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Book Reviews

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Book Reviews

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$$\frac{1}{\beta} \Gamma^{\alpha} \approx * \div - \beta \mu = \epsilon \rho \lambda + \phi \sigma \cdot x \mu \omega \epsilon \cdot \& \mu ? \lambda \gamma^{\epsilon} < \mu \Sigma \cap \phi \zeta \pi \wedge^{\rho} \\ \beta \Sigma \wedge \vdash \lambda \pi^{\epsilon}) \sigma \leq \lambda \approx + o \lambda \$ \alpha \geq \lambda \Gamma^{\alpha} L \vdash o \cap \omega - \phi \Delta^{\epsilon} - \beta \mu \vdash \cdot \setminus ?^{\rho} \approx$$

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.

TOMPKINS, JAMES A. 1989, *Winning Manufacturing: The How-to Book of Successful Manufacturing*, Industrial Engineering and Management Press, Norcross, Georgia, 223 pp., \$32.95 (\$27.95 IIE members).

This book is intended to answer two fundamental questions: where manufacturing should be headed and how to improve manufacturing operations. The answer the author provides stems from his belief that winning manufacturing (WM) operations must be based upon a long-term

commitment to a broad-based, common sense, structured process of continuous improvement covering all phases of manufacturing from product development to marketing. In order to realize this belief, Tompkins presents the WM process. The WM process is a continuous cycle of a series of activities: (1) to understand all 20 requirements for WM; (2) to understand the external and internal issues of the organization; (3) to establish five to seven prioritized requirements; (4) to obtain orga-

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nizational commitment; (5) to establish teams; (6) to assess the firm's present status; (7) to identify specific goals; (8) to identify and evaluate alternative approaches; (9) to define improvement plans; (10) to obtain support for improvement plans and implement them; and (11) to audit the results.

The book consists of 22 chapters plus appendices. Chapter 1 defines the characteristics of the book and gives an overview of the WM process. Chapters 2 to 21 explain each of the 20 requirements for WM and conclude with sections explaining how to achieve each requirement. Chapter 22 and the appendices summarize the five-phase method of initiating the WM process. The appendices also include several meeting formats that can be used for each phase.

Throughout the book, Tompkins emphasizes that there are no quick fixes or panaceas in manufacturing but instead stresses the basic requirements of manufacturing success, together with a how-to approach that will lead a manufacturing team to success. This book gives a clear picture of how successful manufacturing should operate. It characterizes the essential elements of successful manufacturing and gives practical guidelines to achieving them. The book is well organized and easy to read without unnecessary jargon or digression. In particular, this book gives a fine treatment on how to launch a manufacturing improvement program in your organization, including descriptions of how to set up a series of meetings and how to provide education seminars for both upper managers and shop-floor personnel.

The book could have been improved in

two ways. First, it would have been nice to have the relationships among the 20 requirements structured or classified. For example, the success of material flow requirements depends on the success of other requirements such as balance, lead times, and production lots. Second, some of the guidelines for achieving success are too general to appeal to readers. It would be more convincing if these guidelines had been accompanied by real case studies describing how such guidelines were applied to real industries and how much improvement was achieved [Harmon and Peterson 1990].

Overall, Tompkins has rendered a valuable service to the manufacturing management community by presenting a clear picture of WM, articulating its basic requirements, and furnishing a general framework for achieving WM. I recommend this book to all manufacturing people in management who want to achieve WM but do not know where to begin or what to aim for.

Reference

Harmon, Roy and Peterson, Leroy 1990, *Reinventing the Factory Productivity Breakthroughs in Manufacturing Today*, The Free Press, A Division of Macmillan Inc., New York

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BALACHANDRA, R. 1989, *Early Warning Signals for R&D Projects*, Lexington Books, Lexington, Massachusetts/Toronto, 220 + xvii pp., \$39.95.

Resources available for investments in R&D are getting scarcer, and improving the effectiveness of resource allocations

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has become critical. This book is a timely one. It focuses attention on the decision-making process to terminate ongoing R&D projects. The author develops a firm-level monitoring system that can aid in the early termination of potentially unsuccessful projects; he then discusses a system to reallocate resources to increase the effectiveness of existing projects; and finally, he presents an expert system that can aid in this process. The author emphasizes that the systems, presented in this book, relate primarily to R&D projects that are in the developmental stage and have a commercial objective. Discussions regarding the other stages in the R&D process—from initial idea generation, to test marketing and full-scale commercialization—are very brief. However, they do introduce the reader to the basic issues, and adequate references are provided for further study.

The monitoring system is based on 13 factors developed from a discriminant analysis of 57 successful and 57 unsuccessful projects from 40 firms. These factors are the early warning signals. Significant deterioration in these factors would warrant a decision to terminate a project. The author finds that "if at least nine factors improved or remained at the same level as in the previous review, the project succeeded. However, if fewer than six factors improved or remained at the same level, the project failed" (p. 71). Thus a firm may consider any project where nine or more factors have deteriorated as a serious candidate for termination. The author does not mention the accuracy of this simple decision-rule when applied to his own sample, although the discriminant function itself correctly classified 92 percent of the

projects in the sample.

Balachandra demonstrates how such a monitoring system could be developed in any firm. He elaborates on the practical issues involved in deciding the frequency of review, measurement of the critical factors and early warning signals, data collection methodologies and organizational philosophies needed to make such a monitoring system work. He effectively uses a sample company to demonstrate how such a system may be structured and points out some possible problems and pitfalls in its implementation. This section is very useful and replete with insights. However, a more extensive discussion of the problems and pitfalls using real cases as illustrations would have been helpful. This might have highlighted the political dimension of the termination decision—an aspect that is basically ignored in the book. The resource reallocation model is interesting but assumes that "the probability of technical success can be enhanced by allocating additional resources and the nature of the relationship between additional funding and the probability of technical success is known." This is bound to restrict the possible applications of this model. Finally, the expert system described in the book successfully demonstrates how such tools can be used for decision making in R&D.

There may be questions about the comprehensiveness and universal applicability of the 13 factors identified in the monitoring system. The author himself adds four other factors that did not emerge from his study because "the projects in the sample had significantly positive levels of these factors" (p. 65). He refers to these as "critical factors" where significant deterioration

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in even one of these factors can make a project a candidate for termination. The difference between critical factors and early warning signals could have been discussed more fully. For instance, Balachandra could have elaborated on the reasons why "probability of commercial success" is only an early warning signal while "probability of technical success" is a critical factor. The critical factors he added are intuitively appealing. Should each firm add its own factors? This is not obvious to the reader. Further, the sample is weighted in favor of the "machinery" and "instruments" sectors. Thus the reader is unsure as to whether the specific elements of the monitoring system are to be viewed as comprehensive and generalizable, or primarily as illustrations.

The 13 factors discriminate between projects that were mainly "commercial successes" and those that were "terminated." It is not clear whether the projects terminated were "good" termination decisions, or were, in retrospect, mistakes! The author collected information on this in his questionnaires and must have tested this. If he had stated the conclusions from this explicitly, it would have further reinforced the validity of any monitoring system based on a discriminant analysis of empirical data.

There is extensive discussion in the book of the methodological details of the empirical study. While most of this has been relegated to extensive appendices, much of it is in the text, which may distract the "R&D executives and managers of R&D projects" (p. xvi) who are the intended readers and who may not be interested in such details. On the other hand, these same details will

make the book of interest to academics who are researching the R&D process.

This book should have discussed the impact of some of the new developments in R&D management on termination decisions. External sourcing of technology is increasing, and an R&D project may be terminated because a viable license becomes available. Strategic alliances in R&D may introduce new dynamics to the termination decision, giving rise to the inclusion of different early warning signals. A trend towards earlier and more integrated involvement of non-R&D functions may expand the needs of the monitoring system.

Overall, the book adequately addresses a very important issue in R&D management. The arguments are presented professionally and the conclusions are carefully drawn. The limitations of the study and the domains of the conclusions are always spelled out. Despite the quantitative models developed, the author seems well aware that terminating R&D projects is an inexact science, and he presents his "action" statements with caution. Even if the results of the various models discussed in this book are not always used, the discipline and rigor imposed by the monitoring system is bound to improve the quality of decisions.

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KANG, T. W. 1989, *Is Korea the Next Japan?* The Free Press Inc., New York, 196 pp., \$19.95.

T. W. Kang presents his idea of a trilateral relationship among Japan, Korea, and the United States from a business

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perspective. Born in Japan to Korean parents, raised and educated in Korea and in the United States, Kang is now with INTEL and—for all these reasons—seems to be uniquely qualified to write this book.

In chapters one through five, Kang deals with an assessment of the Korean economy, placing major emphasis upon explaining similarities and differences between Korean and Japanese business firms. The author explains how the Korean philosophy of *koenchanayo* ("that's good enough") is different from the quest for perfection inherent in any Japanese businessman. This philosophy seems to form the basis for Korea's goal to "do what the Japanese have done, but to do it cheaper and faster."

In chapter two, the author deals with Korean government policies related to international trade in order to help the reader evaluate the degree of country risk involved in trading with Korean companies. Clearly, his opinion is that the Korean government generally is very helpful only as long as the foreign concern is willing to contribute to the Korean economy. On the other hand, he argues that liberalization is taking place at a very fast rate and that this signifies opportunities for foreign businessmen.

The major strength of the Korean economy is its rate of growth, which is attributed primarily to its well-trained labor force, but also to a high degree to business concentration in growing product fields with a strong orientation towards export. On the other hand, Korea is still very small in absolute terms and, according to projections of the Korean Development Institute (KDI), will remain relatively small until the

turn of this century. Also, North Korea is viewed as posing a difficult problem economically, politically, and militarily. Chapters four and five, then, enlarge on the two peculiarities of Korea's economy mentioned earlier: large companies and the electronics industry.

Finally, the author takes a close-up look at the relationships between Korea and Japan and between Korea and US firms, then tries to make a projection of what the trilateral relationship among the countries involved could be like in the future. Here, it becomes quite clear that Kang's heart is Korean as he urges American companies to reconsider their sourcing decisions in order to help develop a competitor to Japan.

Overall, I regret that Kang did not pursue the path he started out on, namely trying to explain to a non-Korean what the average Korean soul is like. The reason for this is simply that it is not much fun to read verbalized statistics: there are more efficient ways to communicate the type of data presented. Kang's style of writing seems better suited to a qualitative type of analysis. On the other hand, the book offers a lot of hindsight to anyone involved in Far-Eastern trade as it highlights the major issues of doing business in Korea. I do believe that the book is worth its price.

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ERMOLIEV, Y. AND WETS, R. eds.
1988, *Numerical Techniques for Stochastic Optimization*, Springer-Verlag, New York, 571 pp., \$74.00.

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George Dantzig recently wrote that “planning under uncertainty in the author’s opinion is the most important outstanding problem in Operations Research” [1988]. Many others share Dantzig’s sentiments about planning under uncertainty, or by other names, stochastic programming and, more generally, stochastic optimization, but virtually no book gives a novice a broad appreciation of the practical possibilities within this field. Ermoliev and Wets’s book, *Numerical Techniques for Stochastic Optimization*, fills this void by providing comprehensive surveys of the fundamental computational techniques and several application areas within stochastic programming.

This book aims to show how current stochastic optimization procedures can solve a variety of practical problems. Generally, the book describes the issues that must be addressed in computation, the resolution of those issues for implementation, and the results of using these implementations in assorted areas. No prior knowledge of stochastic programming is assumed but the mathematical level of the book limits access to those who are familiar with basic techniques from deterministic mathematical programming and the fundamentals of applied probability and statistics.

Numerical Techniques for Stochastic Optimization contains four parts. Each part has chapters written by various authors. The chapters range from a broad overview of the basic models by Ermoliev and Wets in part 1 to a specific compilation of a variety of applications and test problems (with data!) in part 4. Between these extremes of generality, part 2 describes basic computational procedures in survey chapters on

approximation and integration methods, relationships to mathematical programming, representation of probabilistic constraints, and randomized, stochastic quasi-gradient methods. Part 3 builds on these surveys by presenting specific considerations for computer implementation of the general methods. Many of the part 3 chapters also refer to computer codes available from a project led by the authors at the International Institute for Applied Systems Analysis in Laxenburg, Austria.

Researchers and students can develop a working knowledge of stochastic programming methods by reading parts 1 and 2 and then picking pieces of parts 3 and 4 according to their interests. They can gain a fundamental understanding of most aspects of current stochastic programming practice with the possible exception of modeling issues involving recourse and probabilistic or chance-constrained models. Practitioners with concerns in particular application areas can develop some motivation in part 1 and then choose only the most relevant topics from the remaining parts. Of particular note are applications in facility location (a school district decision in Italy and fish-processing plant locations in Norway), water resource management (pollution control for Lake Balaton in Hungary), and electric power and energy modeling (with both general models and specific data from Belgium). The final chapter also gives full formulations of applications that appeared elsewhere.

Ermoliev and Wets’s book gains content and relevance from having different authors report on the topics they know best, but this combination of styles also causes the book to lose pace. Each chapter re-

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quires some effort to understand the author's style and notation. A large number of typos, a rather small and coarsely bit-mapped font, and some chapters with poor syntax and grammar place an additional burden on the reader.

Despite these difficulties, this book maps a well-marked path into the forest of decision-making problems under uncertainty. It also provides the necessary tools to clear new avenues of understanding. I recommend it to anyone who wishes to join the journey.

Reference

Dantzig, George 1988, "Planning under uncertainty using parallel computing," *Annals of Operations Research*, Vol. 14, No. 1, pp. 1-16

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TUSHMAN, MICHAEL L. AND MOORE, WILLIAM L. 1988, *Readings in the Management of Innovation*, second edition, Balinger Publishing Company, Cambridge, Massachusetts, 769 + xiv pp., \$22.95.

This is the second edition of a widely used book of readings for courses on the management of technological innovation (approximately 80 percent of the papers are from academic authors). The book has been extensively revised with 77 percent of the readings being new (37 of 48) and 18 percent more pages. Nevertheless, the book retains several classic readings with which instructors would want their students acquainted (for example, Abernathy and Utterback's article on patterns of innovation, Marquis' review of the characteristics of 500 innovations, and Cooper and Schendel's study of responses to

technological threats).

The book is organized by sections that cover important matters for all students of innovation. It is especially unusual and useful to find the value of a historical perspective recognized not only in its own section ("Innovation over time and in historical context"—six readings) but in other articles that use a historical methodology. Strategic issues are also well covered with sections on (1) "Technology and business strategy" (four readings), (2) "Executive leadership and the management of innovation and change" (five readings), and (3) "Venturing and organization learning" (four readings).

Despite its coverage of strategic matters, this collection retains a strong orientation toward behavioral aspects of the study of innovation. This orientation is especially evident in the two sections on "Organization and innovation" (seven readings) and "Managing linkages" (five readings), and in several theoretical pieces that have no direct bearing on innovation (for example, Tushman and Nadler's article on "Diagnosing organizational behavior"). The authors have excellent reputations for scholastic leadership in the study of innovative behavior. However, despite a strong effort to obtain a more balanced collection, they still present a slanted perspective on technological innovation.

Tushman and Moore's bias on innovation is not unique to them; therefore, many instructors may find that this collection fits their own courses very nicely. Perhaps the book's most serious limitation is the implicit assumption of technological determinism: the discovery of the technology itself by leading innovators (developers or

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first adopters) is the most important factor in the innovation process. The editors do include useful chapters on marketing and operations (both with four readings). However, the collection fails to provide perspectives on several important matters:

- The complexity of industrial structure and economic issues that determine the emergence of needs for new technology (discussed in the work of such economists as F. Michael Scherer, Nathan Rosenberg, and Vernon Ruttan);
- The processes of imitation, transfer, and adaptation that account for innovation in the majority of technological followers, threats to proprietary advantage, and difficulties with international competition (for example, the work of such scholars of technology transfer and diffusion as Edwin Mansfield);
- The processes of managing the adaptation and learning that are necessary to structure work forces, converge multiple technologies into systems, and respond to changes in input and output requirements (discussed by such scholars as Bela Gold and John Ettlie in their work on the economic value of technology); and
- The environmental, political and economic forces that structure the impact of a technology on users and others and the growth of infrastructures of industrial services needed to maintain technologies and transform ideas into commercial realities (discussed by such advocates of technology assessment as Roy Rothwell and Walter Zegfeld).

None of the authorities mentioned above are employed or were trained in the Harvard-MIT-Columbia community that dominates this selection of readings (ap-

proximately two-thirds of the academic readings). Since I was trained at Harvard, I am sure the bias reflects the superiority of this community. Unfortunately, the experts I've mentioned from Stanford, Claremont, Minnesota, Michigan, and overseas are unlikely to agree, but what can one expect from economists?

It is wonderful to find a book on innovation that contains readings by authors who actually understand technology (for example, Rosenbloom and Cusmano discussing VCRs and Jelinek and Goldhar on CAD/CAM). However, Harvard and MIT people usually underemphasize material and biological fields of technology. The book's selection reflects a common assumption that lessons learned from the electromechanical technologies are equally applicable to the chemical, agricultural, and health care industries, but I suggest otherwise.

While most of the biases of this book are common to many instructors, there is little excuse for the undercoverage of international material both in focus and source. Only four of 48 readings explicitly deal with international issues, and none represent the outstanding contributions of scholars in Europe. Three of the international readings focus on Japanese management. Only one discusses the problems of innovation in a multinational environment that spans both sophisticated capitalist economies and developing nations.

I was very disappointed and unable to explain why Tushman and Moore, two highly competent experts, deprive us of any contribution beyond that of acquiring reprint approval. Approximately half of the articles contain no abstract and I found no abstracts that were written by the edi-

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tors. The section introductions and the preface are also disappointing (for example, "[V.] reviews several generic problems in the management of innovation").

Tushman and Moore have performed a valuable service for behaviorally oriented instructors by packaging these readings in one accessible volume. We can hope that other scholars will perform the same service for economically and internationally oriented readings. We can also hope that Tushman and Moore will resist the temptation to compile larger and larger (and more and more expensive) collections and instead share more of their own expertise in future editions.

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GNEDENKO, B. V. AND KOVALENKO, I. N. 1989, *Introduction to Queueing Theory*, second edition, Birkhauser, Boston, Massachusetts, 314 + xi pp., \$59.00.

This is the English version (translated by Samuel Kotz) of the 1987 second edition of the Russian book originally published in 1966 (English translation by Eng. R. Kondor in 1968). Since the first and the second editions have been translated by different authors, some variations in terminology exist. Furthermore, because the original version is non-English, some terms occur as literal translations (for example, *non-stationary* to mean *time-dependent*). What is called the "Introduction to the first edition" is in fact an expanded version of the original introduction and includes references to books and articles that appeared long after the first edition's publication. In some instances, using a later edition of a

book has affected the chronology of research (for example, the reference to Fry on p. 8).

This book provides a good introduction to the mathematical theory of classical queuing systems and their variants. Considerable effort has gone into revising the first edition. Topics incorporated in this edition include a number of new variants of the standard systems, ergodic methods, stability theory of service systems, and statistical simulation. Emphasis is on Markov models, and proofs of theorems have been given with sufficient mathematical rigor. The authors admit that their selection of material and references was influenced by their own scientific interests and those of their colleagues.

The six chapters of the book are organized as follows: Chapter 1, "Problems of queuing theory under the simplest assumptions" is essentially a chapter on the Poisson queue M/M/1 and its variants. It also includes a discussion of birth and death processes and some simple reliability problems. Chapter 2, "The study of the incoming customer stream" discusses stochastic point processes. Chapter 3, "Some classes of stochastic processes" is also on stochastic processes, including topics such as the semi-Markov process, the linear-type Markov process, and the piecewise-linear Markov process. Chapter 4, "Semi-Markov models of queuing systems" covers the classical systems M/G/1 and GI/M/1 and their variants, such as priority queues. Chapter 5, "Application of more general methods" discusses the general queues GI/G/1 and GI/G/M. In that context ergodic theorems (Kiefer and Wolfowitz, Borovkov and Sevast'yanov)

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and stability conditions are proved and discussed. The chapter also includes a discussion of systems under heavy and light traffic. Chapter 6, "Statistical simulation of systems" gives the mathematical principles rather than their application in practice.

For queuing theorists with good mathematical backgrounds this book is a valuable reference. Since the book contains no examples or exercises, it is doubtful that it can be used as a classroom text, unless it is used for a research course. The book covers only the topics of the '50s, '60s, and the early '70s. Even a cursory discussion of queuing networks is lacking. Applications are mentioned only as sources of problems. Except when the proofs get very sophisticated, mathematical rigor is always maintained. Despite these limitations, the book is a good source of reference, especially on the work done by Russian researchers.

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GANI, J. ed. 1988, *A Celebration of Applied Probability*, Applied Probability Trust, The University, Sheffield S3 7RH, England, 387 pp., \$40.00.

This is a collection of 27 articles, mostly technical applied-probability papers, put together by Joe Gani to celebrate the 25th anniversary of the Applied Probability Trust (APT). For workers in applied probability, APT is perhaps best known as the publisher of the *Journal of Applied Probability* (JAP) and *Advances in Applied Probability* (AAP). It is in fact, in Gani's own words, an "Anglo-Australian foundation consisting of a small publishing house" that also publishes, in addition to JAP and AAP, two other journals of a more general nature,

Mathematical Spectrum and *The Mathematical Scientist*. The APT's four trustees for 1988 were Gani, E. Hannan, C. Heyde, and the London Mathematical Society, represented by R. Bailey.

The collection of papers is organized into eight parts. Part 1 ("Some Thoughts on Applied Probability") starts with Gani's article, which is largely a historical recollection of his own personal and professional life as well as his involvement in applied probability. This article is quite informative, interesting, and at times amusing. In an almost exemplary pedagogical style, Gani uses a figure captioned as "chronological diagram of wanderings, 1924–1987," to highlight his main activities. (The figure reveals some sort of symmetric random walk centered around Australia, with Britain and USA on its left and right sides.) Following Gani's is a paper by David Kendall, which at five pages is by far the shortest paper in the book. Three open problems are discussed: the prehistory of applied probability, the Poisson-Delauney simplexes, and the voids and pancakes in the universe. All three have to do with stochastic geometry. Marcel Neuts concludes Part 1 with a paper discussing the place of computer experimentation in the study of probability models. He uses an interesting example, studying the distribution of the maximal eigenvalue of positive matrices with random elements, to illustrate several "operational rules" that he proposes for sound empirical studies. This article echoes the concerns raised in other scientific communities, for instance, Y. C. Ho's "Is it applications or is it experimental science?" It is good that Neuts used this occasion as a forum to make the point.

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Part 2 ("The First Quarter-Century of the Applied Probability Trust") consists of two articles by M. Hitchcock and K. Lyle, executive editor and technical editor of *Applied Probability*. They cover a wide range of topics from editorial procedures to typesetting. Reading these articles, one can get a sense of the sheer efficiency of that small editorial office in Sheffield. While it has almost become standard for journals nowadays to have teams of area editors and associate editors, all authors of *Applied Probability* papers know that the review process of *JAP* and *AAP* is essentially Miss Hitchcock's one person operation (in consultation with the editors, of course, as she so acknowledges). Without her remarkable operation, one wonders whether the journals would be quite so successful.

The other six parts are essentially technical articles. Part 3 ("Biology and Field Trials") has four articles, by M. S. Bartlett; P. J. Brockwell; J. F. C. Kingman; and A. Cedric, B. Smith, and R. Thomson; Part 4 ("Quantum Theory"), three articles by P. D. Finch; K. R. Parthasarathy; and G. S. Watson. Part 5 deals with "Coincidence and Convergence": three articles by A. D. Barbour; S. Karlin; and R. M. Loynes. Part 6 is a collection of six articles, under the general title of "Analysis of Stochastic Phenomena" by N. H. Bingham (branching process), R. Engelen, P. Tommassen, and W. Vervaat (Ignatov's theorem), J. Keilson and M. Zachmann (row-continuous Markov chains), N. U. Prabhu (semiregenerative phenomena), R. L. Tweedie (invariant measures), and P. Whittle (restless bandits). Part 7 consists of two articles by E. J. Hannan and J. Rissanen, and C. C. Heyde, discussing

"Stationary Processes and Time Series."

Finally, Part 8 concludes the book with four articles on "Random Walks and Graphs" by J. W. Cohen; J. Gani; J. M. Hammersley; and L. Takács.

Although Marcel Neuts ends his paper by thanking P. J. Davis for assuring him that he has "enough gray hair to indulge in some 'philosophizing' on the subject of probability," virtually all the authors of the technical articles, many of them endowed with "enough gray hair," choose to avoid philosophizing on anything. Most of the articles are well written and interesting. They are generally more readable than articles on similar topics published elsewhere. (This, I suspect, is largely due to the fact that for most of the authors, this was not the first paper they had written about the topic.) Indeed some articles could be the best on a particular topic. For me, Peter Whittle's paper on restless bandits is one such example. I am sure other readers will choose their own favorite articles.

It is disappointing that the book falls short on engineering applications. For instance, there is not a single article on queuing theory or queuing networks and their applications. This omission is at once glaring and puzzling, given the enormous amount of literature on the subject published in *JAP* and *AAP*. Ironically, in the epilogue of J. W. Cohen's article, one finds the following sentences:

Consider . . . the attention paid by the journals to queuing theory, an attention which has been quite extensive (maybe too extensive for many a probabilist), but its effects have been immense, particularly in management and computer science. That attention has influenced not only directly the researchers in these fields but also indirectly (via teaching) those concerned with sys-

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tem design. No computer system and no data network can be designed adequately to meet its technical and economical objectives without a sound knowledge and insight in queuing and congestion phenomena.

One wonders if this should not be one of the main directions for applied probability for at least the next 25 years.

In summary, despite its weakness in engineering applications, this is a good book with solid technical substance, a book in which every worker in applied probability will find something interesting, something informative, and something learnable.

Reference

Ho, Y. C. 1982, "Is it applications or is it experimental science?" *IEEE Transactions on Automatic Control*, Vol. AC27, No. 6 (December), p. 1142.

David D. Yao

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VAN RIJN, C.F.H., ed. 1989, *Logistics: Where Ends Have to Meet: Proceedings of the Shell Conference on Logistics, Apeldoorn, The Netherlands, 2-3 November 1988*, Pergamon Press, New York, 234 + viii pp., \$75.00.

On the occasion of the 75th birthday of the research department of an oil company, this department organized a conference on logistics.

By inviting about 10 speakers on research topics concerning logistics in the oil industry, the conference collected a variety of papers that are also of interest to people outside the industry. The speakers were selected to give information on the most recent developments in logistics-related technologies. The topics covered include vehicle routing, large-scale control systems, flexible process manufacturing, and

software and implementation issues, such as parallel computations.

The discussions held at the end of sessions on related papers give insight into the impact of the theoretical developments in practice and into the most useful directions for research. The book is indexed, which makes it more valuable.

The reader who is not distracted by the variety of type faces (including typewriter matrix and laser printers, and phototypesetter) is rewarded by a rich overview of the research topics that are important for process industries.

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TIMPE, A. DALE, ed. 1989, *Productivity*, Kend Publishing, Emerson, New Jersey, 371 + xii pp., \$29.95.

In the preface, the editor presents the book as "the compendium to provide access to a broad spectrum of practical knowledge, research and theory" . . . to "encourage, develop and manage productivity improvement." The book uses 45 readings drawn from different fields of study and divides them into six parts of seven or eight readings each. The first three parts of the book deal with the effects of organizational culture and top management actions on productivity and its improvements. The next two parts deal with the effects of automation and historical evolution on the work environment. The final part covers some issues related to the challenges of measuring and

monitoring productivity.

While the objective behind the book is quite timely and the coverage of topics is wide, the basis for selecting the individual readings is not clearly explained nor are the readings in each part well integrated with each other or with the readings in other parts. A somewhat more detailed introduction at the beginning of each reading would have helped the reader understand how different readings were linked. Some topics (such as quality circles and R & D productivity) have been split into different parts for reasons not clearly spelled out.

Considering the way productivity has been tackled in the different fields of study from which the readings are drawn, the reader is likely to find productivity a paradox [Skinner 1986]. The timely purpose behind the book would have been better served if the editor had started with a clear definition of productivity and had identified the different levels of aggregation used in reference to productivity in different fields of study. The reader's interest could have been better captured by referring to the recent decline in US productivity growth and by giving a comparative review of the way productivity has changed historically in different parts of the world.

Some important aspects associated with productivity have not been adequately stressed, such as the effects of incentives on productivity, international comparisons of productivity [Berger 1987], and the reasons behind the recent decline in the growth rate of US productivity [Bureau of Labor Statistics 1983].

The idea of putting together a compendium on productivity seems timely; its execution lacks the consideration required for

such a challenging task. As a result, after reading the book, the reader is likely to be educated but somewhat confused by the combination of topics picked from different sources but not knit together.

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SHINGO, SHIGEO 1989, *A Study of the Toyota Production System from an Industrial Engineering Viewpoint*, Productivity, Inc., Norwalk, Connecticut, 257 + xxxiv pp., \$39.95 (hard cover).

The original English translation of this volume in 1981 made it the first book on just-in-time (JIT) techniques available to an English-speaking audience. Its incisiveness as a commentary on the work of Taiichi Ohno (the originator of JIT at Toyota Motors, whose own books were published in English only recently) was enhanced by Shingo's supporting role as a consulting engineer and trainer at Toyota during JIT's formative period. In the process, Shingo contributed to the development of one of JIT's key elements, the reduction of setup time for which he coined the term "single minute exchange of die" (SMED). The present book is a newly revised and translated version (by Andrew P. Dillon) of the

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earlier publication.

The author's purposes are (1) to amplify and analyze JIT and its associated information and control system called Kanban, (2) to present the methods and techniques for implementing JIT in a practical context, and (3) to highlight his contribution to JIT via SMED. The intended audience consists of "plant superintendents, industrial engineers, (and) management consultants." On all these counts, the new book is likely to be very well received.

Shingo succeeds admirably in amplifying the basic ideas of Ohno and JIT by drawing a host of fine distinctions, for example, between large-scale and large-lot production and between cushion stocks and safety stocks. In general, however, Shingo is fully supportive of Ohno's thinking. Differences, if any, are primarily of a conceptual or semantic nature.

It is as a practical guide that the book is outstanding. Instead of merely analyzing Ohno's JIT, Shingo draws on his extensive consulting experience in the mechatronic areas of setup time reduction, prevention of overproduction, and prevention of defects to illustrate what is actually involved on the shop floor. The coverage of JIT elements is complete from the technical standpoint. Moreover, the in-depth treatment of Kanban mechanics (Chapter 9) is particularly noteworthy.

It is understandable that Shingo places a great deal of emphasis on his brainchild SMED, which crystallized over 20 years. As he recognizes, SMED helped to demolish a crucial manufacturing assumption that took setups as given and concluded, as a result, that large lots were more efficient. But Shingo himself acknowledges

that "the greatest reduction in production time is obtained, even with processing lots of 1,000, when each item is transported individually to the next process" (p. 36). The solution, he observes, lies in improving layout to establish one-piece product flows (p. 37) as originally envisaged by Ohno; Shingo labels this the Nagara system (p. 136). SMED then helps to ensure that there is simply no advantage to increasing the processing lot size (p. 37). Thus Shingo serves an extremely useful purpose by placing SMED in its proper managerial perspective.

Given a modicum of technical knowledge, even general management faculty and top executives should be able to appreciate the book's contents. The translator, Andrew P. Dillon, is to be commended for the readability of the book as well as for attempting to tackle the problem of overlaps and repetition by making some use of footnotes and cross-referencing. However, an opportunity seems to have been missed to integrate part 1 better with part 2.

With the appearance of this book, one can begin to visualize the design of full scale courses on JIT in management education programs with the required supporting text. At the very least, student teams could investigate the feasibility of some of the (now standard) technical solutions proposed by Shingo in non-Japanese settings as part of their project studies. The phenomenon involved is the customization of purchased machinery (p. 113) by a firm's own engineers and operators (analogous to the training and development of employees). For their part, management theorists may want to ponder whether a distinction

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now needs to be made between "JIT," "Toyota Production System," and "Japanese Manufacturing" to provide a better focus to future academic work based on Ohno and Shingo's ideas.

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MARTINS, JOHN G. AND SVENSSON, MORGAN 1988, *Profitability and Industrial Robots*, IFS (Publications), Bedford, United Kingdom, 170 pp., \$24.95.

This book is intended to help project engineers and consultants develop modern production systems. In seven chapters, the authors show the foundations and potential of profitable applications for industrial robots.

Chapter 1 starts with a brief review of the requirements for profitability. The second chapter, "Achieving profitability," describes the advantages of flexible production processes and some of the requirements for their implementation, that is, designing a product to be handled by a robot. The authors compare three stages of industrial production: hard automation, flexible robots, and manual assembly.

Chapter 3 is a collection of 10 application examples. Reading about the problems and advantages in manufacturing brake parts or drilling printed circuit boards using industrial robots can help one estimate the costs involved in changing similar production processes. Some of these examples describe cases in which an industrial robot works only during human working time; in other cases, robots work all day without human maintenance during third shift. In Chapter 4, the authors give hints for

increasing profitability. Chapter 5, entitled "Carrying out the project," describes several steps during the realization phase: collecting data, choosing an industrial robot, systems design, procurement, and delivery. Chapter 6 discusses ways to assess profitability, showing how to calculate capacity and manning requirements, pay-back time, and investment cost. Chapter 7 is a collection of designing rules and a checklist for proper product development.

This book gives a complete view of the problems and advantages of using industrial robots, and indeed there are some surprising statements: Chapter 1 states "The potential of an installation is good if it is working at least as well one year after commissioning as it did when it first took over production." There should be another way to measure success. Another critical point is the statement that the proportion of personnel costs will decrease with an increase in the number of industrial robots because the amount of manual work will be less for a constant product volume. This statement does not take into account the increase in personnel costs due to the higher qualifications needed.

The book's highlights are checklists such as that on the "Objectives and working rules of the project engineer." They would be helpful in managing the installation process of robots. The rules for designing products to be handled and assembled by robots are shown in a large number of pictures of product parts that show good and bad design. Sometimes the importance of parts' design isn't emphasized enough. One should also realize that many production processes cannot be changed for robot use because of unfavorable product design.

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Nothing is said in this book about the capability of industrial robots to emulate common sense. Cameras and other equipment to make robots see and feel will be important in the future. A short look towards the future would have rounded out the book.

But overall Martins and Svensson's book is a good introduction for users and project engineers interested in using industrial robots. It discusses nearly every important aspect and can serve as a practical guide for people wishing to learn about the potential of robots.

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