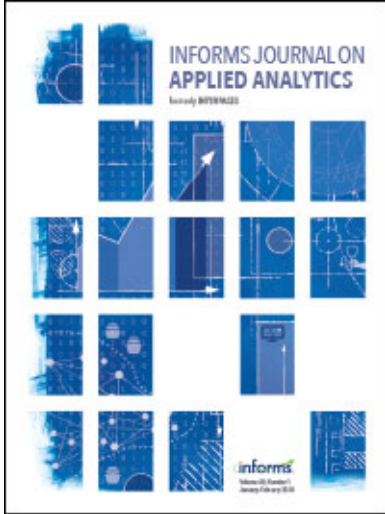




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Book Reviews

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Book Reviews

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$$\frac{1}{\beta} \Gamma^{\alpha} \times \approx * \div - \beta^{\mu} = \frac{1}{\rho} \backslash + \phi^{\sigma} ; x^{\mu} \omega^{\epsilon} : \& \mu ? \lambda \uparrow^{\epsilon} < \mu \Sigma \cap \zeta^{\pi} \wedge^{\rho}$$

$$\beta \Sigma \wedge \div \lambda \pi^{\epsilon})^{\sigma} \leq \lambda \approx + o \$ \Sigma \lambda \Gamma^{\alpha} L^{\epsilon} \vdash o \cap \omega^{\epsilon} - \phi \Delta^{\epsilon} x^{\mu} \beta^{\mu} \div \backslash ?^{\rho} \gtrsim$$

The range of books reviewed is wide, covering theory and applications in operations research, statistics, econometrics, mathematics, computers, and information systems. In addition, we include books in other fields that emphasize technical applications. 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 the Editor their names, addresses, and specific areas of expertise. The Editor commissions all reviews and does not accept unsolicited book reviews. Readers are encouraged to suggest books that might be reviewed or to ask publishers to send copies of such books to the Editor.

JAMES, D. J. G. AND McDONALD, J. J. (editors) 1981, *Case Studies in Mathematical Modelling*, Stanley Thornes, Ltd., Cheltenham, England, Halsted Press, New York, pp. 214, \$17.95.

This compact paperback contains 15 diverse case studies that explore different applications of mathematical modelling. It grew out of a workshop on the teaching of mathematical modelling organized jointly by the Mathematics Departments of Coventry (Lanchester) Polytechnic and Paisley College of Technology. Students using the book are assumed to be familiar with ordinary differential equations.

The book opens with a survey discussion of the *process* of modelling and the importance of models to the field of mathematics. References are made to the work of Copernicus, Galileo, Kepler, Newton, Einstein and others supporting the applied side of mathematics (shades of the continuing debate in the MS/OR field).

The next section of the book (Chapter 2 through 6) is devoted to physical models. For example, in Chapter 3, the birth and death process of deer is represented as a system dynamic model, complete with a DYNAMO program listing. Another

example is the "Modelling of Leaching of Nitrates in Fallow Soils"; a basic program listing is provided for this simulation model.

Part 3 (Chapters 8 through 12) of the book deals with problems of concern to engineers. Two cases are devoted to traffic problems: (1) Humber Tunnel Authority, and (2) Parking a Car. Mechanical engineering topics are discussed in two others: (1) Air Gap Coiling of Steel Strip, and (2) Speed-Wobble in Motorcycles.

The final five case studies are the only ones concerned with management science issues. The first, "The News-Vendor's Dilemma" is a classic problem in trading-off the costs of overage and underage while setting optimal inventory levels. The remaining four are straightforward applications of micro-economics and decision trees (with Bayes Theorem).

Although several journals such as *Interfaces* publish papers about implementations of management science and operations research, there are relatively few sources of case studies pertaining to mathematical modelling that can be used within an undergraduate curriculum. In fact, one of the main depositories, Harvard's Intercollegiate Case Clearinghouse (ICCH), has recently decided to exclude cases originating from faculty at schools other than Harvard Business School. Thus, the timing of this book's publication is perfect.

Unfortunately, the book is imperfect on several counts, especially when compared with *Quantitative Methods in Management* by Vatter, et al. No teaching notes are provided except for an occasional sentence suggesting relevant issues. The stu-

dent assignments are intermingled with notes to the teacher giving pedagogical hints. The authors naively ask the students to skip over these sections as well as the answers to student exercises which are also intermingled with the text. To be fair, the editors do not regard the book as a course in mathematical modelling. The topics covered are much too disjointed for any single class. Rather, these case studies are designed to fill a void for those teachers searching for modelling examples that are more comprehensive than textbook exercises but less detailed than those appearing in the ICCH.

Reference

Vatter, Paul A., et al. 1978, *Quantitative Methods in Management*, R. D. Irwin, Homewood, Illinois.

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LEV, BENJAMIN, AND WEISS, HOWARD J. 1982, *Introduction to Mathematical Programming: Quantitative Tools for Decision Making*, Elsevier North Holland, Inc., New York, 289 pp., \$27.50.

Introduction to Mathematical Programming, was written "in order to introduce general business students and managers to the concepts, models and methods of mathematical programming." The text indeed tries to convince the business student of the usefulness of mathematical programming techniques.

The techniques covered in the book are standard and comparable to those in Hillier and Lieberman's classic book, *Introduction to Operations Research* [1980] and Wagner's *Principles of Operations Research*

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[1975]. This book, however, covers only mathematical programming topics and does not include the stochastic techniques described in those books. Its emphasis is on minimizing the quantitative proficiency required of the readers. Proofs are generally not included, and techniques are illustrated with examples rather than presented as general algorithms with validity proofs. This approach may work against the reader; duality theory and sensitivity analysis (which seem fairly essential to me) are difficult to understand for people with no prior background in matrix theory and no quantitative skills beyond those required of the average reader of this book. For this reason, the book is not self-sufficient and some supplementary material may be needed for business students.

Linear programming and the simplex method are introduced using the graphical method. The art of modelling is illustrated with simple examples. Chapter 4, "Linear Programming — Advanced Topics," represents an abrupt change of pace in the otherwise relaxed style of the text. This chapter might prove to be a hurdle for the average student. An unusual feature of this chapter is that it introduces the dual-simplex method prior to defining the concept of duality.

Other chapters describe the transportation problem and the assignment problem in clear and lucid style, while proofs are generally omitted. A chapter on integer programming is again somewhat more difficult and includes some proofs. The chapter on dynamic programming illustrates the techniques with an example. The chapters on nonlinear programming

and on additional topics in mathematical programming describe major techniques and introduce the concepts of search and greedy type algorithms.

At the end of each chapter there is an extensive list of problems, many with solutions provided at the end of the book. These problems seem to match the spirit of the text and give the instructor a large selection to choose from.

Except for Chapter 4, the book does appear to deliver what is promised in the preface. It covers the important techniques of mathematical programming, and provides numerous illustrations, motivating examples, and problems. As such, it would do very well as a textbook for a business school mathematical programming course.

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Wagner, Harvey M. 1975, *Principles of Operations Research*, Prentice-Hall, Englewood Cliffs, New Jersey.

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BOWEN, EARL K. AND STARR, MARTIN K. 1982, *Basic Statistics for Business and Economics*, McGraw-Hill, New York, pp. xviii + 730, \$24.50.

This is an introductory text intended for a beginning statistics course for undergraduate business and economics students. The book covers the usual topics of descriptive statistics, probability, confidence intervals, hypothesis tests, and the techniques of regression analysis, chi-

square tests, analysis of variance, and nonparametric procedures. There are also chapters on decision analysis, index numbers, and time series analysis.

The authors do an adequate job of explaining the techniques and methodology. Following each topic is a thorough example and a "fix-it-in-mind" exercise for which the answer is provided. Each chapter is also well supplied with problems.

However, the text does not demonstrate an intuitive feeling for statistical inference. The reasoning behind the techniques is not explained adequately, and the examples are basically step-by-step methodological exercises.

Although it thoroughly covers statistical methods, this text is dated because it does not include the more recent techniques of data analysis. The chapter on data analysis is devoid of any of the techniques of exploratory data analysis. The only mention of the use of the computer is a brief description of the different tables outputted by some regression and ANOVA packages.

In summary, this text has little to distinguish it from numerous other texts written for the same audience.

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MARTIN, JAMES 1982, *Application Development Without Programmers*, Prentice-Hall, Englewood Cliffs, New Jersey, \$32.50.

The reaction to Martin's *Application Development Without Programmers* will probably be similar to the reaction to the programming language APL: some readers

will find his ideas quite exciting and innovative, others will put up strong counter-arguments as to why such concepts should never be entertained — very few persons involved with computer-based information systems will remain indifferent. The reason I would expect strong reactions is that the author addresses one of the major problems facing many organizations today, the inability of their data processing departments to keep up with the ever-increasing demands for new software.

The software crisis in which many data processing departments find themselves is apparent in the backlog of application systems awaiting development. Martin cites cases in which this backlog may be up to seven years. The backlog is attributable to a combination of factors; among them the proliferation of computers, the high percentage of the data processing department's effort which must be devoted to maintaining existing systems, and the inability of programmers and analysts to match increasing user demands with increased productivity. Although the "structured revolution" (with its structured analysis, structured design, and structured programming techniques) has indeed improved productivity, the software life-cycle approach still takes an inordinate amount of time to produce a software system. This apparent lack of responsiveness has caused many users to explore ways of by-passing the data processing department, including purchasing their own computers.

What Martin proposes is an alternative approach to application software development. He cites numerous examples

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of information systems created by users, often without any assistance or guidance from the data processing department. These users are equipped with a new set of software development tools, most of which have become available only in recent years. Using such tools, developers can produce application systems quickly, sometimes achieving remarkable increases in productivity when compared to similar development efforts in COBOL and PL/I. Once a prototype of the system has been created, users can experiment with it. Such an approach eliminates the need for voluminous specifications — the user can experience the system, see if it contains information that is really needed, and modify the prototype as necessary.

Two categories of users may create applications software: programming and nonprogramming. Martin describes several languages that have been effectively used to create applications systems by programming end-users, including APL and NOMAD. Unlike procedural languages such as FORTRAN and COBOL which require the user to understand the computer, these languages force the computer to understand the user.

Nonprogramming end-users now have a wide variety of development tools available, ranging from data-base languages to report generators to application generators. Before a software product can be classified as suitable for nonprogramming end-user development, it must pass the following two-day test: users must be able to learn to use it effectively and be comfortable with it in two days of instruction.

A wide variety of software tools for de-

veloping application systems has appeared in recent years: Martin lists some 88 software products currently on the market. These products, which are designed to be used by end-users or systems analysts, can be grouped into seven categories: simple-query facilities, complex-query facilities, report generators, graphics languages, very high-level programming languages, and parameterized application packages. Martin introduces the primary features of many of these languages. For instance, he provides a detailed discussion of Query-By-Example as an end-user data-base language. Using a well-illustrated step-by-step approach, he develops a series of relatively complex queries into a data-base. He then shows how QBE can be used to update, insert, and delete entries in the data-base tables. Each of these dialogues can be constructed in a matter of minutes by a user with little training; a COBOL program to perform equivalent functions would have required several hundred lines of code.

Probably, much of the resistance to end-user application development will come from data processing departments, who see such efforts as threats to their existence. Martin addresses this problem extensively. He proposes the concept of an information center, a group within the data processing department, whose primary objective is to speed up the creation of applications that end-users require. End-users are encouraged and supported in developing their own applications. Systems analysts and programmers serve as consultants and technicians. Such an information center may use several different

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application development tools, depending on the needs of the organization.

Although many persons in the data processing field will find its contents highly controversial, this book is recommended reading for user-managers frustrated with long software development cycles, data processing managers agonizing over maintenance and requested application system backlogs, the builders of decision support systems wondering how to do "rapid prototyping," and programmers and analysts seeking ways to greatly improve their productivity and service to the user community.

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SCHWARZ, LeROY B. 1981, *Multi-Level Production/Inventory Control Systems: Theory and Practice*, TIMS Studies in the Management Sciences, Volume 16, Elsevier North-Holland, New York, 398 pp., \$48.75.

This book is a collection of 16 papers representing some of the state-of-the-art in the theory and practice of managing multi-level production and inventory systems. The topics range from a literature survey on repairable inventory items in multi-level systems to the use of convex analysis in analyzing multi-level systems.

The papers confirm that inventory problems in multi-level production-inventory systems are challenging. Few results are generalizable to all situations. To achieve useful and practical results, nearly every application is treated as unique leading to a proliferation of models. Much of the work involves approximations and heuristics.

Several of the papers deal with applications in the US Air Force where a significant amount of research on multi-level inventory systems has taken place. Other specific applications include work for Eastman Kodak (forecasting and heuristics for computing how much safety stock to hold in a one distribution center, one warehouse situation) and General Motors (a machine loading problem).

The first two papers cover a number of issues in the design of multi-level systems. The next two papers deal with a review and extension of lot sizing in serial and assembly type systems. Two papers are included which deal with the coordination of production and shipping schedules in a requirements planning system.

The next five papers present the highlights of work on the demand process at the warehouse in a warehouse-retailer system operating with periodic and continuous review policies. The work examines and tests approximations, and studies the effect of incorrect assumptions and non-stationarity of the process.

Next is a comprehensive survey on repairable inventory control theory followed by two papers on applications in the Air Force. A paper on the use of convex analysis is next. Finally, an introduction to the problem of multi-level control of perishable goods is given with some limited results.

As advertised the book is a "collection" of papers from different authors who include many of the familiar names in multi-level inventory modeling. The editor has done a good job ordering the papers. They are well-written. Most of them are oriented toward applications

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and offer help to the management science practitioner. The book would also be valuable to researchers and other professionals who work in this difficult area.

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Roving Reporter: In an editorial in *Science*, January 7, 1983 [Vol. 219, No. 4580] Philip H. Abelson commented on the competition for leadership in computer technology:

"At a recent conference on computers in science about 40 leading experts presented lectures on developments in microelectronics and computers in their applications to various scientific fields. The speakers were optimistic that exponential increases in the power and usefulness of computers would continue for another decade . . . Superb graphics are in being and will be applied widely in such fields as biology, medicine, chemistry, and engineering. Artificial intelligence and particularly expert systems have entered an extremely useful phase . . . The Japanese have come a long way in microelectronics and computers during the past 10 years. Their success in capturing leadership in the world market for random access memories (RAM's) is impressive. In 1970

they were no factor. By 1974 they had obtained a 5 percent share of the market for 4k RAM's. In 1978 they shocked Silicon Valley by capturing 45 percent of the sales of 16k RAM's. For a time in 1982 they obtained as much as 70 percent of the world market for 64k RAM's. The Japanese claim to have computers that are faster than American models, including the Cray 1 and Cyber 205. However, the claim has not been verified . . .

Microelectronics and computers are dynamic sectors of the economy and will probably continue to be for another decade or more . . . One area in which the Japanese seem particularly eager to excel is artificial intelligence. In this field the computer deals in symbols rather than numbers. Professor Edward Feigenbaum of Stanford believes that we are at the beginning of a second computer revolution and that ultimately applications of artificial intelligence will become more important than number-crunching."