely to mislead than inform. For example, in the first chapter Rosenhead bills the six topics in his book as being "an alternative paradigm" for operations research, implying that the problems it has so far dealt with successfully could—and should—be handled by these new approaches (or others like them); while reducing reliance on the classical modeling and algorithmic methods, they would "make lay participation . . . a reality" (page 14). My own experience and knowledge of practice belie these implications. Looking at the prize winners in the Franz Edelman competition, I doubt that any of these cases could have been successfully dealt with by the exclusive appli-

cation of any of the approaches described in this book.

In the final chapter Rosenhead does admit that the "methodologies" in this book can be viewed as complementary to the classic methods of OR (pp. 348–349). This obvious conflict presents the reader who lacks experience with an anomaly he or she should not be asked to resolve.

My advice is to read the 12 substantive chapters with great care and appreciation, but to regard the editor's first and last chapters with skepticism.

In sum, in spite of this criticism, this is an important book, especially for American MS/OR workers, who have as yet paid far too little attention to approaches like those it describes. The MS/OR community needs to expand the domain in which it illuminates decisions and solves problems. The problem-structuring methods presented in this book can be an important help in this fundamental enterprise.

Reference

Checkland, P. and Scholes, J. 1990, *Soft Systems Methodology in Action*, John Wiley and Sons, Chichester, England.

Hugh J. Miser
199 South Road, Farmington,
Connecticut 06032

WEST, MIKE AND HARRISON, JEFF
1989, *Bayesian Forecasting and Dynamic Models*, Springer-Verlag, New York, 704 + xxi pp., \$56.00.

Anyone who believes that Bayesian inference is great in theory but of little practical value will be perplexed by *Bayesian Forecasting and Dynamic Models*. Mike West and Jeff Harrison have been instrumental in developing dynamic models for

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Bayesian estimation, smoothing, and forecasting. The dynamic model is Markovian and is analyzed through recursive updating. It specifies the distribution of the data given the parameters by an observation equation and the distributions of the parameters by system equations. In the special case of dynamic linear models (DLM) with normally distributed errors, the recursive updating is equivalent to Kalman filtering. However, the objectives of DLM are to obtain posterior distributions of parameters and predictive distributions of future observations. In their most general form, the dynamic model subsumes many standard statistical models, such as normal linear regression.

This book is an excellent introduction to the field of dynamic models and is suitable for an advanced undergraduate or first-year graduate course in Bayesian forecasting or as a reference for applied researchers. The text is self-contained with an appendix that contains the necessary background on distribution theory and linear algebra. The authors do an outstanding job of mixing theoretical development with methodological implementation. They illustrate the theory with examples from the behavioral sciences, business, and economics.

The book is organized into 15 chapters. The chapter titles provide a fairly concise view of the book's scope: Introduction; Introduction to the DLM: The first-order polynomial model; Introduction to the DLM: The dynamic regression model; The dynamic linear model; Univariate time series DLM theory; Model specification and design; Polynomial trend models; Seasonal models; Regression, transfer function and

noise models; Illustrations and extensions of standard DLMS; Intervention and monitoring; Multi-process models; Non-linear dynamic models; Exponential family dynamic models; and Multivariate modelling and forecasting.

West and Harrison's exposition is clear and direct. Instead of presenting the DLM in its full generality from the start, they slowly develop the model from simple, special cases that are easy to understand. Along the path to generality, they leave signposts about the relationship of these special cases to standard, widely used models, such as exponentially weighted regression and Holt's linear growth model.

In their attempt to provide an omnibus method of forecasting, the authors occasionally wander from the demanding path of Bayesian inference. For example, in Section 11.4 on model monitoring (pp. 406–416), they recommend sequential hypothesis testing where the rejection region is picked in an arbitrary fashion without considering Bayesian issues, such as relative costs, or frequentist properties, such as average run lengths or power computations. Also, the authors suggest rather suspect methods of handling mixtures of normal and gamma distributions (pp. 463–471). Lastly, West and Harrison arbitrarily assume (p. 558) that the parameters of general exponential families are updated by the same equations as the normal linear model. These methods violate the calculus of probabilities and are incoherent. Knowledgeable researchers would discount these recommendations. However, disaster could ensue in the hands of the indiscriminate user.

The book summarizes the developments

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in DLM over the past 20 years. The field is still evolving with great opportunities and challenges provided by non-normal, non-linear models and by model identification. I look forward to a series of editions by West and Harrison that incorporate these future developments.

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SUZUE, TOSHIO AND KOHDATE, AKIRA 1990, *Variety Reduction Program: A Production Strategy for Product Diversification*, Productivity Press, Cambridge, Massachusetts, 164 pp., \$59.95.

The stated purpose of this book is to (1) increase manufacturing flexibility while (2) reducing costs. The goal of the variety reduction program (VRP) is to respond successfully to market demands for greater quantities and varieties of products while lowering costs and reducing the number of parts and production processes that are required to manufacture a product.

Essentially, the book can be regarded as a very detailed working manual. It outlines the total VRP approach to product diversification, from design through production system. The philosophy is based on (1) reducing parts within each product type and (2) the simplifying and standardizing parts between models.

The book consists of five parts: the introduction, "VRP methods," "VRP's advancement," "Examples of VRP application," and "Conditions for success." Each part contains one to seven chapters.

Overall, the book is very detailed. I think there is too much detail in some

parts, but if one errs on the level of detail, it is no doubt better to provide too much detail rather than not enough. For example, there are 98 figures spread over the basic 147 pages of text.

I believe that a company producing complex products that carefully adhered to the notions outlined in this book could achieve large savings. The VRP has been utilized in Japan since 1974. Sony used VRP to reduce parts by 60 percent in the Walkman.

VRP is a more direct approach to product diversification than other approaches, such as CIM or FMS, since it deals with actual products and production systems. Furthermore, VRP can be integrated with JIT manufacturing systems.

Overall, this book would be best used as a working manual. It is a "how to" book, not a theoretical book. I definitely recommend it for manufacturing managers but not as a text book for students of industrial engineering or production and operations management.

B. R. Feiring

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AHMADIAN, AHMAD; AFFIFI, RASOUL; AND CHANDLER, WILLIAM 1990, *Readings in Production and Operations Management*, Allyn and Bacon, Boston, London, Sydney, Toronto, 388 pp., \$15.00.

This book contains five main parts: *Part 1* addresses productivity and quality issues in six articles dealing with concepts, measures, and empirical lessons to be learned from practice. *Part 2* is concerned with production systems design and consists of

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five articles emphasizing the characteristics of flexible manufacturing systems vis-a-vis traditional production systems. *Part 3* addresses planning and control in six articles that cover inventory policies, material requirement planning, and just-in-time systems. *Part 4* discusses the management of technology and its relation to operations management in six articles addressing innovation, robotics, group technology, automation, man-machine tensions, and technology in services. *Part 5* focuses on strategic issues in five articles exploring linkages between POM and the formulation and implementation of cohesive strategies in both manufacturing and service organizations.

I find the book of particular relevance to practitioners in OM areas. It is also useful as supplemental reading to a basic POM text for both upper level undergraduates and MBAs.

The strongest features of this book are the questions section, the book's composition, its exposition, the balance of articles by academics and practitioners, and its coverage of both Japanese and American practice.

The questions were carefully designed, stressing the main ideas to be learned from each chapter, as well as their implications for management in general, and for operations managers in particular. A reader's efforts to answer these questions would be well rewarded.

Another point of strength is the composition and sequence of the articles in each chapter. They are well-integrated pieces, relevant to the chapter's theme, and most provide a rich body of knowledge on their subjects.

The articles are easy to read and non-technical, which is particularly appealing to practitioners and to a wide audience.

Although the articles in each chapter are well-integrated and relevant to the chapter's title, synthesis among the different parts of the book is lacking. This is the main weakness of the book. However, this failing is common to most books of readings.

In general, I thought the book would be useful for POM practitioners and all who would like to enrich their knowledge of the POM field. The papers are carefully selected and are written in an easy and precise style; they should be quite appealing to a very wide audience.

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MCARTHUR, CHARLES W. 1990, *Operations Analysis in the US Army Eighth Air Force in World War II*, American Mathematical Society, Providence, Rhode Island, xxiv + 349 pp., \$81.00 (\$49.00 to members).

This book is a labor of love by a man who was there. McArthur was a bombardier in the 1943–45 period when the Eighth Air Force grew to maximum strength and made its greatest contribution to victory in Europe. He was thus a beneficiary of the contribution that the operations analysis section of the Eighth Air Force made to that victory, even though he professes that he was, at that time, totally unaware of the OR work that was going on.

Perhaps because this is Volume 4 of a history of mathematics sponsored by the

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two societies, the author, a professor emeritus of mathematics at Florida State University, has gone out of his way to emphasize the role of mathematicians in the work of the Eighth Air Force operations analysis section. For example, a kind of mathematical bias emerges in his introduction of W. J. Youden: "Although W. J. Youden's doctorate was in chemistry, he had spent a year at the Rothamsted Experiment Station with the British statistician R. A. Fisher before the war, so it was natural for him to return to statistical work when he reported to England as part of the first OR group from the United States." (George Kimball could have made a choice remark to counter that statement.) McArthur redeems himself by pointing out, in noting Youden's departure from the section, that he "was one of the great operations analysts of the USAAF."

McArthur has chosen to organize his book chronologically, basically in six-month intervals. Within these intervals, he details the work of the subsections of the OAS, with emphasis on the individuals involved and almost no comment on the technical side of the work. The result is a kind of checkerboard, with chronology on one dimension and bombing accuracy, bombs and fuses, loss and battle damage, gunnery, radio and radar, electronic countermeasures, and mission analysis on the other. There is a lack of connective tissue between the squares on this dimension, compensated in part by some repetition, but placing a considerable burden on the reader to provide continuity.

The editing of the book leaves a bit to be desired. For one thing, there has been an over-reliance on the spelling checker so

that the reader is occasionally jolted by a word that is spelled correctly but is out of context. Perhaps the worst instance is in the foreword by Hugh J. Miser. In referring to postwar developments, Miser states that the concept of OR work "in civilian contexts is now widespread," but the spelling checker accepted "not" instead of "now."

Every once in a while, the author seems to forget about OR and to write instead about actual bombing operations in which he participated. These may be the best parts of the book. At the same time, he places proper emphasis on the role of the OAS in affecting the effectiveness of the Eighth Air Force, partly through its development of appropriate measurement techniques and partly through its dissemination of the scores of bombing accuracy and gunnery performance.

In summary, this is an important and long-overdue book on the work of the Eighth Air Force OAS. It should appeal to everyone interested in the early history of operations research. It is meticulously documented and includes quotations from the reports and by the participants that are long enough to give real flavor and immediacy to the book.

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ROBSON, ROSS E., ed. 1990, *The Quality and Productivity Equation: American Corporate Strategies for the 1990's*, Productivity Press, Cambridge, Massachusetts, 338 + xx pp., \$29.95.

This book contains proceedings prepared for the 1989 "Partners in Business" semi-

nars held annually at the Utah State University College of Business. It is the second book published by Productivity Press containing papers from the annual seminars. The authors of the 32 papers presented in the book are a distinguished yet diverse group representing both American business and academia. They include corporate presidents and CEOs, vice-presidents, senior managers and engineers, and university professors.

The aim of this book (and goal of the annual seminars) is to outline broad strategies American businesses must undertake to improve both quality and productivity. The book does not try to present a well-defined equation for quality and productivity as the title may suggest. Rather most of the authors present "best-practice" principles, brief case-studies, and personal opinion to outline the route the United States must travel to succeed in the global marketplace.

It is acknowledged in the first chapter (page 5) that "While the productivity and quality equation remains something of a nebulous mystery, the results of its successful application are not." This quote is not to be interpreted to mean, "We're not sure what it (quality and productivity) is, but we'll know it when we see it." Rather the chapters in the book convey to the reader that improving quality and productivity in American business is a multidimensional problem. Quality and productivity in the United States is linked to the state of the national economy, the educational level of our current and future work force, the way businesses utilize and manage human resources and information, the state of industrial technology and innova-

tion, and the extent to which managers and political leaders understand that improving quality and productivity is a challenge brought about by global competition. Although each of these points have been stressed by numerous people in a variety of settings, this book reminds us of the complex interrelationships that together make up the current level of quality and productivity by trying to cover all these aspects in one book. This is indeed the strength of the book. The reader comes away realizing that there are no quick fixes for this difficult problem.

The papers are grouped into six major areas: the global challenge, quality, productivity, human resources, information systems, and the future. These broad categories allow for diverse challenges: for example, reduce the federal deficit (Sidney L. Jones, Kevin F. F. Quigley), meet the global economic warfare (Malcolm S. Forbes), put ethics in business (James E. Burke, M. Anthony Burns), increase R&D expenditures and improve education (John A. White), improve management skills (Kim S. Cameron, Larry G. McKean), improve the way businesses manage information (Mylle H. Bell, John Diebold). All but one of the papers are written in an anecdotal style based loosely on data. The one exception is Kim S. Cameron's chapter summarizing his research on effective management skills and training.

A major flaw in the book is bibliographic. The authors do not include complete citations for most of the books and articles they cite or quote. They typically provide only authors' last names and the year of publication; rarely do they include a title. When this information is provided,

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it is in the text and not in footnotes or in a separate reference section. Although the table of contents (page ix) lists a section entitled "Bibliography," the section to which this refers is entitled "Selected Bibliography" (page 329). It is not clear to me how the editor decided which books and articles to include (and not to include) in this section.

I recommend this book for those who need to be reminded of the quality and productivity problem in American business and to those to do not understand the complexity of the situation. The reading is light and the message easily conveyed.

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CHECKLAND, PETER and SCHOLES, JIM 1990, *Soft Systems Methodology in Action*, John Wiley and Sons, New York, 329 pp., \$49.95.

In this book, Checkland and Scholes provide a series of case studies describing the use of soft systems methodology (SSM) in different contexts. SSM is an organized way of tackling messy situations in the real world. It involves logical systems thinking about the real world within a cultural context. The authors show how SSM has evolved from a formal, stage-by-stage methodology that is applied to special highlighted problem situations to a way of doing managerial work.

The authors achieve their stated objective, showing how the learning achieved with soft systems methodology derived from the experiences that generated it. They describe interesting applications

drawn from three different areas: industry, community medicine, and civil service.

They also show how the use of SSM evolved in a series of studies within a single company. Finally, they use SSM to make sense of a study that did not formally use the methodology.

SSM was originally described as a structured process of inquiry using systems models. Its more advanced use involves continuing reflection and debate structured by systemic models. Instead of "using SSM to do a study," the emphasis is on "doing work using SSM."

This fact, however, is not as surprising as the authors suggest. It appears that the methodology itself has not evolved, but rather its use by specific individuals has evolved. What happens over time is that experienced users internalize the methodology in their thinking. In fact, the case studies appear to involve some of the same participants, further suggesting that it is the individual's use, not the methodology, that has evolved.

Checkland and Scholes's presentation of the evolution of the use of SSM will be of interest to experienced practitioners. Novice practitioners would probably need more explicit analysis of the formal methodology. However, for experienced practitioners, these cases and the analysis suggest different ways that SSM can be used.

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Books Received for Review

Barnett, Raymond A. and Ziegler, Michael R. 1991, *Applied Calculus for Business, Economics, Life Sci-*