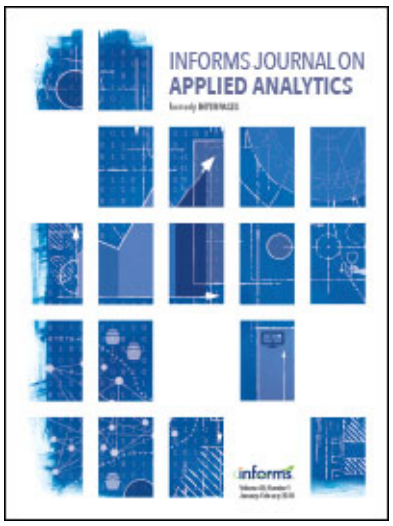

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Book Reviews

Wenjing Shen

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Book Reviews

Wenjing Shen[a]

[a] Department of Decision Sciences and MIS, LeBow College of Business, Drexel University, Philadelphia, Pennsylvania 19104
Contact: wenjings@drexel.edu (WS)

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Abstract. 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 email 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*, 48(6), November–December: *Sustainable Operations and Supply Chain Management*, Valeria Belvedere and Alberto Grando; *Taming the Sun: Innovations to Harness Solar Energy and Power the Planet*, Varun Sivaram.

Belvedere, Valeria, Alberto Grando. 2017 *Sustainable Operations and Supply Chain Management*. John Wiley & Sons. 242 pp. $84.95.

The objective of *Sustainable Operations and Supply Chain Management* is to generate an increased awareness of the challenges related to the principles of sustainability, especially for the next generation—the generation that will lead and change the world in the near future. The book has eight chapters; Alberto Grando wrote Chapters 1, 2, 3, and 7, and Valeria Belvedere wrote Chapters 4, 5, 6, and 8. The organization of the sections within each chapter is such that a reader can easily follow the material.

The sequence of the issues discussed is meaningful, and the book is structured well. It uses the sustainability construct as the basis for all data. The title of the first six chapters starts with either "sustainability" or "sustainable," thus showing the basis of the studies reviewed. The first chapter presents a general picture by using actual statistics to frame operations and supply chain management from the perspective of sustainability. This chapter, like the other chapters, begins with an introduction that includes quotations from the chapter. In Chapter 1, the concepts of climate change and megatrends are explained, and the relationship between these concepts and supply chain management is stated in an understandable way. The relationship between sustainability and demographic evolution, urbanization, the emergence of new consumers (e.g., in nonwestern countries), smart technologies, and digital factors are also discussed. The authors are clearly trying to examine and understand the sustainability phenomenon from various perspectives.

Chapter 2 and Chapter 3 begin with examples from global companies that are concerned about and trying to address these issues. Chapter 2 provides information about the relationships among sustainability and logistics, operations management, and supply chain management. It also tries to highlight to the critical differences between these three constructs. Chapter 3 then provides information about sustainability and environmental issues, including eco-efficiency and eco-effectiveness. The role of procurement is analyzed in Chapter 4, and the circumstances surrounding sustainability and production are explained in Chapter 5.

The remaining sections discuss the application of sustainable operations in actual situations. Chapter 6 includes material about social aspects, physical distribution, warehouse management, and packaging issues. Chapter 7 contains illustrations about reverse flows and closed-loop supply chains, and finishes by addressing value creation through sustainable recovery options. Chapter 8, *Measuring Sustainability*, aims to define and clarify the ideal measurement of the core issue—sustainability.

An important benefit of the book is that it is both comprehensive and relevant. Its contributions to the literature about sustainability and sustainable operations include the necessity of thinking in terms of sustainability to ensure the survival and health of future generations. Applying the concepts of sustainable operations, not only the concepts, is a requirement that should underlie all decisions made by government, and in many situations, by corporations. This book predicts the future of sustainability because all chapters include forecasts that are based on historical statistics. Virtually all chapters of this book include unique contributions by the authors, thus making it suitable as both a literature review book and a textbook.

Finally, the authors are aware that the younger generation—their students—are the owners of the future; thus, they attach importance to the opinions of

this generation. They thank their colleagues, managers, and guest speakers from public and private institutions; but, most of all, they express appreciation to their students, who help them to understand the relevance of sustainability from the perspective of that generation. It is important to understand the effect this younger generation will have on the survival of our planet and all of its resources. The format of this book is such that members of this generation can easily understand it and thus be enlightened about the issues pertinent to their future.

Y. Galip Gencer
Department of International Trade and Finance, Yalova University, 77200 Yalova, Turkey, yggencer@yalova.edu.tr

SIVARAM, VARUN. 2018. *Taming the Sun: Innovations to Harness Solar Energy and Power the Planet*. MIT Press. 371 pp. $29.95.

There is little disagreement today among knowledgeable observers that the climate change problem is both real and likely to be extremely damaging to our planet unless we act now to address it. Addressing the problem efficaciously involves taking action along many different dimensions. One such dimension concerns the use of renewable energy sources. Simply put, we want to encourage the use of renewable energy sources to gradually phase out—if not totally replace—the extensive current use of fossil fuels. Solar energy is a salient source of renewable energy; therefore, many researchers have sought to study the ways in which the sun can be tamed to power our planet.

The author of this book reminds us that the significance of the sun as an energy source notwithstanding, we are currently ill equipped to harness irregular sunshine to meet most of our energy needs. Hence, more research and policy actions are needed to harness the sun's enormous energy. Below, rather than provide a tedious chapter-by-chapter review, I sample selectively from the book's contents. This should give the reader an adequate flavor for the book's intellectual contributions.

In the first of its four parts, this book asks the reader to contemplate two vastly different futures. In the first, cities around the world will be choked with pollution and humans will suffer from calamitous climate change. In the second, the world will be in a position to deal with a range of environmental and other challenges. Which of these two possible futures will materialize? The answer will depend fundamentally on "how well humanity can harness solar energy" (p. 1). In this regard, we are told that solar energy is now one of the world's most important technologies and that this technology gives us a fighting chance to effectively fight the climate change problem.

The author emphasizes the need to invest significantly in the construction of new solar capacity; however, he warns that even if this new investment is forthcoming, the rise of solar photovoltaic (PV) panels could result in its own undoing. Why? Because as the cost of producing solar power gradually declines, the *value* of consuming the electricity that this solar power generates may diminish as more of this electricity is connected to the grid. This can happen because additional solar panels will "supply power in excess of customer demand in the middle of the day and because high levels of solar power [will] strain power grids around the world, requiring costly solutions" (p. 57). This is the "value deflation" phenomenon, and the author urges us to keep this phenomenon in mind in all of the endeavors that we design to tame the sun.

To increase our current solar PV capacity, it will be necessary to provide massive amounts of new capital investment. One way to do this is to tap into *public* capital markets and not rely primarily on private sources of capital. Taking stock of the present situation, the author notes that the solar industry "now appears to be on track to balance financial innovation with a lower risk appetite, which is promising" (p. 98). This notwithstanding, he urges the solar industry to focus on debt capital, and to embrace the notion of *securitization*. This is important because in a securitization, a solar provider "bundles a diverse portfolio of loans for rooftop solar installations into a special-purpose vehicle, which is a way to protect the loans even if the solar provider were to go bankrupt" (p. 101). Along with securitization, it is also important to promote the growth of what the author calls the "off-grid" solar industry.

The author acknowledges the present dominance of silicon solar PV. Even so, he reminds us that it is important to continue research designed to look for materials beyond silicon that can more efficiently convert solar energy to electricity. Otherwise, the solar industry may suffer a "technology lock-in." This means that "an incumbent, dominant technology gets an advantage against emerging technology upstarts" (p. 164). The need to escape lock-in arises from the possibility that upstarts may in fact be able to produce superior technology, but this technology may never be brought to market because "a free market. . .favors first movers" (p. 164).

A key point emphasized by the author is the importance of financial, technological, and systemic innovation in helping us to effectively harness solar energy. In this regard, a salient issue concerns the *size* of the grid. Specifically, should the size of the grid be expanded to capture sunlight wherever the sun is shining? Or, alternately, should the grid be smaller so that the generation and consumption of electricity can be decentralized using smart-grid technology? After discussing the pros and cons of both types of grids, the author suggests that a hybrid grid might be the best way forward. This is because a hybrid grid will "both increase regional connectivity and decentralize control over power supply and demand" (p. 219). As a result, it will be possible for

communities to rely on themselves when they face disruptions to long-distance power flows.

In the fourth and last part of this book, the author makes three significant points. First, he argues plausibly that one of the best ways to address the problem of solar energy's intermittency is to combine solar PV with energy storage. Second, we are told that if we are to achieve deep decarbonization, then we must understand that contemporary markets suffer from a "missing money" problem (p. 240). This means that such markets "fail to pay enough to flexible-base plants such as nuclear reactors and fossil-fueled plants. . .for investors to want to build more" (p. 240). Finally, we learn that the U.S. government needs to do a much better job than it currently does in promoting both basic *and* applied scientific research. In the author's words, it is important to include "applied R&D alongside basic science in the government's portfolio of support for innovation" (pp. 259–260).

Let me conclude this review with the following four points. First, although this book talks a lot about "value deflation," its author could have done a better job of explaining the myriad effects of this notion. Second, the book recognizes the salience of governmental support for applied innovation; however, it appears to underestimate the difficulty of "picking winners" and, as such, devotes insufficient attention to describing exactly *how* the government should support applied innovation. Third, on a few occasions, the book devotes too much attention to the minutiae of alternate ways of harnessing solar energy. Finally, the preceding three points notwithstanding, this is a thoroughly researched and well-written book that provides readers with an excellent account of the important role that solar energy can play in addressing the climate change problem.

Amitrajeet A. Batabyal
Department of Economics, Rochester Institute of Technology, Rochester, New York 14623-5604, aabgsh@rit.edu