



Interfaces

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

Book Reviews

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To cite this article:

Benjamin Lev, (1992) Book Reviews. Interfaces 22(2):112-122. <https://doi.org/10.1287/inte.22.2.112>

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Book Reviews

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$$\beta \sum \wedge \alpha \approx * \div \neg \beta \subset \mu = \iota \rho \setminus + \sigma \cdot x \mu \omega \epsilon \cdot \& \mu ? \lambda \uparrow \epsilon < \mu \cap \zeta \pi \rho$$

The range of books reviewed is wide, covering theory and applications in operations research, statistics, econometrics, mathematics, computers, and information systems (no software is reviewed). In addition, we include books in other fields that emphasize technical applications. Publishers who wish to have their books and proceedings reviewed should send them to Professor Benjamin Lev, School of Management, The University of Michigan-Dearborn, 4901 Evergreen Road, Dearborn, Michigan 48128-1491. We list the books and proceedings received; not all books received can be reviewed because space and time are limited. Those who would like to review books are urged to send me their names, addresses, and specific areas of expertise. We commission all reviews and do not accept unsolicited book reviews. Readers are encouraged to suggest books that might be reviewed or to ask publishers to send me copies of such books.

CONWAY, RICHARD; MAXWELL, WILLIAM L; MCCLAIN, JOHN, O.; AND WORONA, STEVEN L. 1990, *User's Guide to XCELL+ Factory Modeling System Release 4.0*, The Scientific Press, San Francisco, California, 186 pp. \$47.50.

XCELL is a graphics-based manufacturing simulator developed by Richard Conway, William Maxwell, and their colleagues at Cornell. At least two of the authors are pioneers in manufacturing scheduling and control, and it is small wonder

that they perceived the usefulness of such a tool. They are to be commended for attempting to develop it. XCELL relies on graphics in developing simulation models of manufacturing systems. The reasoning is that a graphical interface simplifies the construction and, therefore, enhances the use of simulation models.

I found it difficult to review the user's guide for XCELL+ because I found myself reviewing the software rather than the user's guide itself. One aspect of the soft-

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0091-2102/92/2202/0112\$01 25

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ware also relates to the user's guide. Although XCELL is easy to use through the keyboard, I find working with a mouse and pull-down menus to be more efficient. The authors do state that a Microsoft mouse may be used in a limited way. However, the user's guide contains only one paragraph about this, and it fails to mention how the program could be set up for systems with other mouse types. I was unable to use the system with an IBM mouse attached to my IBM model 55SX computer.

The user's guide is typical of most software user's guides. It explains the structure of the software and then goes on to explain the mechanics of constructing simulation models using the software. Herein lies its main weakness. I found the explanations a little too wordy, relying on terms that frequently sent me to other portions of the manual for explanations. I would prefer more illustrations and fewer words. Also, the computer screen illustrations of models are not clear. The authors claim that they used the white on black illustrations to reduce the cost. However, I think black illustrations on a white background would have enhanced clarity. Also, the quality of the paper that the text is printed on could be improved.

I prefer to go through a user's guide using the paradigm of learning by doing. It would have been much easier and more interesting for the reader if the authors had started with a simple example, such as the three-resource example on page 13, and led the user through the capabilities of the simulator by adding embellishments to the model.

The advantages of a simulation tool de-

veloped on the lines of XCELL are enormous. The ability to develop quick rough-cut models greatly enhances the use and value of simulation. With these simulation models, users in both industry and academe can achieve insights leading to innovative solutions to manufacturing problems and to theoretical evaluations of manufacturing systems.

The last chapter in the user's guide addresses simulation. Titled, "The conduct of a simulation study," it should be very interesting reading to both simulationists and nonsimulationists considering the use of simulation. Even though I do not agree with all of the statements in the chapter, the chapter is very pragmatic, and the authors must be commended for having the courage to comment on the practice of simulation as they see it. XCELL is a useful tool, and I would recommend it and this user's guide for any simulation modeler's library.

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THOMAS, JOSEPH L.; MCCLAIN, JOHN O.; AND EDWARDS, DAVID B. 1989, *Teaching Notes Cases in Operations Management Using the XCELL Factory Modeling System*, The Scientific Press, Redwood City, California, 103 pp., \$15.00.

These teaching notes contain sample runs and discussions of cases presented in the book by the same authors titled, *Cases in Operations Management Using the XCELL Factory Modeling System*. These notes would be useful to any instructor using the book. They provide instructors with sam-

ple solutions and possible discussion areas. They also alert them to problems students might encounter in modeling and interpreting the simulation and provide guidance on what preliminary calculations one should make before constructing the simulation model. They also suggest procedures that may be used to overcome constraints in the student version of XCELL. For example, in the first case discussed, the XCELL model transactions are based on pallet loads rather than individual units. The cases present the student with a variety of problems that can be partially addressed using simulation. With the help of the teaching notes, instructors can prepare discussions that show the difficulties, benefits, and limitations of simulation.

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THOMAS, L. JOSEPH; MCCLAIN, JOHN, O.; AND EDWARDS, DAVID B. 1989, *Cases in Operations Management Using the XCELL Factory Modeling System*, The Scientific Press, Redwood City, California, 143 pp., \$22.50.

This book consists of problem sets and cases that use the XCELL simulator. The student can use the problem-set assignments to learn the basic features of XCELL. In fact, problem set 1, which includes instructions for getting started with XCELL, and its solution are borrowed from the XCELL+ user's manual [Conway, et al. 1990]. Section 6, "An introduction to the XCELL modeling system" is also taken from the user's guide. Solutions to the problem sets are provided in section 5.

This facilitates the learning process. I think this is a good idea. The authors essentially kill two birds with one stone. They impart to the reader basic insights in operations management, and they introduce the reader to the simulator, XCELL. They provide directions on analyzing operations management problems using simulation. They also make useful suggestions, for example, one section discusses the use of buffers to alleviate imbalance and keep bottleneck operations from being blocked or starved.

The authors state that the book can be used in a course dealing with the analysis of production operations or the use of simulation in manufacturing. I think that it would be well suited for a capstone course dealing with the design and analysis of manufacturing systems. The seven cases compiled by the authors would be useful in providing students with insight into the analyses of manufacturing systems using simulation. The cases deal with common problems encountered in manufacturing, such as assembly line balancing, maintenance scheduling, capacity requirements, quality control, and work in process. The authors indicate the approximate time each case requires useful information for both student and instructor.

I would recommend the use of this text in a capstone design course for students who have had a basic course in operations management. I am sure the authors are also working on an updated edition that covers the enhancements in XCELL+ version 4.0.

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Conway, Richard; Maxwell, William L.; McClain, John O.; and Worona, Steven L.

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1990, *Users Guide to XCELL+ Factory Modeling System Release 4.0*, The Scientific Press, San Francisco, California.

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HOROVITZ, JACQUES 1990, *Winning Ways: Achieving Zero-Defect Service*, Productivity Press, Cambridge, Massachusetts, 177 pp., \$24.95.

In this book, Horovitz addresses the maintenance of quality service and how to launch a quality-service program. He covers many important issues, emphasizing understanding the nature of service quality, measuring the service quality, hunting for errors, and achieving zero-defect service. This is a well-organized and well-written book. The author does a good job in motivating readers with many practical examples and linking diverse subjects together.

After an introductory chapter that includes the definitions of quality and service, chapter 2 emphasizes the importance of service quality in the competitive service industry, and chapter 3 describes the unique nature of service quality.

In chapter 4, Horovitz discusses how a company can design a service strategy by combining existing know-how with market expectations. He describes the central role of communication in the success of a service strategy in chapter 5. Chapter 6 deals with developing operational service quality standards and training personnel to use the standards.

Chapter 7, titled "The hunt for errors, the quest for zero defect," defines the con-

cept of zero-defect service and explains the error chase procedure. Chapters 8 and 9 are concerned with measuring customer satisfaction, and they provide a list of the happy moments and the sad moments of several companies in connection with their service and customer responses. The book closes in chapter 10 by explaining how to design and implement a service-quality program. Each chapter ends with a number of simple, but seemingly useful, short self-diagnosis questions.

This book was initially written for the French audience and was translated into English in this version. Although many examples are based on French companies, this does not distract from the overall presentation. Many examples are rooted in the United States, Japan, and other countries. Throughout the book, the author's experience in the service environment is apparent. Although the discussion of some subjects (for example, the connection between quality service and culture) seems incomplete, Horovitz did an admirable job of "maintaining good service" to readers on various subjects.

This book provides a concise and systematic presentation of the subject material that should be useful to practitioners and managers in service industries. It is not written as a course textbook, but I believe it is good collateral material for students in business and some engineering courses. Overall, I believe that it will find many interested readers.

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EVANS, JAMES R. 1991, *Creative Thinking in the Decision and Management Sciences*, Southwestern Publishing, Cincinnati, Ohio, 167 pp., \$12.50.

In this book, Evans surveys the research on creativity and on practical approaches to enhancing creativity in individuals and organizations. What makes this book relevant for us is that it has the special dimension of applying creativity to MS/OR activities. We pride ourselves on being a problem-solving discipline, and problem solving is a creative act.

Evans has filled an important need with this book. We have been too ad hoc in our approach to practicing management science. We have emphasized mathematical techniques over the psychological and sociological aspects of our field. Individual creativity and a creative environment are necessary conditions for management science to enhance productivity and to open new opportunities for us and our organizations.

Chapter 1 defines creativity and makes the important point that it can be learned. Chapter 2 explores problem solving, giving an overview of ways of analyzing problems and implementing solutions. Chapter 3 looks at the cognitive processes involved in being creative and describes the barriers to creativity in individuals and organizations. Chapter 4 shows us ways of enhancing our creative abilities. Chapter 5 presents problem-solving methodologies, surveying the different approaches. Chapter 6 relates the problem-solving methodologies from chapter 5 to MS/OR modeling activities. Chapter 7 discusses creativity in academic research.

Creativity is a large and seemingly

amorphous subject. Much of the research has the quality of the joke about the blind men describing the elephant in that each researcher tends to focus on some specific aspect of creativity. Yet each research contribution adds another piece to the puzzle. The author has done a good job of introducing the reader to various ideas and placing them in a coherent framework. Nevertheless, this book should not be dismissed as a theoretical exercise since it is replete with useful advice and illuminating examples.

The last chapter on creativity in research is a gem that should be read by every professor. We all know that too much research is an exercise in wasted motion. I have never read such a clear articulation of what is and is not useful research.

This book is fun and challenging to read. There is a vintage Gene Woolsey forward that cannot be summarized. The author has filled the book with examples and exercises that make the reader stop and think, which is the point of the book.

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QUARTERMAN, JOHN S. 1990, *The Matrix: Computer Networks and Conferencing Systems Worldwide*, Digital Press, Bedford, Massachusetts, 723 pp., \$49.95.

This could be you. Your colleagues have been bothering you for your e-mail address. You aren't even sure if you have one, but you decide it's time to begin learning about this BITNET stuff. You start using the network to communicate with a few people, sending short, tentative notes. You forward paper copies just in case. It's

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difficult: your hard-crafted messages get fired back at you by someone called mailer demon. You practice, the demons go away, and you start asking colleagues for their e-mail addresses. You print yours on your business card. The turnaround time for your committee work shrinks from weeks to hours. You learn that you can TELNET to a network information center or university library to access information about a wide variety of resources. The same protocol can connect you interactively to a supercomputing center thousands of miles away. You find out that you can anonymously FTP documents, data, programs, and graphics files from hundreds of network sites worldwide. You join bulletin boards and subscribe to online digests and discussion lists. Using the net to cross borders—organizational and international—becomes a daily part of your life. You're superconnected.

With a sophisticated mail program, the Internet and BITNET can be as easy to navigate as the interstate; you can get on in California and drive to New York without using a roadmap. But if the slightest thing goes awry, you can suddenly be in unfriendly, impassable territory. And, besides, you miss an awful lot of interesting happenings on the backroads if you just stick to the high-speed, wide-band routes.

John Quarterman's *The Matrix: Computer Networks and Conferencing Systems Worldwide* is the closest thing we have to a road atlas for the net. A substantial outgrowth of a *Communications of the ACM* article [Quarterman and Hoskins 1986], *The Matrix* gives a broad overview of the services available electronically, an introduction to how they work, and a detailed catalog of

operative networks around the world. Included are hundreds of references to sources as divergent as think-tank technical reports and popular science fiction, and a thorough yet easy-to-use 60-page index.

The book divides cleanly into two parts: chapters 1-8 and chapters 9-21. Chapter 1 is short and merely outlines Part 1. Chapter 2 provides a taxonomy of services available on the net: computer-mediated communication (batch and interactive; one-to-one, one-to-many, many-to-many) and resource sharing (including remote log-in, file transfer, remote procedure calls, distributed file system, window management, videotex, and others). This taxonomy forms the framework for discussion of specific networks in Part 2.

Chapter 3 is required reading for net users. Quarterman first talks about the growth of special interest groups on the net, highlighting communities banded together by research, computer hardware and software, political, and social interests. He then points to studies on the quality of decisions arrived at through computer conferencing, the effects of information overload, and the notion of telecommuting. Sections are devoted to etiquette and ethics, security and privacy, ongoing legal questions (Should the net be regulated as a common carrier, broadcaster, or enhanced service provider?), and questions of boundaries (real or imagined) and access.

The remainder of Part 1 is devoted to chapters on layers and protocols (TCP/IP, SMTP, Kermit, Xmodem, and many other suites), management protocols, network administration, history and future, and standards bodies. In all cases, the discussion is broad and democratic, giving equal

time to grass roots as well as international efforts. Readers desiring more will find technical details in the copious references. Throughout, the author's experience and dry sense of humor make for an informative and pleasant read.

Part 2 details *The Matrix* (what I've been calling the net; *The Matrix* comes from the writings of William Gibson [1984]). A chapter each is devoted to worldwide networks (HEPnet, PHYSNET, BITNET, USENET, UUCP, FidoNet, XEROX, and HP Internet) and the handful of major gateway computers in Amsterdam, Berkeley, Cambridge, Geneva, Melbourne, Rutgers, Seoul, and Tokyo; The Internet (CSNET, NSFNET, DDN, and regional nets); North America (including Big Sky Telegraph, PeaceNet, and EcoNet); Europe; Australasia; Far East; Southeast Asia; South Asia; Latin America; Middle East; Africa; and commercial systems (from large commercial systems like BIX, CompuServe, and Dialog to small commercial systems like the WELL and Portal Communications). Each chapter discusses services offered and provides a point of contact for access and information.

If each of chapters 10-21 is a brick, then chapter 9 is the mortar, discussing electronic address formats and interconnection of networks and systems, news groups, and mailing lists.

There are two appendices: one for public data networks worldwide, including the US services Telenet and TYMNET, and one for legal issues arising from computer mediated communication. This latter is also must reading for net users, especially the section on privacy, fundamental rights, and transborder data flows. This area con-

tinues to be a subject of feverish discussion. Quarterman's bias is clear from the title page where he quotes Benjamin Nathan Cardozo in *Palko versus Connecticut*: "Freedom of expression is the matrix, the indispensable condition of nearly every other form of freedom."

You probably already know if you need a personal copy of *The Matrix*; mine is already dog-eared. If you don't need one, your institution's library and computer center do. A lot of previously impenetrable questions can be answered or directed by this book. It would make a nice complementary text in courses on network design, and I may start requiring it for the course we have at NPS on human-system interaction and Defense Data Network use.

The net changes virtually every day; *The Matrix* cannot [there is, for example, no entry for Prodigy, The Sears/IBM conferencing system now notorious for censoring user postings and for (maybe) collecting information about hard disk organization]. There is talk of putting a dynamic version of the book on the net, and, as an alternative remedy, Quarterman's Matrix Information and Directory Services now publishes a newsletter called *Matrix News*. For more information about these projects send e-mail to mids@tic.com (or snail-mail to MIDS, 701 Brazos, Suite 500, Austin, TX 78701-3243, USA).

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ROSS, SHELDON M. 1990, *A Course in Simulation*, Macmillan Publishing Company, New York, 202 pp., \$35.00.

Simulation methodology embraces modeling, computer science, probability, and statistics, but simulation at work is much more. This book offers some intriguing methods, examples, and problems but still slights some vital areas of simulation practice.

This book provides four chapters reviewing probability and explaining random variates and pseudorandom number generation. After those preliminaries, one brief chapter of ten pages presents the discrete-event simulation approach. Three additional chapters address statistical output analysis, variance reduction, and goodness-of-fit methods. The final chapter is a potpourri of special methods, including the alias method for discrete variates, two-dimensional Poisson variates, Markov chain simulation, and random hazards for expected first passage times. The appendix provides BASIC listings for Poisson, unit normal, and chi-square distributions, as well as for several test statistics.

Throughout the book, Ross focuses consistently on the mathematical details of his topics, illustrating them with various theorems and corollaries. This approach would be comfortable to a mathematics student, or to a mathematically oriented computer science student.

The chapter on variance reduction is especially lucid and reasonably complete. Ross includes antithetic variables, control

variates, conditioning, stratified sampling, importance sampling, and common random numbers. Examples demonstrate each method. However, he neglects limitations of variance reduction methods, such as synchronization of random numbers from one run to another [Law and Kelton 1991].

The author's objective for this book is to show how to analyze a model by use of a simulation study. Regrettably, he does not address pseudorandom number generator tests, simulation languages (for example, SIMAN, GPSS, SLAM), model formulation, model validation, and the process of a simulation study—all central aspects of simulation at work.

Ross states, “. . . we do not explore the interesting theoretical questions . . . relating to the construction of ‘good’ pseudorandom number generators. Rather, we assume that we have a ‘black box’ that gives a random number on request.” Such an assumption can be quite wrong; generators with short-periods, statistically poor subdomains, and unacceptable n -dimensional dependence surely still lie undetected in some government and industry labs. Even with commercial simulation languages, generator testing may be advisable for very large models.

Though they are certainly computationally more attractive, discrete-event models are not necessarily straightforward to formulate correctly. From the practical student's perspective, this book would be improved by a section on event graphing.

If augmented generously by handouts on simulation study methods and languages, this book could be suitable for an undergraduate seminar course, possibly in a mathematics department. Its price and

size are certainly attractive, but for a graduate simulation course, I would prefer Law and Kelton's new edition of *Simulation Modeling and Analysis* or Bratley, Fox and Schrage's *A Guide to Simulation* for their more rigorous breadth and depth.

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WOLSTENHOLME, ERIC F. 1990, *System Enquiry: A System Dynamics Approach*, John Wiley and Sons, New York, 238 + xvi pp., \$39.95.

The techniques of SD (System Dynamics) as developed by the MIT group under Professor Jay Forrester in the '50s fall only generally under "management science" in the broader sense (and definitely not under operations research). In fact, I checked the three most recent OR/MS publications indices, and in none of these did I find SD as a category or subcategory. Although my background is primarily applied probability and optimization in engineering, I was asked to review *System Enquiry* anyway, and hence the viewpoint of my review will be that of an MS/OR academic with very limited prior exposure to SD.

Wolstenholme recognizes in the preface that system modelers have an image of SD as a "soft system type of tool," but he claims that it can also be perceived as a

"hard" one. However, he continues to say that the "hard" aspect is based on converting (complex system analysis) diagrams into formal simulation models. I have a limited background in simulation but believe that it is primarily a last-resort, almost brute-force approach rather than a hard systems modeling tool like our familiar MS/OR mathematical models and algorithms. However, simulation can be an indispensable tool for checking one's mathematical models, especially when experimental data are hard to get.

The author states that a second aim in writing this book is "to attempt to improve (in chapter 3) the communication of the model conceptualization process," and a third is "to try to explain some of the many insights possible from employing the SD method."

The book has a forward by Forrester, who claims that despite the more than 30 books that have appeared on the theory and applications of SD, "SD is still in the early stages of development," and that teaching materials "still fall short of the need." He also makes a point of the "long overdue" setting of SD "in a broader framework that includes OR and the descriptive treatment of social and economic systems." Wolstenholme attempts to do this, especially in chapters 9 and 10. Chapter 9 is titled "The basic concepts of system dynamics optimization" and presents the concepts, and chapter 10 is an application on a case study described in chapter 8.

The book starts with an overview of SD, trying to define and outline the (qualitative and quantitative) SD method. The title of the book *System Enquiry* is a term synonymous with the term *large-scale systems*

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analysis, with which I am more familiar.

The definition of SD given in chapter 1 is extremely broad: "SD means exactly what its name implies. It is concerned with creating models or representations of real-world systems of all kinds and studying their dynamics." However, this is accomplished by "providing a set of easily usable tools, which might be used by system owners rather than just analysts." A more formal definition of SD is also given: "A rigorous method for qualitative description, exploration and analysis of complex systems in terms of their processes, information, organizational boundaries and strategies, which facilitates quantitative simulation modeling and analysis for the design of system structure and control." Hence, the reader may develop the impression that the difference between SD and ordinary OR modeling is in the approximate, easy-to-use methods that become necessary because of the extreme size and complexity of the system model.

Chapter 2 introduces SD diagrams and their components, and chapter 3 discusses SD model creation, both taking a qualitative point of view. Quantitative SD is discussed in chapters 4 (overview) and 5 (equation formulation, model development, and policy analysis).

Chapters 6, 7, 8, and 10 present interesting case studies, ranging from the long-term evolution of a company with attention paid to the effects of inflation and technological change, to a coal transportation system, to a case in defense analysis. Of these three, the first seems much more appropriate for SD application, while the second can be handled almost exclusively with traditional OR tools (and probably

with a "more optimal" or exactly optimal solution, or the same solution in much less time). The SD model in this case could be useful to the OR analyst primarily in the early stages of formulating the problem (and in reproducing the solution of the math programming model using simulation, if necessary). Finally, simple versions of the third case study are worth solving optimally and much more elegantly via discrete or differential game theory.

To me, the most interesting chapter in the book is chapter 9 ("Basic concepts of SD optimization"), which provides very general optimization frameworks to be used in conjunction (or as part of) a SD model. The extreme generality of these models may make them look misleadingly simple and may fail to warn the user (especially one with a SD but not an OR background) of the considerable care that must be exercised in selecting, formulating and implementing a specific optimization model or algorithm. (Unless, of course, the author always implies simulation as the solution approach to the optimization model.)

In summary, this is a well-written and presented book. The audience could consist of SD professionals, and it is written from their viewpoint. For this last reason, OR professionals may find it difficult to incorporate SD methods in their work. The book does provide a good overview of SD for the uninitiated, especially for those who rely on a large number of examples and case studies to understand the underlying concepts.

This book is not intended as a text, but it is written in almost a textbook style, and the simplicity of its presentations should

make it appropriate for either undergraduate or graduate courses in SD and even for self-study for anybody with a background in basic algebra.

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