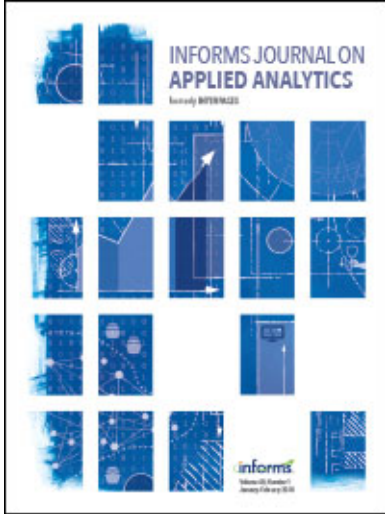




Interfaces

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

Book Reviews

To cite this article:

(1979) Book Reviews. Interfaces 9(4):151-164. <https://doi.org/10.1287/inte.9.4.151>

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.

© 1979 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

T. J. LOWE

AHLERS, DAVID M., *A New Look at Portfolio Management*, JAI Press, Greenwich, Conn., 1977, 201 pp., \$19.50.

This book, which is based on the author's doctoral dissertation, presents a detailed study of the portfolio management process in an operational setting. The setting is the management of pension funds by the trust department of a large New York bank, and most of the work was done while Ahlers was employed by the bank as director of Management Science. Moreover, this is much more than a descriptive study — major changes are investigated as Ahlers attempts to improve the portfolio management process. The stated purpose of the study is to promote better management of pension funds by institutional investors and to provide tools to aid them in improving their management processes.

To many OR/MS types, the title of the book may conjure up visions of newer and fancier mathematical models for the selection of "optimal" portfolios. Indeed, mathematical models are used, and Ahlers' approach, which he calls Structured Decision Making (SDM), is more sophisticated in terms of such models than the approach that was used prior to his appearance on the scene. Quantitative techniques only represent part of the story, however. The emphasis here is on the entire *process*, including institutional, behavioral, and organizational factors as well as mathematical models. Even though my own primary interest concerns the models, it is the emphasis on the process that, in my opinion, raises this study above the level of your typical, run-of-the-mill dissertation application and greatly broadens the potential audience for the book.

After an introductory chapter, the stage is set in Chapter 2, which describes the pension fund management environment. In Chapter 3, which is entitled "Organizational Analysis," the portfolio management process is discussed and SDM is developed. Alternative portfolio management models are presented in Chapter 4 and then evaluated and compared using actual data in Chapter 5. The implications of the results for portfolio management, security analysis, and Management Science are discussed briefly in Chapter 6, together with some suggestions for future work.

From my own narrow view of the world, two of the most interesting aspects of Ahlers' approach are: (1) the explicit use of security analysts' forecasts in the form of subjective probabilities for market levels and for individual security prices conditional

upon market levels, and (2) the stress on portfolio revision instead of portfolio selection. In the Preface, Ahlers states (p. xi) that "this book addresses the problem of making the best decisions possible with the information at hand," and then he really tries to do it! In view of the emphasis on efficient markets in the financial literature, it is interesting to note that the security analysts in this study made probabilistic forecasts which permitted the attainment of significantly better than random returns even after transaction costs and management fees are subtracted.

The lack of critical comments in this review should not be taken as an indication that Ahlers has found the "perfect" approach. As he admits (p. 181), "the experimental results raise at least as many questions as they answer," and some of the results are controversial. It would be easy (and in the spirit of many book reviews) to criticize details of the approach developed in this book, but such nitpicking would be missing the main point here. The important thrust is the development, implementation, and evaluation of an operational portfolio decision-making system in a complex situation, utilizing quantitative techniques while taking into account institutional and organizational considerations. In the Foreword, Kalman J. Cohen (Ahlers' dissertation chairman) makes the following observation (p. vii): "The Structured Decision Making System developed by the author was, for several years, effectively implemented in the trust department of a major New York City bank. Hence this book describes one of those all-too-rare examples of Management Science models that actually were used as part of the management process, and it does not belong to the realm of 'Management Science fiction' (proposed models that have never been implemented) that seems to fill the professional literature." Perhaps this book will encourage practitioners to use more sophisticated models in practice and, in turn, enable academics to understand the difficulties and the potential in applying such models and to direct their efforts toward even better models. In my opinion, the author's hope (p. 181) "that the results and ideas contained in this study are a firm and constructive step toward better portfolio management" has been realized.

Robert L. Winkler

Indiana University, Graduate School of Business, Bloomington, Indiana 47401.

BAILEY, NORMAN T. J., *Mathematics, Statistics, and Systems for Health*, John Wiley & Sons, 1977, 222 pp., \$15.50.

Bailey states that the "purpose of this book is to make available to a wide reading public a greater understanding of the role of quantitative methods in helping to develop and improve medical care and health services throughout the world." Certainly a noble purpose, but could any single volume accomplish the task? This one does not.

The book builds in pyramid fashion from a discussion of the scientific method to a prescription for the makeup of an academic department of biomathematics. Along the way Bailey describes the use of mathematics, statistics, Operations Research, and systems analysis in investigations of health care problems. Much of what is said has a familiar ring since, as the author notes, this volume is largely based on his previous publication, *The Mathematical Approach to Biology and Medicine*.

Bailey presents an excellent discussion of the uses of mathematical models in health. He describes in considerable detail the power and limitations of quantitative techniques in problem solving. Taken as a whole, the book presents a strong argument

for close collaboration between scientist and mathematician in any attack on health care problems.

Nevertheless, the book does fail to meet its avowed purpose. The failure comes not from the relevance of the subject matter presented, but rather from the level of presentation. To make his points the author frequently draws on nontrivial concepts from mathematics, statistics, and the basic sciences without explanation or reference. It is doubtful that there is a wide reading public with a simultaneous grasp of Mahalanobis' generalized distance, autocorrelation, and the work of Franz Boas in ethnology, for example.

The OR/MS professional with an interest in health applications will find this book to be a thought-provoking presentation of Bailey's views. It is unfortunate, however, that few others will fully understand what he is trying to say.

Michael Leonard

1510 B. Doris Drive, Columbia, Missouri 65201.

BUDNICK, FRANK S., MOJENA, RICHARD, AND VOLLMANN, THOMAS E., *Principles of Operations Research for Management*, Richard D. Irwin, Inc., Homewood, Illinois, 1977, 756 pp., \$17.95.

As stated in the preface, the primary purpose of this book is "to make believers out of potential users of quantitative techniques." To achieve this goal, a strong emphasis is placed on examples and exercises which illustrate the potential applicability of quantitative methods — e.g., examples and exercises account for approximately half of the 133 pages on linear programming. The problem scenarios are generally realistic and are drawn from a wide variety of decision problems in business as well as public administration. The book contains a page reference which lists applications covering 87 problem areas (pp. *xiii* and *xiv*).

The prerequisites for the book are basic algebra and statistics. The topical coverage includes the usual fare: linear programming, the transportation model, dynamic programming, inventory, queueing, simulation, PERT/CPM, Markov processes, and decision analysis. In addition integer, goal, nonlinear, and heuristic programming are covered, and there are two chapters on calculus.

The book is well written and conveys the authors' enthusiasm for quantitative methods. However, given the emphasis on examples and exercises, it is disappointing that answers are not provided to any of the exercises, especially the "follow-up" exercises within the chapters. The chapters on calculus are of doubtful value. Except in a few sections, the remainder of the text does not require calculus, and adequate coverage of calculus would consume an inordinate amount of classroom time. Finally, the chapter on decision analysis provides only an overview of the topic. An additional two chapters on decision analysis would have been preferable to the two chapters on calculus.

Comparing introductory quantitative methods books, two conclusions can be reached. First, the topical coverage is standard, give or take a few topics. Second, excluding texts which require calculus, there is not much variation in mathematical level. What distinguishes this book from many other introductory books is the authors' emphasis on applications. I think management students will find this approach to

quantitative methods appealing. I believe this book is a reasonable text for use in a required undergraduate course.

Richard R. Jesse, Jr.

Department of Management, College of Business Administration, University of Florida,
Gainesville, Florida 32611.

BUFFA, ELWOOD S., AND DYER, JAMES S., *Essentials of Management Science/Operations Research*, Wiley/Hamilton Publication, 1978. 528 pp., \$15.95.

This is an introductory undergraduate level text, designed for a survey course for students not majoring in Operations Research/Management Science. It is difficult to get excited about a new introductory textbook on Operations Research/Management Science. There are several competent books on the subject having generally the same content and at the same level as this one. While the book is not unique, nor does it fill any particular void in the literature, it is well written and a good alternative to other similar texts. It does include examples from both the private and public sectors.

The authors assume that the student has had some previous exposure to probability and statistics. There is no formal mathematical prerequisite stated, but the maturity gained from one year of college level mathematics is essential. The homework exercises are divided into review questions and problems. Most of the problems are numerical or elementary formulation exercises, not requiring a great deal of extension of the basic principles covered in the text. The number of exercises is adequate.

The book is divided into five sections, plus appendices. Part I consists of an introduction to Operations Research/Management Science. Part II, entitled "Evaluative Models," contains three chapters; on probability, decision trees, and utility theory. Part III, entitled "Predictive Models," contains five chapters; on forecasting, building models to predict performance, Markov chains, queueing, and simulation. These chapters are rather brief — for example, the forecasting chapter covers moving averages, exponential smoothing, trend and seasonal adjustments, regression, econometric methods, the Delphi method, and market surveys in less than 30 pages.

Part IV deals with optimization models. This section contains a chapter on inventory models covering simple deterministic models, quantity discounts, and a discussion of how uncertainty in demand can be treated. There are three chapters on linear programming and related topics, including some discussion of model formulation, the simplex method, and elementary network models. Sensitivity analysis is illustrated, but duality is not. There are several interesting example applications of linear programming, including production planning, portfolio selection, advertising media selection, sales territory determination, personnel scheduling, land-use models, and school desegregation. The section concludes with a chapter on CPM and PERT.

Part V is a summary and synthesis of the key topics from the book. The appendices contain a review of several mathematical and statistical topics, including sets, functions, solving linear equations, descriptive statistics, and regression and correlation. Tables of the normal CDF, queue length as a function of number of service channels for various traffic intensities for the Poisson-exponential queue, and random numbers are also included.

While the topical coverage is brief, the authors have generally presented a good descriptive treatment of the subject. Instructors teaching an introductory survey course for non OR/MS majors should certainly consider this as a text.

Douglas C. Montgomery

School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332.

CHEEK, LOGAN M., *Zero-Base Budgeting Comes of Age*, AMACOM, American Management Association, New York, New York, 1977, 314 pp.

Logan Cheek has written the definitive work on zero-base budgeting (ZBB). This book was out of print six weeks after it was published, with many more printings envisioned by the publisher.

Zero-base budgeting is a successful management tool developed for use in allocating limited resources, evaluating alternative programs and activities, and controlling costs in organizations. The popularity of this tool has increased significantly in the last few years, following its introduction at Texas Instruments in 1969 by Peter Phyrri in a cost-reduction era. Currently, it is being used by more than 150 major corporations, the federal government in FY 1977 fiscal planning, over 15 state governments, and hundreds of municipal governments and public institutions. ZBB allows management to review budget decisions at all levels of the organization, to consider both new and existing programs in a consistent manner, and to allocate resources on a cost-effective basis.

Logan Cheek has been directly involved in implementing and using ZBB and writes from this point of view. He has presented many seminars on this subject to corporate executives. The purpose of the book is to present a documented handbook on the ZBB system and procedures. Current or potential users of ZBB will find the book to be helpful, as it presents the details necessary to understand and to use ZBB and, as such, it is self-contained.

The book treats all of the relevant topics on ZBB. In Chapter 1, Cheek presents the essential concepts of ZBB and compares ZBB with a variety of traditional approaches in budgeting. He shows that ZBB is an outgrowth of such methods as Capital Budgeting, Programming, Planning and Budgeting (PPB), Project Management, Management by Objectives (MBO), Overhead Value Analysis (OVA), and Bracket Budgeting. Cheek indicates some of the shortcomings of traditional methods, which are overcome by the ZBB approach. Chapter 2 is devoted to the specific procedures involved in the ZBB process. Particular references are made to the ZBB training and implementation and the role of top management. Detailed work sheets for use in describing decision packages are presented as a result of experiences of a number of companies. Chapter 3 deals with one of the critical problems in ZBB, the problem of rank ordering decision packages. Cheek presents methods that have been used, although there is substantial literature on theoretical aspects of this problem in the Management Science literature. Ranking table formats are presented, along with photographs of a "decision card system" which solves the problem of efficiently ranking packages in a simple and systematic manner. The Management Scientists will find this chapter of particular interest, as the problem of ranking decision packages is an important multilevel, multiobjective organizational decision problem.

In Chapter 4, Cheek addresses the problem of corporate planning and shows how a modified version of zero-base budgeting can be applied to this problem. In reviewing a corporation's planning process, a "programmatic approach" is advocated, including a "Delphi technique" for use in evaluating risks. Once the desirable corporate strategy is developed, the zero-base budgeting approach is used to evaluate and select decision packages. The remaining chapters of the book are concerned with problems of implementation of ZBB. Two appendices provides ZBB procedures and forms.

How can the book be used? Managers who are considering the use of ZBB in their own organizations should read this book prior to any significant investment of time and funds in ZBB. Managers whose organizations are implementing or using ZBB should purchase this book as a reference. Careful attention is placed on important details in the book which will improve the usefulness of ZBB. The book may be used as a reference text in courses on corporate budgeting, managerial control systems, and managerial accounting in MBA programs. Management Scientists will find this book to be useful, as optimization techniques may be incorporated in the ZBB process.

Finally, this reviewer believes that the book succeeds in presenting the current state of the art of zero-base budgeting. Further research and studies of ZBB implementation will make future books on ZBB even more useful than this one.

Burton V. Dean

Department of Operations Research, Case Western Reserve University, Cleveland, Ohio 44106.

COOK, THOMAS M., AND RUSSELL, ROBERT A., *Introduction to Management Science*, Prentice-Hall, Inc., 1977, 512 pp.

As the title suggests, this is an introductory book that introduces the reader to the field of Operations Research/Management Science. The authors address the usual topics (Probability and Distributions, Decision Theory, Linear Programming, Transportation Problem, Assignment Problem, Project Scheduling, Queueing Models, Simulation, and Inventory Systems) which are treated in a dozen or more introductory books in the area of Management Science which are comparable to this book with respect to the contents as well as (to some extent) the level of mathematical sophistication.

This book requires less mathematical sophistication on the part of the reader when compared to some texts. The presentation of the material is simple and clear. A student with a reasonable facility should not have much difficulty (excluding a couple of appendices) in understanding the material. In addition, the authors have provided some very interesting and useful case studies, which is a novel feature. The only other book which contains case studies that comes to mind is *Fundamentals of Management Science* by Efrain Turban and Jack R. Meredith.

A major criticism is that the example problems selected by the authors in many cases are overly simplified. In addition, the material covered under some topics is minimal. For instance, in the context of Decision Theory, the opportunity losses, the use of continuous distributions, and a discussion on different decision criteria are omitted.

This book is adequate for a one semester course at the undergraduate level, but not at the graduate level. However, this reviewer recommends it as a reference book for an

introductory course in Management Science at the graduate level because of the case studies.

R. R. Vemuganti

School of Business, University of Baltimore, 1420 N. Charles St., Baltimore, Maryland.

GRINOLD, RICHARD C., AND MARSHALL, KNEALE T., *Manpower Planning Models*, New York, North-Holland, 1977, 256 pp., \$19.50.

The authors intend their book to help managers and decision makers to build and understand mathematical models that can be used to analyze manpower policy and assist in manpower planning. In reality, however, this book is better suited to the serious student of Operations Research who has an interest in the area of manpower planning. The book (starting with page *xxi* of the overview) is heavily laced with mathematical notation which the average manager would be unwilling to first decipher and then trace all the subsequent developments. Thus, this review is being made from the point of view of the book's relevance in the application of Operations Research by managers to the field of manpower planning.

This book provides many of the fundamentals of the manpower flow processes and uses these concepts to construct a number of useful planning models. A very good presentation is made in the mathematics tracing the intricacies of cross-sectional and longitudinal models and their possible synthesis. A *cross-sectional* model is one which uses the changes in the structure (i.e., stocks of manpower) at two points in time. The rates of flow from one class to another are assumed to be independent of the time an individual has spent in the class. On the other hand, a *longitudinal* model is based on the entire history of the group. It stipulates that each individual in the system is subject to a stochastic law of motion that depends only on the individual cohort or chain and elapsed time in the system. In particular, the movement of any given individual is independent of the movement of the others. The data demands of each are described in general terms. Illustrated is the fact that the longitudinal models have the possibility of excessive data demands.

The authors state in the first chapter on basic concepts that they do not believe many manpower systems are in equilibrium. However, for most of the remainder of the book they make the simplifying assumption that an equilibrium system makes for a useful approximation to the actual system. They state that the examination of the equilibrium consequences of any fixed (stationary) policy is essential in uncovering the direction of change implied by the policy and for discovering the policy's long run implications. Similar types of simplifications are made in the optimization model which uses the inflows to the manpower system as the decision variables and the minimization of discounted cost as the objective. Some of the assumptions (which the authors say can be eased to some degree) include ideas such as that the manpower flow process can be described by a longitudinal model, the system is of constant size, etc. To take care of the data explosion problem with longitudinal models, the authors never bring up the fact that many job categories of manpower are generally needed for all but the very small scale problems such as given in their example. Thus, the authors in their models have assumed away in their examples many of the characteristics most desirable in a robust manpower

model. Among other things, organizations normally are not in equilibrium; they generally want a reasonable number of job categories to be considered, almost never stay a constant size, and would have problems in choosing the discount rate needed for the objective function. Other multicriteria, multiobjective approaches, such as goal programming, with which comprehensive manpower models have been constructed, are not mentioned or discussed.

The book is recommended to Management Scientists with professional interests in the area of manpower planning. For the areas covered and under the assumptions used, the material is presented very well. A strong feature of the Grinold and Marshall book is the provision of extensive examples and problems throughout, and thus it could be incorporated as part of a course on manpower planning if used in conjunction with additional materials.

R. J. Niehaus

U. S. Navy Office of Civilian Personnel, Washington, D. C. 20390.

JACOBY, JACOB, AND CHESTNUT, ROBERT W., *Brand Loyalty: Measurement and Management*, John Wiley & Sons, 1978, 157 pp., \$15.95.

This book is an extensive review of the brand loyalty literature, the authors' conceptual framework for developing better brand loyalty measures, and some "hints" as to the managerial applications of such measures. This latter point is somewhat frustrating — but not the fault of the authors; the company that sponsored the study did not wish to have specific applications published. As such this book may not have too much appeal for some practitioners.

The authors are both from a behavioral science tradition; they are interested in understanding and measuring brand loyalty. The term "brand loyalty" is loosely used by marketers to cover a wide variety of constructs. The authors make a valuable contribution by attempting to put this brand loyalty concept on firmer ground.

The authors do not spend much time on the stochastic modelling that has been done by Management Science/marketing types. They are interested in the measurement and not the analysis of brand loyalty constructs *per se*. Hence, this book will be of more interest to behaviorally oriented researchers, although marketing managers who use results of questions such as "What would you do if you went into the store and your favorite brand was out of stock?" should also find useful material.

The simple chronological literature review is thorough. The passing references to so many articles will leave most readers a little disoriented. The review reflects the gradual and complex accumulation of research in this area. However, on balance this review is valuable. For example, Table 3.1 gives the sensitivity, reliability, and validity for 53 proposed measures of brand loyalty. In most cases all three constructs are unknown — or at least inadequately documented. Future researchers should be more careful about claims they make for their brand loyalty measures.

This literature review does have (in this reviewer's opinion) one major omission. The much used, but highly controversial, Hendry System is totally ignored. At the very least the Hendry use of repeat purchase probabilities to partition markets should have been discussed. This partitioning will certainly affect a definition of brand loyalty. See Kalwani and Morrison [1] for a moderately detailed description of such partitioning.

The authors' view is that repeat purchase behavior is conceptually different from brand loyalty. On p. 80 the authors then define brand loyalty as " . . . (1) the biased (i.e. nonrandom) (2) behavioral response (i.e., purchase) (3) expressed over time (4) by some decision-making unit (5) with respect to one or more alternative brands out of a set of such brands, and (6) is a function of psychological (decision-making, evaluative) processes." These six points do provide a nice framework for assessing previously proposed measures. Jacoby and his colleagues have then done a number of studies in which they develop brand loyalty measures based on these six points.

The reader who expects one simple and useful definition of brand loyalty to emerge from the literature and its review will be disappointed. Despite this the researcher interested in the general area of brand loyalty will find the time invested in reading this short book well worthwhile. The typical practicing marketing manager will be confused by the vast number of previously proposed measures of brand loyalty reviewed in the first half of the book. Those individuals whose ethnic background is Scotch (as is this reviewer's) will be shocked at the \$15.95 price tag for a 157 page book — small pages no less!

REFERENCE

- [1] Kalwani, M.U. and Morrison, D.G., "A Parsimonious Description of the Hendry System," *Management Science*, Vol. 23, No. 5, January 1977, pp. 467—477.

Donald G. Morrison

Graduate School of Business, Columbia University, New York, New York 10022.

MILLS, RICHARD L., *Statistics for Applied Economics and Business*, McGraw-Hill, 1976, 618 pp., \$15.95.

This book is a good solid text in applied statistics. It is suitable for students having diverse educational backgrounds who are taking statistics as a part of their business or economics program.

The content and organization of material are that found in many other texts currently available, thus making it relatively easy for a teacher to change to Mills' book. Topics not found in many other texts which enhance its usefulness are: time-series analysis, economic model construction, and statistical decision theory. These are found near the end of the book and thus do not interfere with the presentation or continuity of the conventional topics.

Other desirable features include a subset of the 1970 census data in an appendix which can serve as a breeding ground for many interesting and challenging problems, especially if students are using a computer package such as SPSS in conjunction with their course. The exercises are numerous and questions have been carefully sequenced within each exercise in order of difficulty. The mathematics required to understand in the main explanations is at a low level, but by including starred sections and footnotes the student with knowledge of matrix notation can enrich his understanding of the material.

The author's style is very conversational. This is appealing to many — the reviewer included — but to others it may not be a positive attribute.

In summary, this is an excellent text and one which this reviewer plans to use in undergraduate courses within our Management Sciences program.

J. B. Moore

Department of Management Sciences, University of Waterloo, Waterloo, Ontario, Canada N2L3G1.

SAGE, ANDREW P., *Methodology for Large Scale Systems*, McGraw-Hill, 1977, 425 pp.

This book on MLSS contains a wide variety of models associated with some of the decision and policy making that is necessary in large systems. In chapters 2 and 4, graphs and matrices are shown as tools for representing the organization of large projects, and as an aid in obtaining the structure of the objectives and goals of a relatively large decision making body. Chapter 6 is an introductory discussion to a number of systems analysis models, including systems dynamics simulation and econometric models. The chapter suffers, to some extent, since there is little effort to integrate all of these models into one framework or to relate them to each other. The 7th chapter, on decision making, presents an extensive and in-depth study of utility theory with interesting material on group decision making.

The book does not sufficiently consider, along with the methodology, the difficulties that may be overcome by use of the methods or the difficulties that may be incurred when using the methods (see, for example, Warfield's *Societal Systems* book). As a result, the student may be misled with regard to both the extent and ease of applicability of the methods. For example, little attention is given to the problem of data acquisition for the information that is to be input to the models.

Each of the book's chapters contains many clarifying examples and there are a considerable number of problems at the end of each chapter which aim to extend material presented in the chapter. Overall, the depth of presentation is such that the book is suitable for senior level and first year graduate student use.

In summary, the MLSS book presents a clear discussion of a wide variety of models and examples of their application, but with some gaps in integrating the presentation and in consideration of the difficulties associated with applying the methods. Chapters 4 and 7 seem to be especially strong and might be used for an initial assessment by a potentially interested reader.

Joseph Talavage

Department of Industrial Engineering, Grissom Hall, Purdue University, West Lafayette, Indiana 47907.

SCHWARTZ, MISCHA, *Computer-Communication Network Design and Analysis*, Prentice-Hall, 1977, 372 pp., \$18.95.

A rich source of motivation for the mathematical techniques of Management Science and Operations Research (especially the latter) is data communication system analysis and design. Consider the common problem of connecting large numbers of computer terminals spread over a wide geographic area to one or more computers. In the simplest case, if one merely wants to design a network connecting the relevant locations

by leased data communications channels most economically, a minimum spanning tree algorithm will suffice. Unfortunately, life is rarely simple; the communications channels have limited capacity and engineering constraints frequently limit the number of channels which can be incident at a single location. Thus, what was initially a simple problem becomes a rather nasty integer programming problem. Data communication is often "bursty"; that is, the peak rate of transmission is very much higher than the average rate. One way of dealing with the resulting inefficiency is the use of concentration. A concentrator is a device with several low-speed input channels and (usually) one high-speed output channel. The sum of the *peak* data rates of the input lines is usually more than the channel capacity of the output line but the sum of the *average* input rates is less. Thus, in the long term, the traffic from the input lines can all be carried by the one output line; however, in the short term, data storage must be provided for those periods when the sum of the input rates is temporarily higher than the output capacity, otherwise data will be lost. Sizing this storage requires queueing theory. To design a network with concentration, the number of concentrators, their locations, and the connection of terminals to concentrators must be decided. This is a capacitated plant location problem. Quite often redundancy is provided in the network connecting the concentrators to the computers. This is to provide extra reliability, among other reasons. In this case, switching and routing functions are often added to the capabilities of a concentrator. Packets of data move through a network of switches, possibly queueing at each one, as they travel towards their ultimate destination. Analyzing optimal routing of the packets to minimize delays leads to convex nonlinear multicommodity flow problems. Problems of sizing communication channels on centralized computer networks can be solved using dynamic programming.

Professor Schwartz has covered these topics and many more. In addition, he has provided a context to the design and analysis techniques with extensive descriptions of four major data communication networks: ARPANET, the G.E. Information Services Networks, the SITA Network, and TYMNET. His book occupies a unique position intermediate between books such as: (1) Kleinrock's *Queueing Systems*, especially Volume 2, and (2) Frank and Frischs' *Communication, Transmission and Transportation Networks*, which are basically devoted to a unified group of mathematical techniques with data communication applications as examples, and books such as (3) *Communications Networks for Computers* by Davies and Barber, (4) *Data Communications* by Doll, and (5) Martin's *System Analysis for Data Transmissions*, which basically deal with data communications applications with design techniques introduced by a table of formulas with little theoretical development. While the principal use of the book would be a graduate level textbook in Computer Science or Communications Engineering, the book should also be attractive to those with Operations Research or Management Science backgrounds who find themselves involved or interested in data communications. Schools of Operations Research could contribute to the future economic well-being of some of their students if they used this book as supplementary material, since data communications is a dynamically growing field. In fact, I would be glad to hire a graduate who thoroughly understood the material covered in Professor Schwartz's book.

One might be misled by the somewhat academic format of the book to believe that the material is not of practical use. I can personally attest that the techniques reported in

the book developed by present and former colleagues of mine at Network Analysis Corporation (Chapters 5, 9, 10, and 11) have been and are being applied to the design and analysis of a wide variety of implemented data networks.

One can quibble about small questions of taste; i.e., I do not think the applications material was as successfully integrated with the material on analytic techniques as it might have been; and I think there was sometimes too much emphasis on techniques with little practical implication such as capacity allocation with a continuous range of allowed capacity values. But the book is excellent in general and particularly attractive to those with Operations Research and Management Science background. The value of the book is enhanced by extensive examples for all the methods introduced and by exercises at the end of each chapter.

Richard Van Slyke

Network Analysis Corp., 130 Steamboat Road, Great Neck, New York 11024.

LINSTONE, HAROLD A. AND SIMMONDS, W.H. CLIVE, *Futures Research, New Directions*, Addison-Wesley Publishing Company, Inc., Reading, Massachusetts, 1977. 270 pp., \$22.50.

This book deals primarily with the philosophy and approach of futures research rather than content. It consists of 18 contributions plus expository material by its editors to tie these contributions together. The contributors include leading researchers in OR/MS (e.g., Bellman, Churchman, Mitroff) as well as leading futurists (e.g., Willis Harman, Marvin Cetron).

The collection of papers is somewhat of a hodgepodge. One set of five consists of the formal texts of a series of lectures on Managing Complexity held at Portland State University in 1975. Another group of four consists of progress reports on specific research performed in Europe and the United States in the mid-1970's. Inevitably in such a collection, a few of the papers are embarrassments to their distinguished authors. Others however, are jewels.

The underlying message is that understanding the future cannot come from optimizing models and the formalisms of classical science alone. There is a call for holism, for qualitative analysis, and for inductive logic to be used in parallel with (but not as a substitute for) analytic techniques. One gets the sense in reading the various papers that the contributors have run into the limits of analysis and are trying to find their way out by ideas they haven't used, but for which they have high hopes. This is particularly true for the arguments that biological rather than mechanical or electrical systems are better analogs.

This book is a signal that in the second half of the seventies, futures researchers, like OR/MS researchers, are taking stock of their basic assumptions about their field. Although the book is subtitled "New Directions," only one of the papers (by Teige, Harman, and Schwartz) is concerned with specific areas of unsolved concern about the future. The emphasis is on what methodology and approach is appropriate.

Should you own this book? Probably not unless you are a futures research professional, although your institution's library should. The book is a snapshot of soul searching in a field at a point in time and will become rapidly dated as the field

evolves. If you are a novice, it doesn't tell you how to go about solving problems nor does it present sufficient details about specific problems. It is not likely that you would pick it off your bookshelf for specific information. Should you read the book? Yes, if you are concerned about the philosophical underpinnings of what you do, whether OR/MS or futures research. It will provide you with food for thought and may even lead you to new problems or new ways of thinking about existing problems.

Paul Gray

School of Business, University of Southern California, Los Angeles, California 90007

BOUCHER, WAYNE, *The Study of the Future: An Agenda for Research*, National Science Foundation, Research Applications Directorate and Rann-Research Applied to National Needs, 1977, 316 pp., \$4.75.

Serious, systematic study of the future is a development of the last two decades. Until now, almost all of the available work has been published either in journals (including some first-rate papers in *Management Science*) or in books that speak mostly to futurists. Several of the books were reviewed in *Interfaces* (e.g., Ackoff's *Redesigning the Future*, November 1977, Beer's *Platform for Change*, November 1977, and Linstone and Simmond's *Futures Research: New Directions*, in this issue). However, none of these sources provide an entry to the field for the novice; this volume fills that role. It consists of a well-edited, integrated series of chapters by 16 contributors, and is suitable for use both as a textbook for self-study and as a reference.

The relation between futures research and OR/MS is nicely stated by Olaf Helmer:

Futures research is a branch of Operations Research. And like that of traditional Operations Research, its function is to provide decision makers with operationally meaningful assistance in the form of information and analysis that can facilitate better decision making ... The main characteristic that differentiates futures research from standard Operations Research is that its objective is to improve decision making in the case of long range plans. Here "long range" ... clearly means that the operational conditions at the time of implementation are expected to differ substantially from those prevailing at the time of planning.

The present volume is the result of one of a series of National Science Foundation sponsored studies directed toward developing agendas for research. As such, it contains a nice mixture of state-of-the art survey (as of 1975), critique, and definition of problems yet to be solved. In the sections on what has been done, there are excellent surveys of the methods being used, ranging from conventional extrapolative forecasting techniques to more modern methods, such as trend-impact and cross-impact analysis. Chapters on social, technological, and economic forecasting, among others, present a balanced review of existing approaches. For example, the chapter on the impacts of futures research on policy development summarizes the models by Allison, Dobrow, Dror, and Jantsch.

Several chapters critique the present state of the field, including a particularly biting (but quantitatively soft) chapter by Ida Hoos. She points out that "the systems approach attacks the future in much the same way as it deals with the present. However, we find the same tools and techniques used now without the constraints imposed by real-life tests in the present."

Of the various contributions, I was most fascinated by Boucher's chapter on "Forecasting When the Future is Known: The Case of the Soviet Union." Boucher traces the evolution of futures analyses in the Soviet Union and describes the biases introduced by the need for conformity with the vision of the future determined by doctrine and by party tradition. Forecasting in the Soviet Union is seen as a way of helping to achieve a global Communist victory. The Soviets monitor research in the field and are relatively current in new developments in the West.

Harold Linstone discusses the concept of discounting the future. He argues that the vast majority of decision makers have a short planning horizon as well as a short memory. Linstone shows, for example, that if a 5% discount rate is applied to the standard runs in the Forrester-Meadows *World Dynamics* models, their crisis peaks in 60 to 90 years for pollution, population, and food production are reduced to minor significance, being perceived by today's observer as no dramatic worsening over the current situation. In the other direction, most forecasts that are trend extrapolations are based on data that go back at most one generation.

The book contains several useful sets of data, including a survey of the information systems about the future that are being maintained by a number of organizations and an extensive bibliography of Futures Research through 1975. The final chapter uses the methodology of futures research to develop an agenda (really a priority-ordered list) for the research projects critical for moving the field forward. This agenda should be a spur both to funding agencies, such as NSF, and to practitioners seeking research ideas. The book is seriously hampered by lack of an index.

In summary, this book is a well-done survey of the field, done at an almost nonmathematical level, and well written to make ideas easily accessible. It is a steal at the price (\$4.75), and is highly recommended.

Paul Gray

School of Business Administration, University of Southern California, Los Angeles, California 90007