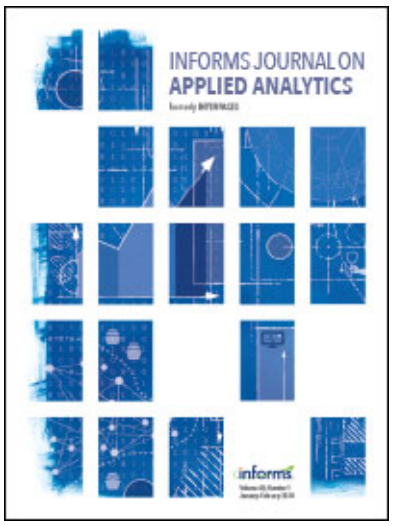

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Book Reviews

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Book Reviews

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In *Book Reviews*, we review an extensive and diverse range of books. They cover theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems. In addition, we include books in other fields that emphasize technical applications. However, we do not review software. To submit a book for review, please send it to me at the above address. Although we cannot review all books because of space limitations, we do list all books that we receive. We commission all book reviews and do not accept unsolicited reviews. To become a reviewer, please send me your name, address, and specific areas of expertise. We encourage readers to suggest books for review or to ask publishers to send copies of such books.

The authors or editors of books we review in this issue are U. Narayan Bhat, Dilip Chhajed, Timothy J. Lowe, and Richard Schonberger.

BHAT, U. NARAYAN. 2008. *An Introduction to Queuing Theory: Modeling and Analysis in Applications*. Birkhauser, Cambridge, MA. 268 pp. $59.95.

There are two routes to gaining an understanding of introductory-level queuing theory. The first—and typically less detailed—route is to take a course in the theory of stochastic process at either the advanced undergraduate or beginning graduate level. Such courses almost invariably devote some time to queuing theory; the single chapter on queuing theory in books such as Taylor and Karlin's *An Introduction to Stochastic Modeling* (1998) and Ross's *Introduction to Probability Models* (2007) is adequate for a beginning course. The second—and generally more detailed—route is to take a course in queuing theory. The book under review is designed to meet the needs of students who wish to take this second path.

Bhat's book has 12 chapters and three appendices. Interestingly, the first chapter does not immediately begin to discuss elementary queuing models. Instead, it provides a general and historical account of the types of problems that queuing theory has addressed, the state of queuing theory in contemporary times, and the ways in which computers have obsoleted the graphs and tables that were prepared using analytical results of effectiveness measures. This approach should assist students in understanding both the subject and the range of problems that queuing theory could be used to analyze effectively.

The author next discusses "system element models" and basic concepts in the theory of stochastic processes. We learn about the deterministic and exponential distributions and about the identification of queuing models. As the author correctly points out, the key steps in this identification process include collecting data, conducting tests for stationarity in time, conducting tests for independence, and selecting distributions and (or) estimation procedures. This discussion concludes with a fairly standard account of discrete-time and continuous-time Markov processes.

The author's discussion of Markovian queuing models—in many ways the bread-and-butter material of an introductory course in queuing theory—is competent and thorough. We learn about the M/M/1, the M/M/s (s servers), the M/M/∞ models, and standard extensions of these models to account for finite capacities, balking, and reneging. When either the arrival process of a queuing model is not Poisson or the service process is not exponential, the "memoryless property" does not hold and standard techniques cannot be used to analyze such models. The author shows that, even in these situations, one can construct an "imbedded Markov chain" by focusing on the departure epochs in the M/G/1 queuing model and on the arrival epochs in the G/M/1 queuing model. In addition, he also correctly stresses that the limiting distributions of the number of customers in the system at the arrival epochs, the departure epochs, and

at arbitrary points in time are only the same when the arrivals occur in accordance with a Poisson process.

How does one analyze queuing networks in which customers demand service from more than one server and all customers might not require service from the same set of servers? The author addresses this question in his discussion of open and closed queuing networks. He notes at the very outset of this discussion that when the arrival rate into and the departure rate out of a network are either identical or approximately identical, this network "can be modeled as a closed network without sacrificing too much accuracy" (p. 142). The author then proceeds to analyze queues with blocking. He clearly points out that when studying such queues, any specification of the state space "must include information on the number of customers in all the stations" (p. 148). Clearly, this substantially complicates the underlying analysis. For example, for a queue in series with blocking, even a seemingly inconsequential alteration of the blocking rule will change the transition diagram for this model and the state balance equations; these two changes will require a reworking of the ultimate solution as far as the determination of a certain set of probabilities is concerned.

To use the various queuing models that the author discusses, one must "estimate model parameters and make sure that [one has] the right model" (p. 185). Therefore, he discusses alternative methods that can be used to estimate the parameters of a queuing model, particularly when standard data collection procedures are not possible. He notes that although there are two estimation procedures that are widely used in queuing contexts—the method of moments and the maximum likelihood method—the preferred estimation procedure is the method of maximum likelihood. He concludes this discussion of estimation by noting that because the objective in queuing theory is to set up an apposite stochastic model to aid in decision making, "the use of hypothesis testing is limited" (p. 197).

Let me conclude this review with the following seven observations. First, the author occasionally uses terms without first defining them (see examples on p. 33 and p. 77). Second, when he discusses the solution to Equation (7.3.2) (p. 146), he does not adequately explain why this solution has "the uniqueness property." Third, the discussion of renewal process models and semi-Markov processes is too brief. Fourth, one of the references provided for readers who wish to learn more about semi-Markov processes is not particularly helpful because the author of this reference "does not explicitly use a semi-Markov model in his investigations" (p. 167). Fifth, because the material in the penultimate chapter on decision problems in queuing theory is very interesting, the author should have discussed it more fully. Sixth, although he includes exercises at the end of some chapters, from a pedagogical perspective these exercises are not as useful as the ones found in either Ross (2007) or Taylor and Karlin (1998). Therefore, instructors wishing to use this book as a textbook will want to either supplement these exercises with their own problems or create new exercises. Finally, the above caveats notwithstanding, it is important to note that this book explains introductory-level queuing theory well. Therefore, I recommend it to all readers who wish to learn more about the topic at this level.

References

Ross, S. M. 2007. *Introduction to Probability Models*, 9th ed. Academic Press, Burlington, MA.

Taylor, H. M., S. Karlin. 1998. *An Introduction to Stochastic Modeling*, 3rd ed. Academic Press, San Diego.

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Chhajed, Dilip, Timothy J. Lowe, eds. 2008. *Building Intuition: Insights from Basic Operations Management Models and Principles.* Springer, New York. 177 pp. $79.95.

A serendipitous conversation with a long-standing friend at the Washington, DC, INFORMS meeting motivated me to read this book. Its purpose, according to the editors, is "to provide a means for making selected basic operations management models and principles more accessible to students and practicing managers" (p. xi). To this end, they have persuaded leading exponents of several fields to contribute a chapter about a specific model, such as the economic order quantity and Little's law, indicating the insights that these models reveal.

The typical chapter starts with a motivating scenario that involves fictitious characters and trivial problems. Although these scenarios might jar many INFORMS members, they also might capture the attention of one target audience: students who are taking their first operations management (OM) course. I wonder whether real-example descriptions might not have been more appropriate. They could be simple but include a reference for follow-up, or they could be additions that are more realistic, motivating examples. Such an addition to the book would be a useful pedagogical tool for a second target readership: teachers of introductory OM courses. Most chapters in the book conclude with a brief discussion of applications and a useful historical summary.

Kenneth Baker, who has been making important contributions to OM for more than 40 years and whose text (Baker 1974) is a seminal work, begins by looking at the shortest processing time (SPT) rule in scheduling. He concentrates on one operation and several jobs. He demonstrates, via full enumeration and logic, that for a static problem, the SPT rule minimizes not only the sum of completion times but also several other plausible objectives: "Whether a manager focuses on customer delays or on unfinished work in progress, or tries to focus on both at once, shortest-first sequencing is a good idea" (p. 4). This is useful intuition for a fixed problem in which all the jobs and their work times are known beforehand. However, what about the more realistic dynamic situation in which jobs are arriving continuously at a workstation and the problem is to decide which job to process next? Using an SPT priority rule could result in a situation in which a job with a long processing time is never processed, if jobs with shorter processing times continue to arrive at the station. In this situation, using intuition or common sense is not a good principle.

John Bartholdi addresses the knapsack problem. His premise is that sorting possible choices by a suitable measure, in this case "bang-for-buck," and then using a greedy algorithm is appealing because it is intuitive. This seems to be a circular argument, however. He points out that the greedy algorithm is heuristic and discusses whether the resulting solution is good enough: the author argues that it might be acceptable if you are going on a picnic, but not if you are loading a space vehicle destined for Mars. Stephen Graves contributes two chapters, one written jointly with John D. C. Little, for whom Little's law is named. Little provides a fascinating personal history at the end of the chapter. Little's law states that, under steady-state conditions, the average length of a queue, L, is equal to the average rate that items arrive, λ, multiplied by the average time in the system, W; hence, $L = \lambda W$. Therefore, if two of these parameters are known, the third can be deduced. This is useful in many different manufacturing and service-industry contexts. Graves's second chapter addresses flexibility; he shows that limited flexibility, appropriately deployed, can produce most of the benefits of total flexibility at far less cost.

The chapter on the economic order-quantity model is written by acknowledged expert Leroy B. Schwarz. He analyzes the most famous building block of inventory systems and summarizes the intuition to be gained as "the EOQ formula provides near-optimal order quantities . . . even in realistic management scenarios when the unrealistic assumptions of the EOQ model don't apply" (p. 154). I would have liked him also to have included the insight to be gained from Silver's trade-off curves for multiple products; Silver uses the product of total average cycle stock and total number of replenishments per unit time to construct a hyperbola (Silver et al. 1998). By evaluating the current and presumably nonoptimal ordering policy, management can select a desired point on the hyperbolic (trade-off) curve that, for the same number of replenishments, will give optimal cycle stock, or, for the current cycle stock, will give the optimal number of replenishments.

Other chapters cover simple queuing models, the M/M/1, M/G/1, and G/G/1 queues, the use of the median rather than the mean, and the newsvendor problem, contributed, respectively, by Wallace J. Hopp, the editors, and Evan Porteus. In the final chapter, Matthew J. Sobel addresses risk pooling. He demonstrates the insights that occur because the standard deviation of a sum of independent random demands could be lower than the sum of the standard deviations of the component demands. He applies this to inventory centralization and dual sourcing by using an extensively worked pedagogical example. This chapter provided me with the most insight.

I recommend this book to those who teach the models with which it deals, although I think its price is excessive. It has motivated me to adapt two sections of my postgraduate manufacturing course, which I will have tried and tested by the time this review appears. A serendipitous conversation indeed!

References

Baker, K. R. 1974. *Introduction to Sequencing and Scheduling*. John Wiley & Sons, New York.

Silver, E. A., D. F. Pyke, R. Peterson. 1998. *Inventory Management and Production Planning and Scheduling*, 3rd ed. John Wiley & Sons, New York.

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SCHONBERGER, RICHARD. 2008. *Best Practices in Lean Six Sigma Process Improvement: A Deeper Look.* John Wiley & Sons, Hoboken, NJ. 290 pp. $45.00.

Richard Schonberger is, of course, one of the "original gurus" of what is today called "Lean." In 1982, he wrote the influential book, *Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity*, and has since authored many other books. He has remained in the forefront in this field through almost three decades and several field name changes—World Class Manufacturing, Lean, and now Lean joined by Six Sigma.

Schonberger has a huge following (including me) who eagerly snap up every new book that he writes. His latest book does not disappoint.

This book comprises six parts that examine some fundamental questions, including the following:

- Does Lean beget financial success?
- How has improvement gone wrong?
- What are the weak spots of impressive companies?
- What is the changing landscape of Lean?

These are important and difficult questions to which both academics and senior managers should be seeking answers. Does he answer them? Well, he gives answering them a good shot.

In the view of this reviewer, however, the book has two themes that are presented in an integrated way. The first provides a considerable extension of Schonberger's long-standing inventory-turns research, which began in his earlier book, *Let's Fix It*!: *Overcoming the Crisis in Manufacturing* (Schonberger 2001). The second theme continues his remarks on current manufacturing-improvement practice.

The book includes little direct material on Six Sigma. Although several leading organizations have Lean Six Sigma or Lean Sigma (or some other combination of Lean and Six Sigma) programs in place, their integration remains an open issue that *Best Practices* does not resolve. Thus, this book is about Lean manufacturing practice, not Six Sigma. The author's remarks about Six Sigma, which emphasize collecting data in real time "at gemba" by direct observation, fit very well with the concepts presented in *Chasing the Rabbit* (Spear 2009).

Schonberger uses inventory turns as an indicator of an organization's Leanness. He tracks them from company accounts extending over a period of 10 years or more. He then ranks them from A (an improving trend of at least 10 years) through F (a many-year declining trend) using a point-scoring system for long-term performance. On face value, inventory-turn numbers cannot be disputed because they come from a company's individual accounts. Note, however, that it is inventory-turn trends, rather than absolute levels, that he uses.

If we compare the performance of international, individual companies, the results are often surprising. Thus, the United Kingdom is shown to have the most rapid rate of improvement and the United States an intermediate rate. Japan, however, which showed sharp improvement until the mid-1980s, was almost flat for 20 years until it resumed its upward trend beginning in 2003. The outstanding companies discussed include Dell, HP, Kodak, and Sony. The darling of Lean, Toyota, is shown to be distinctly unimpressive with its declining inventory turns of 4 percent per year for 13 years! Given the huge volumes of material that have been written in praise of Toyota, Schonberger raises the possibility that at least some of this material results from a "halo effect," as Rosenzweig (2007) describes extensively. Schonberger's book will certainly raise a few eyebrows.

With that, the speculation begins. First, one needs to consider if inventory turns is a legitimate measure

of Leanness. Schonberger acknowledges some limitations. Little's law would say it is—confirming its relationship with lead time—surely a more reliable indicator, but one that would be difficult to access. However, several other considerations remain. One is outsourcing. Thus, Dell (and others) do not hold substantial safety inventory but require some suppliers to hold it. A second consideration is extending (to suppliers) payment terms that would also favorably influence apparent inventory turns, at least in a growing market. A third consideration is the type of inventory that is held—raw material, work-in-process jobs, or finished goods—relating in turn to supplier management, plant management, and distribution management. Of course, these may move in opposite directions but would not be included in the financials.

Relative and absolute performance is a fourth consideration. Schonberger focuses on inventory-turn trends. This certainly helps overcome the problem of comparisons between very different businesses. For example, Toyota has moved steadily from an astounding (for a car manufacturer) 22 turns per annum to a still credible 10. Therefore, it ranks poorly against others in the automotive industry that have steadily improved, but from a very low base. On profitability, however, the reverse is apparent. As Schonberger says, "when the data talk you have to listen" (p. 162).

Throughout the book, Schonberger offers speculation and sometimes explanation for inventory-turn treads. Because he has been at the forefront of developments in Lean for almost three decades, he is uniquely able to do this. He has such a breathtaking knowledge of many industries that imagining a more informed observer is difficult.

Schonberger rewards his followers with many practical gems and warnings in a snappy question-and-answer style—frequently shooting down widely held beliefs. For example, he warns about future-state value-stream maps becoming a set of numeric goals rather than focusing on process improvement, insights into capacity utilization, and the importance of some underutilization. He also provides observations on counterintuitive plant layout. The chapter on metrics, which includes comments on the "hot" topics of "Lean Accounting," measures, and misguided overall equipment effectiveness (OEE), alone justifies the purchase of the book. Schonberger continues a theme that he has discussed in several previous books—that good design is a huge source of competitive manufacturing advantage that only a few recognize. In passing, he takes a sideswipe at people who have speculated that a company can be "too lean," saying that it is better to be too lean than to have pipelines choked with inventory.

Some might not like his views, and some might criticize that his attention on inventory turns represents a partial view and is too lengthy. However, this book is classic Schonberger—always challenging, never following the Lean Six Sigma party line, but always seeking new insights.

References

Rosenzweig, P. 2007. *The Halo Effect . . . and the Eight Other Business Delusions That Deceive Managers*. Free Press, New York.

Schonberger, R. 1982. *Japanese Manufacturing Techniques: Nine Hidden Lessons in Simplicity*. Free Press, New York.

Schonberger, R. 2001. *Let's Fix It!: Overcoming the Crisis in Manufacturing*. Free Press, New York.

Spear, S. 2009. *Chasing the Rabbit*. McGraw Hill, New York.

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Books Received for Review

Battiti, R., M. Brunato, R. Mascia. 2008. *Reactive Search and Intelligent Optimization*. Springer, New York. 196 pp. $99.00.

Bier, V. M., M. N. Azaiez, eds. 2009. *Game Theoretic Risk Analysis of Security Threats*. Springer, New York. 236 pp. $99.00.

Blum, C., D. Merkle, eds. 2008. *Swarm Intelligence: Introduction and Applications*. Springer, New York. 281 pp. $89.95.

Caramia, M., P. Dell'Olmo. 2008. *Multi-Objective Management in Freight Logistics: Increasing Capacity, Service Level and Safety with Optimization Algorithms*. Springer, New York. 185 pp. $159.00.

Ciegis, R., D. Henty, B. Kagstrom, J. Zilinskas, eds. 2009. *Parallel Scientific Computing and Optimization: Advances and Applications*. Springer, New York. 274 pp. $78.48.

Cook, W. J., L. Lovasz, J. Vygen, eds. 2009. *Research Trends in Combinatorial Optimization*. Springer, New York. 562 pp. $139.00.

Frankel, E. G. 2008. *Quality Decision Management—The Heart of Effective Futures-Oriented Management: A Primer for Effective Decision-Based Management*. Springer, New York. 110 pp. $179.00.

Gawiejnowicz, S. 2008. *Time-Dependent Scheduling*. Springer, New York. 377 pp. $109.00.

Jank, W., G. Shmueli, eds. 2008. *Statistical Methods in E-commerce Research*. John Wiley & Sons, Hoboken, NJ. 429 pp. $81.85.

Kahraman, C., ed. 2008. *Fuzzy Multi-Criteria Decision Making: Theory and Applications with Recent Developments*. Springer, New York. 591 pp. $139.00.

Kozielski, S., R. Wrembel, eds. 2009. *New Trends in Data Warehousing and Data Analysis*. Springer, New York. 345 pp. $129.00.

Kubiak, W. 2009. *Proportional Optimization and Fairness*. Springer, New York. 285 pp. $119.00.

Lipsky, L. 2009. *Queueing Theory: A Linear Algebraic Approach*, 2nd ed. Springer, New York. 548 pp. $79.95.

Nakagawa, T. 2008. *Advanced Reliability Models and Maintenance Policies*. Springer, New York. 246 pp. $139.00.

Neiger, D., L. Churilov, A. Flitman. 2009. *Value-Focused Business Process Engineering: A Systems Approach with Applications to Human Resource Management*. Springer, New York. 259 pp. $99.00.

Pereira, F. B., J. Tavares, eds. 2009. *Bio-Inspired Algorithms for the Vehicle Routing Problem*. Springer, New York. 213 pp. $129.00.

Powell, S., R. J. Batt. 2008. *Modeling for Insight: A Master Class for Business Analysts*. John Wiley & Sons, Hoboken, NJ. 465 pp. $71.96.

Pronzato, L., A. Zhigljavsky, eds. 2009. *Optimal Design and Related Areas in Optimization and Statistics*. Springer, New York. 224 pp. $119.00.

Riccia, G. D., D. Dubois, R. Kruse, H. J. Lenz, eds. 2008. *Preferences and Similarities*. Springer, New York. 320 pp. $219.00.

Roventa, E., T. Spircu. 2009. *Management of Knowledge Imperfection in Building Intelligent Systems*. Springer, New York. 253 pp. $129.00.

Shi, L., S. Olafsson. 2009. *Nested Partitions Method, Theory and Applications*. Springer, New York. 257 pp. $86.27.

Weidlich, A. 2008. *Engineering Interrelated Electricity Markets: An Agent-Based Computational Approach*. Springer, New York. 174 pp. $119.00.

Wilson, N. H. M., A. Nuzzolo, eds. 2009. *Schedule-Based Modeling of Transportation Networks: Theory and Applications*. Springer, New York. 312 pp. $119.00.