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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. The editor will be pleased to receive an e-mail from those willing to review a book, with an indication of specific areas of interest. If you are aware of a specific book that you would like to review, or that you think should be reviewed, please contact the editor.

The following books are reviewed in this issue of *Interfaces*, 42(1), January–February 2012: *Profiles in Operations Research*: *Pioneers and Innovators*, Arjang A. Assad and Saul I. Gass, eds.; *Operations Rules*: *Delivering Customer Value through Flexible Operations*, David Simchi-Levi; *Service Parts Management*: *Demand Forecasting and Inventory Control*, Nezih Altay and Lewis A. Litteral, eds.; *Linear Programming Sensitivity Analysis and Related Topics*, Marie-France Derhy; *Artificial Ants*: *From Collective Intelligence to Real-life Optimization and Beyond*, Nicolas Monmarche, Frederic Guinand, and Patrick Siarry, eds.

Assad, Arjang A., Saul I. Gass, eds. 2011. *Profiles in Operations Research: Pioneers and Innovators*. Springer Science + Business Media, New York. 867 pp. $99.00.

At rare intervals, a near-perfect book comes along. *Profiles in Operations Research: Pioneers and Innovators*, a volume that should be sitting on every operations researcher's bookshelf, well dog-eared from having been read and reread, is such a book. It is a loving recounting of the lives and contributions of 43 men who shaped our field. (Note that all the chapters deal with men because the time span covered—the youngest man profiled was born in 1934—is one in which very few women participated in the field.) Assad and Gass refer to themselves as having "written, compiled, and edited" the volume: the description "edited" is inadequate. Indeed, they wrote 11 of the 43 articles.

Profiles in Operations Research presents its 43 biographies in the order of the date of birth of the men being profiled. It starts with P. M. S. Blackett (born in 1887), who is acknowledged as the father of operations research (OR), and ends with Ron Howard (born in 1934), a major contributor to decision analysis. It includes Nobel Prize winners (P. M. S. Blackett, Leonid Kantorovich, Herbert Simon, and Harry Markowitz), and some whose names are inextricably linked to one another (Ackoff, Arnoff, and Churchman; Charnes and Cooper; Kuhn and Tucker; and Morse and Kimball). Those profiled are mostly Americans, but also include a sprinkling of people who did their work in England (Martin Beale, Stafford Beer, P. M. Blackett, Charles Goodeve, Pat Rivett, and Steven Vajda), France (Bernard Roy), and Russia (Leonid Kantorovitch). Emigres include Egon Balas, John von Neumann, Tom Saaty, and Andy Vazsonyi. The list includes the famous (George Dantzig, John D. C. Little, Jay Forrester, and John von Neumann) and some who are less well known (Ellis Johnson, George Kozmetsky, Hugh Miser, John Magee, and Jacinto Steinhardt). It also contains major contributors to specific fields; these include Richard Bellman (dynamic programming), Al Blumstein (criminal justice), Seth Bonder (the military), Ray Fulkerson (traveling salesman and networks), Saul Gass (linear programming), Murray Geisler (logistics), Ralph Gomory (integer programming), David Hertz (risk analysis), Howard Raiffa (decision theory), Tom Saaty (analytic hierarchy process), Harvey Wagner (inventory), and Phillip Wolfe (decomposition). Although *Profiles in Operations Research* is a who's who of pioneers and innovators, it is not simply a recitation

of their accomplishments and dates. For shorter résumés for many of those profiled, the reader can visit http://www.informs.org/About-INFORMS/History-and-Traditions/Miser-Harris-Presidential-Portrait-Gallery and the citations in the IFORS Hall of Fame, published over a period of four years (2003–2006) in *International Transactions in Operations Research* (see http://ifors.org/web/ifors-hall-of-fame/).

On average, the editors devote 18 pages (including extensive references) to each profile. For each person profiled, they discuss his early life, jobs held, education, families, accomplishments, honors, and how he came to OR (often accidentally); they also show informal photos and sidebars containing stories and quotations. The editors describe the individual contributions each made to OR (and to other fields) in terms that anyone who has taken an introductory OR course can understand. They focus on the human element and the professional productivity of each, thus making the profiles come alive. The editors and the contributors of individual chapters are to be complimented for taking this approach.

The people profiled, with only two exceptions (John Little and Al Blumstein), came to OR after completing degrees in other fields. However, remember that the two youngest were 77 in 2011. Many were introduced to OR in World War II, and their contributions helped change that conflict's outcome.

Some personal and professional vignettes from the book follow. P. M. S. Blackett (born in 1897) was a naval cadet at age 12 and emerged from World War I as a British Navy lieutenant. In 1934, he was asked to participate in a study of what would become radar. By the time World War II started, he had organized and was running the first OR unit, also known as Blackett's Circus, developing antiaircraft defenses and then defenses against U-boats. He was a pragmatist, a firm believer in data-based decision making, and a confirmed socialist in his political outlook.

Bill Cooper, a true child of the Great Depression, dropped out of high school in Chicago to go to work when his father's business failed. He learned how to fight and became a boxer to survive. He also set bowling pins and worked as a caddy. One day in 1932, he hitched a ride to a golf course with Eric Kohler, an accountant; Kohler was so impressed by Bill's erudition that he paid his tuition at the University of Chicago. Bill started in physical chemistry but wound up in economics after taking a part-time job at Anderson & Co. World War II, during which he served as the principal economist for the government's Bureau of the Budget, interrupted his PhD studies at Columbia. After completing his PhD, he taught at the University of Chicago but was hired away by Carnegie Mellon, where he became the leader of the OR faculty and began his legendary 40-plus-year association with Abe Charnes. At 90, Bill was still regularly going into his office (at the University of Texas at Austin, to which he had moved in 1980).

Murray Geisler's career is typical of the people who, in the early 1940s, were in or just out of college and wound up in OR. His assignments included positions at the Office of Price Administration (OPA), meteorologist for the US Army Air Force, and analyst at the Pentagon. After World War II, he worked with George Dantzig on Project SCOOP in the Pentagon; he later worked at the Rand Corporation. At age 43, he took a leave of absence from RAND to study for a PhD in statistics at Stanford. He concluded his career at the Logistics Management Institute (LMI) as the guru of OR in logistics.

John Magee was 18 when World War II ended, and a Harvard MBA at 21. Unlike almost all of those profiled, he never completed a PhD. He wanted to work in industry. He joined Johns-Manville but was soon plucked from there when Harry Wissman, an Arthur D. Little industrial economist, found his résumé among Harvard alumni with strong backgrounds in both business and mathematics. In 1950, Wissman was tasked with setting up an OR group and offered Magee a position as an analyst. Magee's acceptance changed his career and led to his being appointed president of Arthur D. Little 20 years later. In his years as an analyst, he was known for his contribution to production planning and inventory control.

Andy Vazsonyi was a Hungarian mathematician who managed to emigrate to the United States before World War II reached his homeland. At age 16, he had already solved Fermat's famous 1643 problem, which is the basis for modern facility location. Andy worked in industry for 25 years and also in academia; he was a strong early advocate of using computing

and spreadsheets in OR. He was also known for his puckish humor. For example, he argued that "models and sausage machines are alike. They both transform inputs into outputs" (p. 284). He originated the Gozinto diagram to illustrate the flow of parts in a production problem. He prided himself as having been the first past president of an organization (TIMS) without ever having been its president. His autobiography, *Which Door Has the Cadillac*, describes the optimal strategy for playing the American television game show, *Let's Make a Deal*. However, he was unable to convince his boyhood friend, the famous mathematician Paul Erdös, that the solution was correct.

I believe that beyond reading *Profiles in Operations Research* for personal pleasure, this book should be standard reading and discussion material in the first doctoral seminar for our graduate students. It will give them a broad picture of how the ideas that we now take for granted in our field came to be and the often serendipitous ways that the results were obtained.

Yes, I know that the $99 price for an 867-page volume is much greater than people in our profession usually spend on a book. However, remember that widely adopted OR introductory textbooks list at over $200 today. So, obtain your copy of this book. It will be well worth your investment.

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Simchi-Levi, David. 2010. *Operations Rules: Delivering Customer Value through Flexible Operations*. MIT Press, Cambridge, MA. 256 pp. $29.95.

This is an excellent book! The reader who is truly interested in operations management should consider buying it. It is insightful, deep but not technical, to the point, and illustrated with many interesting examples. I believe it fills an important gap between general management books, which often oversimplify in trying to sell a single concept, and technical books, which try to be exhaustive in covering all topics and get lost in details.

In my opinion, the book's key theme is alignment. It focuses on the need for alignment between business strategy and operations strategy, and specifically on the importance of supply chain strategy. In the current global competitive context and the commoditization of products and services, supply chain management becomes a key differentiator. It is the link between strategic intent (i.e., what a company states it wants to do) and operational reality (i.e., what the company is able to do day to day). That link needs to be carefully designed into the system by taking advantage of modern technology. It does not happen automatically. All too often, we observe a big disconnect in practice; the book argues correctly that this can soon turn out to be extremely costly. Unfortunately, in today's business and educational world, people use buzzwords and expensive business speak and freely juggle empty concepts—such as agility, flexibility, resilience, or (add your own as you please)—when making strategy presentations; however, a quick look at the reality of operations will show that no clear operational translation of these concepts exists.

Although strategies can be changed overnight, operations are slow to change. Obviously, performance comes from operations, not from a strategy presentation. Unfortunately, the business world and students in operations or supply chain management do not realize the importance of coherence between strategy and execution to the sustainable success of a business. They fail to see that this is a complicated science that requires serious study instead of an accumulation of the right set of buzzwords. The value of this book is that it makes this point, whereas offering many opportunities to develop the deep knowledge that is necessary.

This book will be useful to executives who need to learn about the importance and intricacies of supply chain management, to MBA students who need to understand how they can leverage operations to realize strategic objectives, and to technical operations staff and students who need to see the bigger picture and make the case for the value they bring to a firm.

The book starts with an introductory chapter on the value of operations in today's businesses. This sets the right context. Part I covers operations strategy; Chapter 2 deals with the link between customer value and operations strategy; and Chapter 3 discusses matching products, markets, and strategies. Although these are relatively standard chapters in terms of topics, the book contains specific chapters (4, 5, and 6) on important and newer issues in global supply chains. These

chapters deal with procurement and supply contracts, risk mitigation strategies, and the role of information technology, respectively. Part II proceeds to address flexibility as the key enabler to make the dynamic link between strategy and operations. Chapters 7, 8, and 9 address system, process, and product design flexibility, respectively. Part III is particularly interesting because it covers emerging trends, thus giving a nice forward-looking aspect to the book. Chapter 10 covers the effects of oil price volatility, whereas Chapter 11 discusses corporate responsibility and its potential future impact on business. The book concludes with a chapter on barriers to success.

This final chapter is useful because it makes the link with the book's fundamental premise. Indeed, the author's premise is the increasing strategic importance of supply chain management as the link between strategic intent and day-to-day operational reality. The author also posits that in today's world, supply chain management is complex and dynamic, not just a collection of flavour-of-the-month buzzwords. A simple way of stating this is to talk about the maturity of supply chain management. Many companies are immature in that they still believe in one-size-fits-all static solutions. Unfortunately, consultants and many software applications enforce both this and the belief that one can outsource supply chain decisions, which they perceive to be tactical at best. This book argues successfully that supply chain management is strategic and requires deep knowledge and consistent and hard management decisions at the highest level.

Operations Rules: Delivering Customer Value through Flexible Operations succeeds in its purpose because of its style and correct level of detail. It continuously introduces a concept, illustrates it with a telling example, and then summarizes the learning in a useful rule. It also contains many two-by-two tables that show how many concepts and issues in supply chain management require choices that are in line with the company's strategic positioning. Unfortunately, one cannot have it all, as many textbooks or consultants like to propose. By doing so, this book successfully lays out the strategic role of operations and supply chain management.

It follows from the above that I really like this book and strongly recommend it to all. However, as a good academic, I can also be critical of some parts. So what bothers me? As a European, the sometimes pushy style is a bit too much. Consider the following quote: "Ignore these rules and you will find yourself heading toward failure. Follow them, and you will steer yourself away from predictable problems and toward an operations strategy that drives real business value" (p. 10). This book does not need this type of superficial consulting-speak language, which it successfully refutes with its depth and clarity of insight. Some chapters are also less developed than others. I believe that the section on flexibility could have been stronger. Finally, one might also get the feeling that the book focuses too strongly on consumer products and services and does not discuss other sectors deeply enough. Perhaps, this is because the need for supply chain expertise is more obvious in consumer industries.

However, these critical remarks do not in any way diminish the value of this excellent book. It is timely, insightful, well written, and fills a big gap in literature. Bravo.

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Altay, Nezih, Lewis A. Litteral, eds. 2011. *Service Parts Management: Demand Forecasting and Inventory Control*. Springer-Verlag, London. 325 pp. $179.00.

Service Parts Management: Demand Forecasting and Inventory Control covers a wide spectrum of relevant issues on spare parts management. With contributions from some of the most active researchers in this field, the book provides a great foundation for academics who want to explore this field in detail and offers useful advice to managers. A number of chapters discuss empirical findings; however, because most of the content is quite technical, the reader should have some training in mathematics and statistics to effectively use it.

Topics discussed include various types of demand categorization, forecasting (Croston, Syntetos Boylan, bootstrapping, Bayesian, decision trees), inventory control issues (order and disposal decisions), and general guidelines. The material is somewhat scattered and the links between the chapters are sometimes

unclear, as is often the case in books that combine contributions from many authors. I would advise reading the chapters in the following order: general forecasting issues (Chapters 1–2), forecasting classification (Chapter 10), specific forecasting methods (Chapters 3–6 and 8), stock control (Chapters 7, 9, and 11–13), and managerial guidelines (Chapter 14).

The introductory sections of each chapter are repetitive. They might have been combined in a more extensive general introductory chapter; however, the format used could be helpful to a reader who wants to read only selected chapters.

In conclusion, the book offers practitioners and researchers a reasonably complete and good overview of relevant issues in spare parts management. Moreover, many chapters have relevance beyond service logistics, because other industries must also cope with the slow-moving and uneven nature, which is typical of spare parts demand, of many of their stock-keeping units (SKUs). Although such SKUs often represent only a small part of the total revenue, they may account for up to 60 percent of total stocking costs, as some of the book's contributing authors explain. *Service Parts Management: Demand Forecasting and Inventory Control* makes a contribution in the areas of forecasting and inventory control of such SKUs and particularly of spare parts. In addition, it shows that many opportunities for further research remain.

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Derhy, Marie-France. 2010. *Linear Programming Sensitivity Analysis and Related Topics*. Prentice Hall–Pearson, Harlow, UK. 464 pp. $92.50.

Linear Programming Sensitivity Analysis and Related Topics is an introductory textbook on linear programming (LP). As the author notes, she wrote the book with the needs and questions of students in mind. Her pedagogical considerations led to the circular approach that the book follows. It introduces the reader to a set of applications, which serves as a platform for illustrating the various topics. It then revisits these applications, each time from a different perspective, thus using a familiar framework to introduce new techniques. This approach motivates the reader to focus on the subjects presented; with each revisit, the author poses new questions about a known application, stimulating the reader's interest on the specific technique that addresses these questions.

The book has three parts, preceded by an introductory chapter. The introductory chapter explains LP and previews some of the issues analyzed in subsequent chapters. It introduces modeling using LP, provides a visual example of a(n) (in)feasible problem, and presents a graphical (elementary) approach to sensitivity analysis, including some key questions that LP can answer. It references the simplex method, introduces LP solvers (mainly LINDO), and presents structure-specific LP problems, including the transportation and assignment problem. It also acquaints the reader with binary integer LP and some fundamental algorithmic problems of graph theory (e.g., shortest route, minimum spanning tree). The chapter concludes by showing how the book can facilitate various course structures. For example, it suggests two alternative paths for visiting the material discussed in the first part of the book. Each path serves a distinct learning objective by focusing on different aspects of the material and reading the chapters in a different order. Thus, an instructor can tailor the book's contents to emphasize the material that he (she) considers important to a specific audience.

In the first part of the book, the author presents the fundamental concepts of LP. She starts with toy applications that are modeled as two-dimensional linear programs and uses the graphical approach to expose the reader to basic notions such as convexity, proportionality, feasibility, and optimality. She solves these simple linear programs graphically and calculates shadow prices. Interpreting the results in terms of the original applications emphasizes the wealth of information that LP provides and motivates the reader to study the more technical chapters that follow.

The next chapter introduces the simplex method and includes a thorough presentation of both of its phases; the author modifies an application, which she modeled as a two-dimensional linear program in the previous chapter, to include an extra variable and solves it to optimality. The book highlights the interpretation of the information provided by the simplex tableau. It discusses and analyzes optimal solutions, slack and surplus variables, shadow prices, and reduced costs, and also includes a description of

the revised simplex method. Notions such as alternative optimal solutions, infeasibility, unboundness, and degeneracy and their diagnosis through the simplex tableau are topics of another chapter, which clearly presents each case using a numerical example. I disagree with the position taken that degeneracy and cycling rarely occur in practice. I also find that the presentation is missing a description of a standard anticycling rule (e.g., Bland's rule).

The next two chapters are among the book's highlights. In the first, the author analyzes the relationship between the primal and the dual problem. The theoretical analysis includes weak and strong duality theorems and the complementary slackness theorem (easy-to-follow proofs accompany all theorems). On the practical side, it teaches the reader how to derive the dual of any linear program. The chapter ends with a presentation of the dual simplex method.

The second of these two chapters is devoted to sensitivity analysis. It provides a detailed explanation of the ranges of optimality and feasibility, describes how to calculate these ranges, and discusses the effects of changes in the coefficients of the objective function and right side on the optimal basis. It shows how to restore feasibility through the dual simplex method and examines cases such as the introduction of a new variable and (or) new constraint into the model. In addition, it examines the effect of simultaneous changes to both the objective function coefficients and (or) the coefficients of the right side. I suggest that a formal treatment of parametric programming would complement the material presented in this chapter.

The first part of the book concludes with an application-oriented chapter that considers various applications of LP, including staff scheduling, production, finance, advertising, and efficiency problems. However, the most useful part of this chapter describes the use of software packages, EXCEL and LINDO, to solve linear programs. The author does a good job of interpreting the output; the reader learns how to extract the information illustrated (e.g., optimal solution, shadow prices, reduced costs) and to recognize cases of multiple optimal solutions, unboundness, and degeneracy, which were discussed in previous chapters. Given that an analysis of the output is essential in decision making, I consider this chapter to be an asset of the book, especially because few LP books include similar chapters.

The second part of the book helps the reader to obtain a broader view of LP. It presents integer programming at an elementary level, shows how to use LP to model a two-person zero-sum game, and gives a standard treatment of the transportation and assignment problem. It also presents fundamental problems on graphs and networks (e.g., maximum flow, shortest route, minimal spanning tree), models most of these problems as linear programs (thus demonstrating the expressive power of LP), and describes standard combinatorial solution algorithms. I think that a reference to the computational complexity and the proofs of the correctness of these algorithms is missing, although including such a reference might be beyond the book's scope.

The third part of the book deals with mathematical considerations related to some topics presented in previous chapters. These include examining the maximum-flow minimum-cut relationship in a network through a primal-dual prism, applying sensitivity analysis to the shortest-route problem, and presenting cluster analysis as another approach to the minimal spanning tree problem. This last chapter also touches on the topic of quadratic programming.

Marie-France Derhy has written a book that crystallizes her many years of experience in teaching LP. The effort she took to motivate and guide the novice to develop insights on LP is evident in many parts of the book, making it most suitable for a crash course on LP. Its structure will also assist an instructor in designing an LP course; each chapter contains a short summary of its contents, a series of objectives, and several exercises; solutions to selected exercises are presented at the end of the book. A short review chapter includes basic material on matrix algebra and partial derivatives. The instructor's manual and PowerPoint slides are additional optional resources that can be ordered from the publisher.

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Monmarche, Nicolas, Frederic Guinand, Patrick Siarry, eds. 2010. *Artificial Ants: From Collective Intelligence to Real-life Optimization and Beyond.* Wiley, Hoboken, NJ. 576 pp. $200.00.

Ant algorithms is one of the nature-inspired techniques to which researchers in mathematics, computer science, engineering, and other disciplines have devoted a lot of attention over the past two decades. They have used these algorithms to solve a range of search and optimization problems both in the discrete and continuous domains. Several variants of ant algorithms exist, including ant colony optimization, ant systems, and max-min ant systems, all of them inspired by the behaviour of real ants and their self-organization ability. The number of research articles and books about this topic is considerable. Ant algorithms can be considered part of swarm intelligence, which refers to those algorithms that mimic self-organization for problem solving inspired by the social behaviour of insects, birds, and fish.

Artificial Ants is a collection of 21 short chapters that provides an overview of the principles and fundamentals of this technique and a series of case studies detailing the implementation of ant algorithms to solve specific problems. Although this is an edited book, the majority of its chapters have one of the editors as a coauthor. The book is an English translation of the original French version (Monmarche et al. 2009). The first two chapters provide introductory material and basic principles. The next three chapters provide a brief review of the implementation of artificial ant algorithms to particular types of problem-solving contexts—combinatorial optimization, continuous optimization, and constraint-based problem solving. Each of the other 16 chapters focuses on describing the application of artificial ant algorithms to a specific problem. The range of problems covered includes manufacturing, image processing, classification, telecommunication, games, language processing, art, and design.

Most books published on ant algorithms and related topics are edited collections of research articles; some include a few introductory chapters. *Artificial Ants* is yet another edited book that follows this style. Unfortunately, the reader who is seeking a more in-depth and integrated coverage of this nature-inspired technique must still rely on the one or two authored books that have been published previously. Nevertheless, this book is a good review of what can be done with artificial ant algorithms. Each problem-specific chapter provides details of modelling, design, and implementation issues. However, some readers might perceive the book as repetitive because it replicates some concepts and principles in many chapters. The five first chapters are general; therefore, readers who are new to this field might well view them as the most valuable. However, the rest of the book contains little material that differs significantly from other edited books and conference proceedings available on the topic.

Because the original version of this book was written in French, most of this book's authors are affiliated with French academic institutions. In the introduction, the editors acknowledge that the book seeks "to take a stock of the research progress, particularly in the French speaking community" (p. xvii). Perhaps for this reason, the presentation style of some chapters appears to be less concise than one would expect; this is understandable because of the difficulty of translating while maintaining content integrity. Indeed, the writing style is sometimes wordy and elaborate in expressing ideas and arguments. Because some readers might enjoy this style of writing, this is not a major weakness of the book. However, some readers might complain that most problem-specific chapters concentrate on describing the implementation of the artificial ant algorithm without comparing it to alternative techniques. As noted above, the book serves the purpose of surveying what can be done to use artificial ant algorithms to solve search and optimization problems.

In summary, *Artificial Ants* is a useful collection of short articles on artificial ant algorithms. It includes two chapters with brief descriptions of basic concepts, principles, and methodologies. Three chapters have useful surveys on the application of these algorithms to combinatorial, continuous, and constrained problems. The other 16 chapters are research accounts detailing the application of artificial ants to specific problems. This edited book is comparable to other collections of research articles available on this topic.

Reference

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