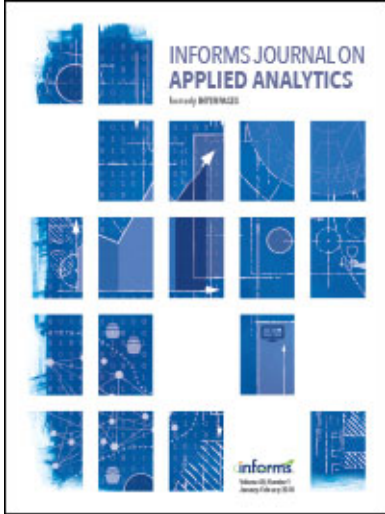




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Book Reviews

Benjamin Lev,

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Book Reviews

BENJAMIN LEV

School of Management
The University of Michigan-Dearborn
4901 Evergreen Road
Dearborn, Michigan 48128-1491

$$\frac{1}{\beta} \Gamma^{\alpha} \times \approx + \div \neg \beta \mu = \epsilon \rho \backslash + \sigma \alpha \geq \mu \omega \epsilon \cdot \& \mu ? \lambda \uparrow \epsilon < \mu \Sigma \cap \zeta \pi \rho$$

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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, BLEV@FOB-F1.UMD.UMICH.EDU. 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.

VOLLMANN, THOMAS E.; BERRY, WILLIAM L.; AND WHYBARK, CLAY D., eds. 1992, *Manufacturing Planning and Control Systems*, third edition, Richard D. Irwin, Homewood, Illinois, 864 pp., \$54.95.

This book is the third edition of a well-established text covering manufacturing planning and control (MPC) systems. Basically, MPC systems provide information to manage the whole manufacturing process efficiently. Typical activities supported by MPC systems include: planning capacity

requirement, planning arrival of material, ensuring utilization of capital equipment, and scheduling.

This edition of the book has a clear focus on adapting the manufacturing planning and control system to "meet the dictates of the marketplace and to support overall company strategy" (p. 1). Compared with the previous editions, the authors have devoted a new chapter to advanced just-in-time concepts and modified the book somewhat to overcome an excessive bias toward material requirement

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planning. They have included recent research with respect to linking the design of manufacturing planning and control systems with corporate strategy and also cover research related to integration of manufacturing requirement planning and just-in-time in existing or new systems.

The book is organized into 18 chapters. The first chapter presents the basic framework of the book and gives an introduction to the MPC field. The following five chapters introduce fundamental aspects of the MPC system: material requirement planning, just-in-time, capacity management, production activity control, and master production scheduling. Next are two chapters titled "Integrated MPC systems" and "Implementation of MPC systems"; these chapters offer important insights into organizational aspects of implementation of production systems and the integration of just-in-time with manufacturing requirement planning. Five more chapters elaborate on the fundamental aspects and have titles starting with "advanced."

The rest of the chapters are on short-term forecasting, independent demand inventory management, distribution requirement planning, demand management, and MPC frontiers. These chapters seem less central to the theme of the book and could easily be skipped.

The chapters are organized uniformly starting with an outline of the key topics of the chapter and including a set of principles, references, some discussion questions, and several pages of problems at the end. There are no references to other pages or chapters in the book. This allows the reader the flexibility to go through the ma-

terial in the order best suited for a specific course.

For most of the book, no prior knowledge of operations research or management science techniques is required. Even the chapters on advanced concepts in material requirement planning and just-in-time introduce basic lot sizing models and so forth without mathematical rigor. Likewise, in the chapter on advanced concepts in production planning, for example, the authors present mathematical programming formulations of production planning problems but do not include proofs or technical discussions of the models in the book. Instead they provide references to original contributions at the end of each chapter.

Within the main text, the authors present several case studies and examples. Most of these are based on published articles describing real applications of manufacturing planning and control techniques.

When Amitabh S. Raturi [1986] reviewed the first edition of the book, he found it to be ". . . undoubtedly the best book of its kind in the market today." Since then, his judgment has been confirmed as the book has been adopted as a basic text in courses all over the world. Overall the book is an excellent introduction to the MPC field, and it is an extremely competently written book that offers useful and reasonable methods for designing and managing manufacturing planning and control systems in a variety of circumstances.

Part of the book would be suitable for an undergraduate course, or the whole book could be used for an MBA course. Further, the principles and methods out-

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lined in the book should be known to everybody involved in consulting, teaching, or research in the operations management field.

Reference

Raturi, Amitabh S. 1986, "Review of *Manufacturing Planning and Control Systems*," by Vollmann, Thomas E.; Berry, William L.; Whybark, Clay D., eds. 1984, Richard D. Irwin, Homewood, Illinois, *Interfaces*, Vol. 16, No. 1, pp. 112–113.

Per Nikolaj D. Bukh

Institute of Management, University of Aarhus, DK-8000 Aarhus C, Denmark

SHEDLAR, GERALD S. 1993, *Regenerative Stochastic Simulation*, Academic Press, San Diego, California, 401 pp., \$59.95.

People trained to use a simulation language are common; however, those who can run simulation studies and provide an intelligent analysis of the results are scarce. Shedlar provides an excellent coverage of one method of analysis, regenerative stochastic simulation. He provides a complete discussion of the methodology developed by Fishman [1973], and Crane and Iglehart [1975], which is summarized in Gross and Harris's [1985] *Fundamentals of Queueing Theory*. Such books on simulation analysis as Law and Kelton's [1991] *Simulation Modeling and Analysis* and Hoover and Perry's [1989] *Simulation: A Problem Solving Approach* provide excellent although limited practical discussions. In contrast, this is the first book to concentrate solely on the method and provide a comprehensive and focused description.

The book itself is well written; the author provides elegant examples of most of the concepts he introduces. At the end of most sections, he supplements the text

with several well thought out exercises. It would be excellent material for one of a series of simulation courses. Students using this book would need previous graduate level study of stochastic processes and probability theory and statistics. An appendix contains a brief guide to the limit theorems for stochastic processes. This is a good reference for those with some understanding of the material; however, it is not strong enough to serve as an initial introduction.

Chapter 1 introduces the concepts of discrete event simulations, emphasizing such methodological concerns as random-number generation, state definitions, and time advance procedures. Also included is an excellent introduction to the generalized semi-Markov processes (GSMP) with many well-chosen examples. In chapter 2, Shedlar discusses the nature of regenerative processes, starting with an overview of the regenerative property and then describing limit theorems for regenerative processes. This chapter culminates with a section bringing together all the introductory material to detail regenerative generalized semi-Markov processes.

Chapter 3 concerns using the regenerative method on simulation output, with in-depth discussion of the method of analysis and implementation considerations, discrete time conversion, computational methods for arriving at theoretical values for Markov chains, and statistical efficiency. Simulation of networks of queues is the background for the topics discussed in chapter 4. These topics include the job-stack process and the conditions for ensuring the regenerative nature of job-stack processes. The chapter concludes with a

discussion of the use of the geometric trials lemma for obtaining criteria for recurrence results, using this to extend analysis to preemptive-resume priorities.

Estimation procedures for characteristics of limiting passage times in a network of queues are the focus of chapter 5. Shedlar presents formal specification in the form of the augmented job-stack process. He follows this with descriptions of two procedures, the marked job method and the labeled jobs method, and compares the statistical efficiencies of the two methods. He concludes the chapter with a discussion of abstract passage times, describing several examples. In chapter 6, he discusses the complexities introduced by simulations with simultaneous events. The chapter includes a discussion of simultaneous trigger events and several examples detailing the introduction of compound events into the event set. Shedlar then tackles the formal specification of GSMPs with simultaneous trigger events. Finally, he presents regenerative theorems for these GSMPs.

As previously mentioned, the appendix covers limit theorems for stochastic processes. Also included is an informative discussion on random number generation, from the linear congruential generator and inverse transformation through acceptance/rejection criteria and decomposition methods.

This book can be a valuable asset in a series of courses on simulation techniques. It provides the knowledge necessary for running a meaningful simulation study with intelligent analyses of results. The prolific use of examples and exercises enriches its teaching potential and enables fast comprehension of difficult material.

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- Alan G. Kalton
Department of Industrial and Operations Engineering, University of Michigan,
Ann Arbor, Michigan 48109-2117

CHACKO, GEORGE K. 1993, *Operations Research/Management Science: Case Studies in Decision Making Under Structured Uncertainty*, McGraw-Hill, New York, 396 pp., \$49.95.

Ever since operations research was developed as a practical and scientific tool to aid decision making in an operational setting, many books have been written on the subject for various audiences. One of the most gargantuan tasks in this arena is to write a didactic book for high-level decision makers who do not have mathematical backgrounds or highly developed computational skills. Very few authors have accepted this challenge, and fewer have been equal to the task. George Chacko belongs to the rare class of educators qualified to tackle this problem.

An expository book on operations research and management science, albeit elementary, cannot successfully cover all as-

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pects of the field in one volume. One must make a judicious choice of topics. In this book, Chacko touches on and interlaces major aspects of the field in a rather creative manner. He discusses problem identification (formation), formulation, computation, and implementation (commitments). After an integrative introductory section, Chacko discusses the foundational concepts of key MS/OR methodologies, such as mathematical programming (including dynamic programming), inventory, forecasting, game theory, and simulation in five parts. In most of the parts and the 19 chapters they comprise, he makes an attempt to interrelate concepts and methodologies. In so doing, he continuously reminds the reader of the common bonds of the topics discussed. This is an admirable attribute of the book.

An aspect of the book that has considerable appeal is his introduction of MS/OR topics using recent, authenticated success stories as reported by well-known major corporate giants and organizations. This is a useful strategy for marketing MS/OR to the difficult-to-reach audience of high-level executives with minimal quantitative backgrounds. Perhaps, this explains the author's use of the misnomer *case studies* in the subtitle of the book. However, this welcome attribute is unfortunately not exploited uniformly, especially with regard to the important topic of dynamic programming. This topic is judiciously motivated in chapter 2, using the Apollo 11 and 13 cases, and the author correctly emphasizes the philosophical underpinnings of dynamic programming as a tool for conceptualization, design, and policy making. But in chapter 19, the "case studies" of stage

coach for backward recursion and knapsack for forward recursion are standard textbook fare and do not compare with the real and real-to-life examples of the previous chapters. I would prefer to have seen dynamic programming illustrated with celebrated case studies from space systems navigation for lunar landing control, optimal planning of economic development, or optimal inventory management—a topic for which other methods of MS/OR fail to yield globally optimal strategies. Further, since this book purports to deal with tools for decision making under uncertainty, the fact that dynamic programming provides a model that can handle deterministic and stochastic systems, discrete and continuous problems, and linear and nonlinear objective functions with almost equal ease should have been made clear. The typographical error replacing *state* with *stage* in the description of "Stage 5 resource-returns" on page 297 will certainly confuse the novice.

Another appealing pedagogical feature of the book is the six-part "Questions: Concepts and computations for commitment" section following each chapter. While this feature is for emphasis and intended to remind the reader about the purpose of the questions, not all six aspects are relevant to all chapters. For example, only 10 out of the 19 chapters have questions that cover all six aspects. In particular, two of the chapters most relevant to the title of the book (forecasting and simulation) surprisingly lacked any questions! The solutions provided at the end of the book will be useful in following the essential aspects of MS/OR that the author tries to convey.

One of the most important aspects of the book is the fact that many of the examples either stem from military environments or assume such a background while the reported successes come from industrial or corporate environments. In the current national and international climate in which the concern is for conversion from the military to the civilian, this book may prove timely. It may contribute to a smoother transition and qualify as a bold attempt at technology transfer.

Augustine O. Esogbue

*School of Industrial and Systems Engineering,
Georgia Institute of Technology, Atlanta,
Georgia 30332-0205*

WATERS, C. D. J. 1992, *Inventory Control and Management*, John Wiley and Sons, Chichester, England, 364 pp., \$54.95.

Waters has written a book on inventory control that is useful for students and practitioners as well. Waters achieves this by using appropriate numerical examples rather than proving theorems in rigorous fashion.

Essentially, the book is partitioned as follows: Section 1 provides a general introduction to inventory control, describing the purpose of stock, the costs involved, and the purpose of stock control; Section 2 considers independent demand inventory systems; and Section 3 describes dependent demand systems, where demand for materials is derived from production plans.

In particular, Section 2 concerns the classical EOQ model and analysis, other models with deterministic demand, models with probabilistic demand, demand forecasting methods, and information for inventory systems. Section 3 provides a nice

account of material requirements planning (MRP), just-in-time (JIT), and planning for dependent demand inventory system from an organizational perspective. It includes hierarchical decision making; strategic decisions including corporate strategy and capacity planning; tactical decisions that include aggregate planning and master production scheduling. The coverage is quite good in Section 3 except that Holt, Modigliani, Muth, and Simon's procedure for aggregate planning might have been mentioned. Also, the author might have expanded the coverage of linear programming as a useful tool and covered the use of sensitivity analysis to analyze such considerations as demand uncertainty. Actually, linear programming approaches to aggregate planning are not very complex, and they can consider uncertainty in the data via the standard output from any linear programming solvers. Lastly, under master production scheduling, Waters might have mentioned optimal disaggregation research.

Overall, my impression is that this is a refreshing approach to the subject. The key strengths are practicality, usability, and readability. At the same time, this book provides enough reasons that it is not a cookbook. I recommend it to anyone interested in a good thorough introduction to the subject.

Bruce R. Feiring

*City Polytechnic of Hong Kong, Kowloon,
Hong Kong*

FOURER, R.; GAY, M. G.; AND KERNIGHAN, B. W. 1993, *AMPL: A Modeling Language for Mathematical Programming*, The Scientific Press, South San

CPLEX for MS-DOS environment. A small manual, *Using the AMPL Student Edition under MS-DOS*, is also included. It explains the steps needed to install AMPL, some of the features of the interactive environment, and how to call MINOS and CPLEX from AMPL.

In my opinion, AMPL is an excellent tool for any serious user of optimization softwares in both research and decision making. The book is well written; it provides a clear and concise explanation of modeling techniques under AMPL, making its use attainable for all modelers.

Samer Takriti

Department of Industrial and Operations Engineering, The University of Michigan, Ann Arbor, Michigan 48104

MCNEESE, WILLIAM H. AND KLEIN, ROBERT A., eds. 1991, *Statistical Methods for the Process Industries*, Marcel Dekker, New York, 512 + xvi pp., \$55.00.

Drawing on their extensive experience in the process industries, McNeese and Klein have compiled a useful, practical text on the major techniques involved in statistical process control. The range of topics covered is extensive. Fundamental concepts, such as control charts for attributes and variables data, are included along with more advanced topics, such as capability measures and monitoring techniques for short production runs and autocorrelated processes.

This book is aimed at the practitioner. Indeed, in the preface, the editors outline the book's focus and intended audience by stating that "it is a basic text designed to teach the fundamental quantitative tools . . . to help the process industries imple-

ment the use of statistical techniques." To fully appreciate the book, the reader should possess a working knowledge of statistical methods.

The strength of this book lies in the breadth of topics covered and its attention to detail. The knowledge the authors wish to convey to their audience is clearly stated in the chapters' objectives, which are highlighted and placed early in each chapter. The authors explain the concepts of quality, process variation, total quality management (TQM) and its relationship to statistical process control (SPC) in the first three chapters.

Chapter 4 should be particularly useful to the practitioner. Companies that decide to adopt the TQM philosophy often have difficulty in translating the philosophy into detailed steps that can be understood and implemented by their employees and yet meet their customers needs. Chapter 4 outlines a multi-step strategy for accomplishing both of these objectives. Its key ingredients are the need for process improvement efforts to flow from a company's mission statement, the identification and prioritization of customers' needs, and the selection of major processes for monitoring and improvement based on these needs. The authors also offer two methods companies can use to measure their progress in implementing their process improvement plans. One method involves assigning a numerical grade based on the degree of completion of each step of the quality plan. The other method focuses on quantifying the benefits of the process improvement efforts to the company in dollars. While the dollar-impact method is somewhat controversial, the ability to attach a

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dollar value to an achieved process-improvement goal may result in an enhanced understanding by employees and management of the company's progress in achieving its objective of continuous quality improvement.

The authors also include a number of special topics not usually found in books aimed at the practitioner: regression control charts for data exhibiting trends, measurement systems, and nested experimental designs.

The rest of the book is devoted to the standard SPC techniques. Pareto diagrams, process flow diagrams, control charts for attributes and variables data, and cause-and-effect diagrams are presented in a workman-like manner, with enough detail to engage but not bore the reader. A worked example concludes the explanation of each technique. Readers who want a more thorough treatment of the topics covered here may prefer Montgomery [1991], one of the more popular SPC textbooks.

Although the book's intended audience is the practitioner and not the student, the book could be improved by the inclusion of problem exercises that reinforce the chapters' contents. The authors' statements that exponentially-weighted-moving-average (EWMA) charts and cumulative-sum (CUSUM) charts are not normally combined with range charts is somewhat unsettling. Inferences drawn from a chart on the process mean are meaningful only if the process variability is in control. To ensure that the variability is in control, a chart on the variability is necessary. For this reason, charts on the process mean should always be combined with charts on the process variability.

In summary, this book will be a useful addition to the library of the practitioner who wants a broad overview of the major SPC techniques.

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Montgomery, Douglas C. 1991, *Statistical Quality Control*, second edition, John Wiley and Sons, New York.

Claude R. Superville

Department of Management and Information Systems, Valdosta State University, Valdosta, Georgia 31698

GEWEKE, JOHN, ed. 1992, *Decision Making under Risk and Uncertainty: New Models and Empirical Findings*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 260 pp., \$111.00.

This book is the latest in the series containing papers presented at the prestigious Foundation and Applications of Utility, Risk, and Decision Theories (FUR) conferences. It presents 28 papers from the fifth FUR conference convened at Duke University, June 1990. This conference was the first to be held in the United States and it naturally had the most US participants. The sixth FUR conference was held in Paris, June 1992, and the seventh will be held in Oslo, June 1994. Papers from these conferences will also appear in books to be published by Kluwer Academic Publishers.

Full versions of many of the papers in this book have appeared in such journals as *Theory and Decision* and *Journal of Risk and Uncertainty*. In these cases, the book presents abridged, easier-to-read versions, which are often preferable to the originals. The papers I comment on below are those that appealed to me the most.

Part 1 of the book contains seven papers on extensions to the expected utility the-

ory. It starts with an introductory paper by Fishburn on nontransitive preferences. The article is a friendly introduction to the topic written in a way that even a high school student can understand. In the next paper, Kadane explains how a consequence that is too good to be true can evoke suspicion that there may be some cheating involved. A decision maker who has such a suspicion may then assume a positive probability of cheating and include it in expected utility calculations. Kadane shows how this modification can explain Allais and Ellsberg paradoxes.

The paper by Bordley and Hazen concerns negative complementarity of preferences over time and positive intertemporal correlation between subjective probabilities. An incorporation of these phenomena into the expected utility model leads to a nonlinear model, of which the Allais and Bell models become special cases. In the next paper, Hazen considers repeated choice, or decision policy, in Ellsberg-type situations and proves that risk aversion would lead to ambiguity aversion in those situations. In a short paper, Rasmusen and Petrakis show how a four-point mean-preserving spread is equivalent to a combination of a three-point spreads. The paper thus adds a simplification to the seminal work by Rothschild and Stiglitz and also corrects a small error in their writing.

Part 2 contains six papers about the alternatives to expected utility theory. It starts with Hagen's paper in which he summarizes his earlier models and points out how skewness of a probability distribution, as used in his models, can account for such things as regret or disappointment. He also introduces his concept of

"blame" which may explain certain types of decision-making behavior.

In his paper, Montesano derives formulas for measuring risk aversion in the cases of expected and nonexpected utilities. The article is so instructive that I recommend it to even those who do not believe in nonexpected utility theories. The next paper by LaValle and Fishburn is a chronological narrative of their study of lexicographic state-dependent utility. The distinguishing feature of lexicographic utility is that subjective probabilities become matrices with interesting structural properties. Insua extends the expected utility theory to decision making under partial information. The idea here is that given a quasi order among alternatives based on partial information, there exists a family of consistent value functions that can be rationally used in decision making. In my opinion, this idea has many possibilities for further research as to how additional pieces of information can be used.

Part 3 contains five papers on new empirical evidence of various violations of traditional principles. In the first one, Erev finds that if the probabilities are more explicitly given in an Allais-type situation, the chances are greater that the decision maker would violate subjective expected utility theory. In the next paper, Gigliotti and Sopher confirm the fanning-out hypothesis in the probability triangle for three-outcome lotteries, especially at the borders of the triangle. The paper by Rowe, Wright, and Bolger is a summary of research they and others carried out on the nature and quality of subjective probability estimates, particularly in forecasting. In the last paper, Smidts presents empirical test-

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ing of ties between the function $v(x)$, which encodes diminishing marginal value of outcomes, and $u(x)$ which encodes risk aversion. The conclusion is that both risky and riskless choice situations are necessary to assess risk attitudes satisfactorily.

Part 4 on information, learning and equilibrium contains 10 very varied papers. In the first paper, Allen outlines the proof that under reasonable assumptions, competitive equilibrium exists in the information market just as in any commodity market. Munier's paper focuses on the process of belief formation in uncertain environments and suggests that subjective probabilities are the result of a deliberation process between the decision maker and the market.

The paper by Nau and McCardle on arbitrage, rationality, and equilibrium is a very informative one that collates finance literature on arbitrage, decision theory literature on rationality, and economics literature on equilibrium into one perspective. Anyone specializing in decision theory must read this article. McAllister examines the effects of a decision maker's myopic adaptation over time in two game theoretic contexts, namely, prisoners' dilemma and security trading. He finds the cooperative solution to prisoners' dilemma stable but the rational expectations equilibrium in security markets unstable. In the next paper, Sobel asserts that some but not all of Newcomb's problems are prisoners' dilemmas just as some but not all prisoners' dilemmas are Newcomb's problem.

Nehring's paper is a formal treatment of decision making with vague priors where the decision maker entertains, not one, but a convex set of probabilities for the states

of nature. In their paper, Elliott and McKee present empirical evidence that a decision maker confronted with multiple uncorrelated risks may place unduly high weights on some risks and unduly low weights on others.

Overall, this book presents yet further evidence that the theory of decision making under risk and uncertainty is still evolving and evolving rapidly. Both academics and practitioners will find the book useful in keeping up with this evolution.

Jayavel Sounderpandian

School of Business, University of Wisconsin-Parkside, Kenosha, Wisconsin 53141-2000

FLOOD, ROBERT LOUIS 1993, *Beyond TQM*, John Wiley and Sons, New York, 303 pp., \$39.95.

The primary purpose of this book is to offer a critical analysis of current thought concerning total quality management (TQM) and to propose a new method for implementing TQM in organizations. Flood contends that there is a lack of rigor in current TQM thought because it has not been related to the various management and organizational theories that exist. In addition, he feels current TQM philosophy has given inadequate consideration to the directions of modern management and the system sciences. Flood believes that if an organization is to truly benefit from quality management, it must make fundamental changes to traditional TQM assertions. Although written primarily for management practitioners, research academicians, and students of management education, the book does have a thought-provoking appeal for all open-minded TQM enthusiasts.

The book is divided into three sections:

(1) the philosophy, principles, and methods of quality management (chapters 1–10); (2) case studies illustrating the application of quality techniques and methods (chapters 11–15); and (3) exercises and games, which invite readers to demonstrate their knowledge of TQM (chapter 16).

In chapter 1, the author provides a brief history of quality thought and in chapter 2, he describes the philosophies, principles, and methods of the major quality gurus (that is, Deming, Juran, Crosby, Shingo, Taguchi, Ishikawa, and Feigenbaum). He also enumerates the strengths and weaknesses of each guru's ideas. In chapter 3, Flood presents the main concepts and ideas of quality management and provides a holistic definition of TQM. In chapter 4, he outlines the ISO 9000 standards and lists the strengths, weaknesses, opportunities, and threats inherent in that accreditation approach.

In chapter 5, he presents arguments that the traditional approaches to quality management are inadequate and can actually hinder quality innovation in contemporary organizations. The author contends that one must stress the value of a complementarist framework for the proper and valid use of TQM. In chapter 6, he builds on chapter 5 and introduces the total systems intervention (TSI) approach. He discusses the three phases of TSI—creativity, choice, and implementation.

In chapter 7, Flood creates a theory of TQM taking into consideration the philosophy and principles of management and organization theory. The major premise of the chapter is that quality, viability, and culture need each other. Chapter 8 is con-

cerned with the importance of practicing freedom (for example, providing people with opportunities for autonomy, responsibility, and open participation) in quality management. In chapter 9, Flood supplies the reader with a guide showing the methods and techniques of quality management and how they can be used most effectively. Chapter 10 is a review of previous sections of the book.

Chapter 11 is an introduction to case studies and chapter 12 through 15 present actual case studies—Diagnostic Biotechnology Ltd., Tarty Bakeries USA (disguised company), North Yorkshire Police (NYP), and Cosalt Holiday Homes—designed to illustrate efforts to achieve TQM in differing organization types. Chapter 16 contains exercises, incident cases, and games to generate thought and discussion concerning quality management.

I feel the book is useful and thought provoking. I recommend the book to both researchers and practitioners who have questioned current TQM philosophy and its methods of implementation.

Stanley J. Stough

Department of Management, Southeast
Missouri State University, Cape Girardeau,
Missouri 63701

ZAHEDI, FATEMAH 1993, *Intelligent Systems for Business: Expert Systems with Neural Networks*, Wadsworth, Florence, Kentucky, 658 pp., \$38.00.

In this book, Zahedi introduces expert systems (ES) and neural networks (NN) in a unifying framework of intelligent systems. The book is divided into six parts, followed by four appendices. Beginning with a general introduction of ES and NN

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as managerial decision-making tools and productivity tools (part 1), Zahedi provides in-depth and clear discussions of two fundamental, theoretical foundations of ES: knowledge representation and knowledge processing. Parts 2 and 4 are especially well written to cover three alternative knowledge representation approaches (logic-based, object-oriented, and hybrid) and two approaches of knowledge processing (deductive and inductive reasoning). Part 3 helps the reader gain hands-on experience in creating prototype ESs, using a deductive reasoning based ES shell (LEVEL5) or an inductive-reasoning-based ES shell (1st-CLASS). In part 5, Zahedi reviews advanced ES topics, such as uncertainty, software evaluations, and liability issues. Part 5 introduces the reader to NN, a new AI tool for business decision making. The author compares NN with ES and examines the development of NN from a historical perspective.

The strengths of this book come from the following attributes: First, every page of this book is precisely written, and the book covers all essential topics. Students, instructors, and general readers should appreciate Zahedi's talents in conveying clear ideas and key concepts with straightforward words. Second, the book is well organized; it blends a thorough examination of theoretical foundations, hands-on experiences in creating ES, and ample learning opportunities from real-world case studies of ES and NN.

I compared Zahedi's book to two other books: *Introduction to Expert Systems* by J. Liebowitz [1988] and *Expert Systems for Business: Concepts and Applications* by D. V. Pigford and G. Baur [1990]. There are very

distinctive differences among the three books. First, Zahedi's book (658 pages) discusses ES and NN, with more breadth than the other two books (by including NN) and depth, in a unifying framework of intelligent systems. I certainly would adopt Zahedi as an introductory graduate ES textbook. On the other hand, Pigford and Baur (394 pages) is written for undergraduate students enrolled in an introductory course on ES or the two-year college level. Liebowitz (182 pages) is intended to be used by practicing managers, executives, or engineers to provide practical guidelines to building ES.

Zahedi aims to reach three audiences: undergraduates, graduate students, and general readers. In my opinion, this book will be most suitable for graduate students and general readers with some knowledge in ES.

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Liebowitz, Jay 1988, *Introduction to Expert Systems*, Mitchell Publishing, Inc., Santa Cruz, California.

Sean B. Eom

Department of Management, College of Business, Southeast Missouri State University, Cape Girardeau, Missouri 63701

BUCKLAND, MICHAEL 1991, *Information and Information Systems*, Praeger Publishers, New York, 248 pp., \$16.95.

Michael Buckland wrote *Information and Information Systems* to introduce information systems theory to students and professionals whose interests are in the nature of information systems and in how informa-

tion systems are related to their social context. In his preface, he defines information systems broadly as "systems that provide information services intended to result in human beings becoming informed: archives, libraries, on-line data bases, and so on."

The book consists of five parts. In part 1, the author defines information systems as including both computer-based systems and manual systems. He states that the book is intended "to build a better understanding of information systems through the description of their nature." In part 2, he describes several views of theory. Buckland is concerned with theory that assists and guides people in understanding practical activities. He focuses on the broad area of retrieval-based information systems, such as management information systems, records management, archive services, library services, and museums. Since theory is characterized by system variables (attributes), laws of interactions, and boundaries, he devoted part 3 to analyzing six variables (different types of processes) involved in processing and using information that are essential to describing his view of information systems theory. The six variables are inquiries, information processing, perceiving and receiving information, becoming informed, the demand for information services, and the provision of information services. In part 4, Buckland examines how the variables are related to each other and to the system boundary (the environment). Part 5 is a summary and some conclusions.

The book's strengths lie in Buckland's identification of six model variables (different types of processes) involved in process-

ing and using information and his examination of the interrelationships among those variables and the environment. Part 5, the conclusion, I thought was especially incomplete and weak. The last two sentences of the book may indicate a need for continuing research to build information theory: "We need adequate *theory*. We need a better understanding of information and information systems."

This book may be suitable for graduate students, professionals in the area of library and information science, and those interested in retrieval-based information systems in archives, libraries, and museums. I would recommend this book to graduate students and academics in the library and information systems areas.

Sean B. Eom

Department of Management, College of Business, Southeast Missouri State University, Cape Girardeau, Missouri 63701

Books Received for Review

- Anderson, David R.; Sweeney, Dennis J., and Williams, Thomas A 1991, *An Introduction to Management Science: Quantitative Approaches to Decision Making*, sixth edition, West, New York, 868 pp., \$45.95
- Blischke, Wallace R. and Murthy, D. N. Prabhakar 1993, *Warranty Cost Analysis*, Marcel Dekker, New York, 731 pp., \$185.00
- Bolles, Robert C 1993, *The Story of Psychology: A Thematic History*, Brooks/Cole Publishing, Pacific Grove, California, 445 pp., \$52.00
- Cooper, James W 1993, *Visual Basic for DOS: Building Scientific and Technical Applications*, John Wiley and Sons, New York, 401 pp., \$34.95.
- Csorgo, Miklos and Horvath, Lajos 1993, *Weighted Approximations in Probability and Statistics*, John Wiley and Sons, New York, 442 pp., \$89.95.
- Devas, Nick and Rakodi, Caorle, eds 1993, *Managing Fast Growing Cities: New Approaches to Urban Planning and Management in the Developing World*, John Wiley and Sons, New York, 337 pp., \$39.85.