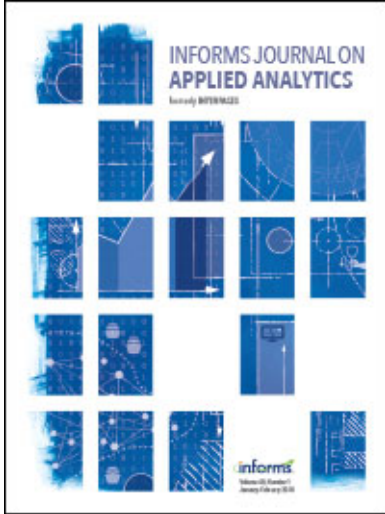




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To cite this article:

(1996) Book Reviews. Interfaces 26(5):81-90. <https://doi.org/10.1287/inte.26.5.81>

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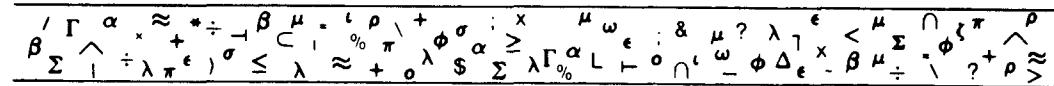


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Book Reviews

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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, 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.

GROMICHO, JOAQUIM ANTONIO DOS SANTOS 1995, *Quasiconvex Optimization and Location Theory*, Tinbergen Institute Research Series, Amsterdam, The Netherlands, 196 pp., \$25.00.

A doctoral thesis needs to strike a balance between the necessity of presenting the elementary topics and the complexity of one's advanced research. Gromicho has achieved this balance through his clear and concise explanation of the elements of convexity and convex and quasiconvex pro-

gramming, and his thorough treatment of the ellipsoid method and its application in location theory, the main focus of this book.

Gromicho begins by describing his own notation—an important part of any thesis (unfortunately lacking in many)—and goes on to give the basic details of convexity and convex programming. His description is based largely on Rockafellar's famous book on convex analysis. Although a reference book of choice for many authors, it is not

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0092-2102/96/2605/0081\$01.25

INTERFACES 26: 5 September–October 1996 (pp. 81–90)

easy to read. Gromicho has done an excellent job of putting the information into more tractable form.

One of the main methods of solving convex programs has been to use separating hyperplanes. In this book, Gromicho uses the ellipsoid method as an illustration of the use of separation hyperplanes. He begins with a one-dimensional case, the bisection method. Building on the one-dimensional case, he proceeds to the mathematical description of the ellipsoid method in a higher dimension. One of the important topics he covers is a new type of cut, a norm cut, to give the ellipsoid method more numerical stability. It is well known that ellipsoid algorithms tend to have numerical instabilities and his new simpler approach promises a more solid method.

Perhaps the only place his treatment of the topic falters a bit is in his explanation of the so-called separation oracles. In my opinion, a book of this type has a secondary role of motivating others to further the research done by the author. A good explanation of the basic topics is a prerequisite for a good guide to further research. Gromicho does this in most of the book, specifically in his treatment of the application of the ellipsoid method and of convex programming in location theory. Like most chapters, these application chapters start with simple and clear explanations of terms (here *location* and *measure*). The author goes on to describe the role of convex programming in location models.

The last two chapters of the book deal with quasiconvex programming and its application in location theory. Quasiconvex programming doesn't seem to be a good

candidate for the ellipsoid method, and Gromicho recognizes that some global optimization techniques are needed to modify the ellipsoid method. He presents a separation oracle for quasiconvex functions and gives a pointed interpretation of the very complex theoretical results in quasiconvex programming. In the last chapter of the book, he covers quasiconvexity in location models, considers more realistic models, and presents a few numeric results.

With its clear and concise treatment of elementary methods and its elaborate proof and illustration of complex results, this book would be a great asset to graduate students and researchers who want to further research in the area of ellipsoid method in convex and quasiconvex programming problems and new methods of solving quasiconvex continuous location models.

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BIROLINI, ALESSANDRO 1994, *Quality and Reliability of Technical Systems: Theory—Practice—Management*, Springer-Verlag, Berlin, 524 pp. (including 9 appendices), \$114.00.

This book packs a lot into its 500 pages. For whom is the book intended? Birolini, in his preface, outlines an ambitious scope. Chapter 1 and appendices A-1 to A-5 are for project and quality assurance managers. Chapters 2 through 5, 7, and 8 are for engineers working in development or production. For scientists and systems oriented engineers, there are chapter 6 and appendices A-6 and A-7. There is no mention of students as part of the intended audience, and

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indeed, one would need to stretch to defend the book as only a textbook. But for the intended audience, it may serve as a handbook or a planning document, especially (but not solely) for those concerned with electrical systems.

For the manager, chapter 1 is primarily a quick overview of the terminology of the field. Appendices A-1 to A-5 go into the topic in more depth for that audience. Appendix A-1 is a lengthy glossary that includes terms from chapter 1 and many not there. Appendix A-2 is concerned with quality and reliability standards, including a brief history of such important standards as the IEEE/ANSI standards for software. In appendix A-3, the author lists a set of tasks for quality and reliability assurance, including a possible management system for carrying out the tasks. A long list of questions (no answers) to be addressed in a quality-reliability program comprises appendix A-4. Finally, appendix A-5 is a lengthy list of requirements for a data-reporting system.

For the engineer working in development and production, chapters 2 through 5, 7, and 8 are more technical than chapter 1. They comprise the longest section of the book, about 320 pages. Chapter 2 starts with the simplest parallel-series systems with independent components. Various tables of questions to be asked, procedures to be developed, and a nice fault tree-like study done by the author add zest to an otherwise dry recitation of well-known formulas. Chapter 3 is nearly devoid of formulas but is a guide for the selection and qualifications of components and materials for design for reliability. It includes a long table (Table 3.2) of technological properties

of electronic components, a checklist for qualifications testing, a lengthy discussion of integrated circuits with photographs of some common causes of failure, and a long discussion of design guidelines for reliability. In chapter 4, Birolini discusses maintainability and its analysis during the design phase. As in other chapters, he includes a lengthy catalog of questions for the evaluation of maintainability during the design phase. The chapter includes a section on well-known formulas to be used during a design program to predict such things as mean time to failure and mean time to repair, a short section on models for spare parts provisioning, and a short section on cost considerations. Chapter 5 is a bit of an anomaly in that it is concerned with software reliability, which seems out of place in a book so heavily devoted to hardware. Still, it deserves a place somewhere, if for no other reason than the close association of quality and reliability considerations of hardware and their computer monitoring and control. The chapter is short.

Continuing with the section, chapter 7 is devoted to statistical quality control and reliability testing. The quality control part includes the common estimation procedures, hypothesis testing, and a sampling plan, all devoted to defect probabilities in the simplest cases. Goodness-of-fit tests and Kolomogorov-Smirnov tests round out the chapter. While the chapter is short, it provides a good elementary introduction to the topics considered. In chapter 8, the author discusses quality and reliability assurance during the production phase, primarily of electrical components. Table 8.2 "Tests and screening procedures . . ." is a

nice addition. Included in the chapter is an interesting section on qualification tests with a set of photographs of actual production flaws in soldered joints. The chapter concludes with brief discussions of screening electronic assemblies, testing and screening strategies, and their economic consequences.

The final group in the intended audience, scientists and systems engineers, is addressed in chapter 6 and appendices A-6 and A-7. Chapter 6 is a long review (80 pages) of the well-known models of reliability and availability. Birolini summarizes these models in Table 6.1, including for each model where it is useful and the background one needs to understand it. Appendices A-6 and A-7 provide a quick overview of underlying probability and stochastic process concepts. Included are discussions of the common distributions, renewal processes, Markov processes, regenerative and semi-regenerative processes, and nonregenerative processes.

Appendix A-8 contains a review of such standard statistical topics as estimation, hypothesis testing, and goodness-of-fit tests. It supplements the material in chapter 7. Appendix A-9 is quite short and contains tables of most common distributions, for example, the normal distribution, and three pages of probability charts, for example, the Weibull probability paper.

The references are extensive, as eclectic as the text, and keyed to the chapters. The references are as diverse as the 1933 paper on probability by Kolomogorov and various recent government standards for reliability testing and reporting. It is a remarkable compilation, though far from exhaustive.

In summary, this book is a superb overview of the topics it claims to cover in its subtitle. There is something here for the manager, for the production engineer, and for the scientist engaged in quality and reliability programs. While it does not appear to be a text, it likely should be on the bookshelf of those actively engaged in this important area. The author has 25 years of experience in all aspects of the field and at the time of the writing was head of the reliability laboratory of the Swiss Federal Institute of Technology (ETH). His hands-on experience shows.

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HARRIS, DOUGLAS H., ed. 1994, *Organizational Linkages: Understanding the Productivity Paradox*, National Academy Press, Washington, DC, 328 pp., \$44.95.

The observation that many firms have realized marginal apparent productivity gains from their large investments in information technology has become known as the *productivity paradox*. This book is the outcome of research on organizational linkages sponsored and coordinated by the Human Factors Committee of the National Research Council. The research was conducted between 1989 and 1992. The debate over whether a productivity paradox actually exists has continued since the conclusion of the research described in this book (for example, Brynjolfsson [1993], Due [1994], and Ives [1994]) and centers on a number of research design and measurement issues.

The book collects 11 research papers that

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explore the linkages among individual, group, and organizational productivity in one volume. Harris provides an introductory chapter, and a committee of the papers' authors write a concluding chapter. A major strength of the book is that it includes the work of a diverse group of researchers focused on one issue. The researchers' backgrounds include psychology, information technology management, sociology, industrial engineering, decision science, and systems engineering. A major weakness of the book is that the papers are not organized in any identifiable taxonomy. The only synthesis of the work appears in the final chapter. The book would have benefited if the papers had been categorized into related groupings with introductory and summary material for each grouping.

This is not to deny the valuable contribution of the individual papers. The Ruch paper (chapter 5) and the Sink and Smith paper (chapter 6) together provide an insightful analysis of various approaches to measuring productivity. The Kiesler et al. paper (chapter 9) and the Harris paper (chapter 10) do an excellent job of illustrating the productivity linkage ideas developed earlier in the book using the settings of software development and computer-aided design, respectively.

A unique contribution of this book is that the collected papers present a sophisticated approach to examining productivity measurement. By identifying the linkages among individual, group, and organizational activities, the book opens up a line of research that shows great promise compared to the macro-level models used in much existing productivity research. I would recommend

this book to anyone conducting research on the productivity effects of technology investment. I also believe that managers who make technology investment decisions might find some chapters of the book useful despite the book's academic tone.

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BUSHNELL, P. TIMOTHY 1995, *Transformation of the American Manufacturing Paradigm*, Garland, New York, 274 pp., \$46.00.

The past 25 years in the manufacturing industry have seen the emergence of a lot of innovative concepts driven by intense global competition, rapid technological change, and the cost and quality conscious customer. Academics and practicing professionals have been forced to question many of their traditional beliefs and practices. Managers have witnessed a lot of experimentation with new and interesting ideas concerning strategy and practice. Bushnell has done an excellent job of writing a comprehensive historical account of these changes and visions.

Starting with Taylorism in the first quarter of this century, American industry has absorbed and implemented principles of scientific management. Bushnell uses these

principles as a framework in describing the evolution of the manufacturing paradigm in this century. He explains the acceptance of time and motion study and job standardization and the pitfalls faced by the early practitioners. Their primary motivation was to develop a more effective system of compensation and provide incentives for higher productivity.

The author also points out many of the indirect benefits of such efforts, which include Taylor's extensive research into metal-cutting techniques, the standardization of tools, the establishment of detailed systems of cost accounting, inventory management, and layout design and planning. These developments established an infrastructure that promoted the segregation of planning and production tasks. Bushnell extrapolates to point out the complete alienation of top management from the manufacturing function and top management's measurement of the health of a company in purely financial terms.

From its place as leader in manufacturing in the 1950s, American industry has lost competitive advantage. The American manufacturing system, which emphasized mass production, long runs, division of labor, standard designs, transfer lines, inventory buffers, vertical authority, and hierarchical communication, seemed unable to handle the changes in product demand patterns. The customer became more demanding with regard to product design and quality. Responding to changes in demand quickly became essential for survival in some industries, as evidenced by the auto, steel, television, and machine tool markets of the late 1970s and early 1980s.

The author compares American manufac-

turing practice and its counterpart in Japan. The reforms in the two countries concerned the same four areas: worker participation, production and delivery scheduling, quality control, and computer controlled manufacturing, and they challenged the Tayloristic model of management of resources.

Companies are increasingly aware of the feasibility and desirability of an enterprise-wide coupling of manufacturing and marketing function. Bushnell points out that the Americans pursued reforms in each of these areas almost entirely independent of the other factors; the Japanese combined their reforms into a coherent management strategy.

According to Bushnell, the Japanese developed a systematic approach for simplified and collaborative design, quality, and synchrony. They coordinated all the functions of the business and pursued a progressive, rational, and a slow approach to implementation, which gave the organization time to absorb and improve on the process. In contrast, US firms employed comprehensive design standards imposed on all business units by top level management or technical committees who could not visualize the impact they would have on micro level activities. This has been the Achilles heel of American manufacturing and management.

The book, with its extensive bibliographical references, is an excellent resource for students and practitioners of management strategy. Its application is not limited to manufacturing; most of the insights presented are equally applicable to the service sector. Bushnell covers the evolution and experimentation with QWL, QC, TQC, TQM, Reliability Engineering, MRP, JIT,

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NC, CAD, CAM, and CNC that have dominated management strategy literature in the last decade.

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SCHLEIFER, ARTHUR JR., AND BELL, DAVID E. 1995, *Data Analysis, Regression, and Forecasting*, Course Technology, Inc., Cambridge, Massachusetts, 248 pp., paper \$19.95.

In the field of operations research training, there has always been a trade-off between theoretical and applied methods. Schleifer and Bell have written a book that is clearly intended to teach the application of a few basic problem-solving techniques to a variety of real-world problems. They explain in the introduction that they intend the students to apply the methodologies provided to observed data, with its limitations and errors, rather than to solve a collection of invented problems to practice generating numerical answers.

In six chapters they cover data analysis, sampling, time series, forecasting with regression analysis, causal inference, and multiplicative regression models. At the end of each chapter, except for that on sampling, are one or more case studies. These case studies typically consist of several pages of narrative text and often, large data sets. While students may find such large tables of data daunting initially, the experience should be good preparation for dealing with the volumes of data that are commonplace in business. Fortunately the text comes with a floppy disk that includes all the data (and some worked solutions) in

Excel v. 5.0 format. The spreadsheets are clearly formatted to make their use quick and easy. Students will be able to spend time analyzing the data instead of keying it in. The book includes a brief tutorial on using Excel for students that are not familiar with applying functions or producing graphs.

The book is definitely not meant for the traditional style of teaching data analysis and regression. The book contains no numbered equations. It does not include tables of statistics. Chapters do not end with long collections of problems. The authors introduce concepts and basic equations in the text, and give examples and case studies. From the beginning they challenge students to think about the meaning of their results, instead of asking them to solve equations and compare the numerical results to correct answers. The very first exercise in the book, for example, examines two switch-hitting baseball players; one player has a better batting average either right handed or left handed, yet the second player has a better total batting average. The question is who is the more valuable hitter.

The authors believe the book is suitable for both introductory and more advanced classes, as a stand-alone text or with a more traditional statistics text. It should be excellent for getting students to tackle problems that do not have neat, clear solutions. The style an instructor might employ in class using this book could be intimidating for students in an introductory class, but there is no better way than case studies to train new practitioners to face messy problems in the workplace. By the end of a semester using this book, students will be much better prepared to accept the responsibility of

analyzing business problems that never seem to fit any of the examples in a textbook. However, while the case studies could be challenging to more advanced students, the text would probably not be comprehensive enough for an advanced class; they would need a traditional text to explain advanced methodologies. The price for this paperback book is fairly low, which would permit the use of two books in the classroom.

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RAGSDALE, CLIFF T. 1995, *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Management Science*, Course Technology, Cambridge, Massachusetts, 718 pp., \$46.95.

This is one of many books, including those written by Plane [1996] and Savage [1994], that have been written to capitalize on the use of spreadsheets in solving OR/MS models. Savage's book requires Lotus 1-2-3 or Quattro PRO, while Plane's uses Excel and 1-2-3. In this book, Ragsdale introduces the most common MS/OR tools and their implementation using Microsoft Excel 5.0 for Windows. The book is targeted towards students in introductory OR/MS courses. The author assumes familiarity with Windows and basic spreadsheet concepts, with less emphasis on mathematical derivations. In reviewing the book, I applied five criteria: (1) coverage of OR/MS models, (2) use of examples and cases to motivate the reader, (3) end-of-chapter exercises, (4) supporting instructional material, and (5) overall value to its intended audience. I have used the book in an intro-

ductory OR applications undergraduate course, and I believe that Ragsdale has done well in meeting all five criteria.

As for the contents, Ragsdale covers most introductory OR/MS topics in 16 chapters. Chapter 1 starts with an overview of modeling using OR/MS methods. Deterministic OR models: linear programming (LP), sensitivity analysis, networks, integer programming, goal programming and multiple objective optimization, and nonlinear programming are presented in chapters 2 through 8. Unlike Savage's [1994] book, this book does not cover dynamic programming (DP). A spreadsheet approach would help minimize the difficulties students usually face when taught DP by traditional methods. The discussion of LP, in chapter 2, would also be improved had Ragsdale used an example that does not require integer decision variables. Chapters 9 to 11 cover the predictive models: regression analysis, discriminant analysis, and time series analysis. In all three chapters, Ragsdale uses the spreadsheet effectively to explain and to extend the basic concepts of these topics. To illustrate, the author applied spreadsheets in chapter 11 to determine the optimum weights in the weighted moving average method. In chapter 10, he presents a clear and simple introduction to discriminant analysis, making the book unique among OR/MS texts. Chapter 12 relies on only the inherent capabilities of Excel, whereas chapter 13 is based on the extra add-in @RISK to present simulation. Both chapters would be improved by an explanation of transient and steady state conditions and their impact on simulation results. In chapter 14, Ragsdale uses spreadsheet templates of the closed form

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equations in four common queuing models. The use of spreadsheets in project management, chapter 15, is cumbersome and infeasible for large projects. He might have referred students to a specialized project management software, such as MS Project. Finally, in chapter 16, he presents decision trees, utility functions, and the analytical hierarchy process (AHP). The user needs the add-in TreePlan to create and analyze decision trees.

The book contains lots of examples to illustrate both the concepts and the spreadsheet implementation of OR/MS tools. Under an end-of-chapter feature titled "The world of management science," the author summarizes articles about actual OR/MS applications. Ragsdale assembled a challenging set of end-of-chapter exercises, which enhances student learning. The book comes with an instructor's resource kit that includes problem and case solutions, transparency masters, a test bank, and a data disk containing all the spreadsheets used in the book. This data file is also available to students.

In a nutshell, Ragsdale successfully integrates the formulation of OR/MS models into their spreadsheet implementation using Excel. He capitalizes on the spreadsheet to explain and clarify basic OR concepts. The book is very well written and reasonably priced. In my own experience, it proved to be useful to its target audience. It is a welcome and unique addition to the set of textbooks available on introductory OR/MS topics.

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KALPAZIDOU, SOPHIA L. 1995, *Cycle Representations of Markov Processes*.
Springer-Verlag, New York, 165 pp., \$49.95.

This book (165 pages, not including a lengthy bibliography) introduces a new way of looking at Markov chains (discrete parameter) and processes (continuous parameters). It should be of interest to anyone working in the field at any level of involvement. It is essentially a research monograph based on the author's own research but incorporates most of the known work in the field.

The basis concept upon which the book is built is quite simple, but the results are far reaching. Consider a point moving through $p \geq 1$ points on a circle at moments one unit apart. Let $c = \{c(n), c(n+1), \dots, c(n+i)\}$ for $n = 0 \pm 2, \dots$ and call this a directed circuit of period $p(c) = p$. Assign normalized positive measures w_c to c . Upon this basis, the entire theory follows. It is shown that any irreducible Markov chain admits of two equivalent definitions: one the usual definition through the one step transition matrix P , the other through the circuit-measure properties.

The book is divided into two long sections. The first develops the background theory of new and ongoing research. The second ties this geometric interpretation with the better known algebraic interpretation to provide an instructive new way to look at an old friend.

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