Operations Management and Sustainability

“Many companies still wrestle to fully understand the implications of sustainability for their operations and supply chain management practices. This situation is not surprising, given the systemic interdependencies around sustainability. Written by an international team, this book therefore aims to build more comprehensive theory in this area, as well as offering practical solutions. The editors are to be congratulated for having put together such a timely volume.”

—Lutz Preuss, Professor of Strategic Management,
University of Sussex, UK

“This is a comprehensive book on an important and highly complex topic. It brings together findings from a variety of research projects in the area of Sustainable Operations Management, employing different methods and theoretical perspectives, and covering different sectors and industries. The book presents an overarching, systems perspective on the topic, providing coherence across the different contributions.”

—Annik Magerholm Fet, Vice-Rector and Professor,
Norwegian University of Science and Technology, Norway

“This book provides a helpful collection of sustainable operations management chapters. It will be of interest to researchers and reflective practitioners alike, clustering topics around strategy, theory, practice and capabilities. Acting responsibly on sustainability issues is arguably the biggest challenge facing operations and supply managers, and indeed the world’s population as a whole. The book is both timely and relevant.”

—Helen Walker, Professor and Chair of Operations and Supply Management, Cardiff Business School, UK
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Dear reader: thank you for taking an interest in our book on sustainable operations management! This is an edited book about what we and our co-contributors believe to be a topical and highly important issue. We also realize that this is an issue with political overtones that may cause divides and heated debates. Despite several global warnings and calls for action with respect to becoming more sustainable, disagreement and even resistance remains towards the call for action towards more sustainability and the urgency for action. The dissent has moved from outward rejection of any

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climate change happening, to a discussion regarding the impact of this change on society (Lomborg, 2010). Currently, the debate revolves around whether we understand how and to what extent the current rate of natural resource exploitation affects global climatic conditions, how much and at what rate it will affect us and which route is the most promising to follow in order to become (more) sustainable. Take the case of the Trump administration, which repeatedly has expressed skepticism towards climate change and has withdrawn the United States from the UN climate negotiations. Consequently, the US presidential administration has removed sustainability from the agenda of political aims for the United States and is currently considering rolling back the greenhouse gas emission policies that were put into action by the former president, Barack Obama. Meanwhile, the depletion of resources and the unintended consequences of unlimited growth in production and consumption are increasingly recognized in other parts of the United States and by stakeholders in other societies in-and outside the United States.

We side with the latter side of this debate. In our view, it takes a considerable amount of human resolve to overlook or ignore the consequences of ongoing depletion of natural resources. We are not alone. In most parts of the world, there is an increasing political and public pressure towards improving sustainability in operations from all levels of society. There is an ongoing mental transition from what Kenneth Boulding (1966) in his famous essay on “spaceship earth” named the “cowboy economy”, building on the notion of illimitable plains, where human society can move when the current area’s resources are exhausted, towards a “spaceman economy”, in which resources must be reproduced and recycled as no resource is really unlimited. Although this high-level notion was formulated more than 50 years ago, there has been little agreement among constituents on how to proceed. Several international organizations have provided evidence with respect to the dire climatic consequences of pursuing the existing depletion patterns and how this is already impacting and will impact on societies of the future. Several of the UNs 17 sustainable development goals, formulated in 2015, speak directly to these issues, emphasizing a precautionary approach to environmental challenges and encouraging the diffusion of environmental-friendly technologies.

This book is written both for researchers exploring sustainable operations management as a research field and for reflective practitioners, seek-
ing more insights into the nature of sustainable operations management. We hope you will find this book both illuminating and useful for grasping the current state of the art in sustainable operations management research. We would also like to take this opportunity to thank the contributors to this book and the many people who have been involved in reading and commenting on drafts to chapters and so on.

1 Background

For most societal actors, but not least for businesses, sustainability has moved from the periphery to the core. According to the most recent global survey conducted by McKinsey & Company consulting firm (2017), nearly 60% of the more than 2400 respondents asked, report that the organizations they work for are more engaged with sustainability issues than they were two years ago. Companies are focusing on sustainability as a way forward, not only to meet challenges but also to transform these into a profitable and competitive advantage. Furthermore, when asked about the top reasons for addressing sustainability, an increasing number (46%) tick off the organization’s goals, mission or values. Also, expectations of customers and employees towards the organization rank among the important reasons for the firms, which are more engaged than previously in sustainability. In addition, several sustainable technologies have surfaced and become mainstream or serious alternatives to less sustainable options. This includes for instance technologies related to renewable energy, transportation and recycling, but encompasses also a wide range of technologies, which indirectly helps in supporting the minimization of waste, such as data analytics and automation technologies.

However, it seems that many of the initiatives seen are driven from issues pertaining to risk, to external constraints of businesses (such as tougher regulations) or from customer monitoring. Deploying sustainability as a principle for increasing the profitability of business—either through recouping resources and minimizing waste or by developing new products seems to be seen as less achievable than previously (see Fig. 1.1).

In general, the results from a global survey by McKinsey & Company consulting show that although internal operations is one area where sustainability is formally integrated, companies struggle with integrating
sustainability into the operations that extend the corporate boundary, such as procurement and supply chain management. Approximately one out of every four respondents in the survey reported that sustainability was not formally implemented in their company. These findings from the McKinsey survey support the conclusions made by other investigations into the transformation challenges facing companies seeking to develop their abilities within the management of sustainable operations (Loorbach, 2010). Although there is a strong willingness and broad support towards developing more sustainable business models, the challenge of integrating sustainability into the existing way of doing things remains a challenge.

We believe this is the case because transformation towards sustainability is a systemic challenge, calling for fundamental and synchronized changes throughout a widespread network of business actors involved. Rather than seeing sustainability as an organization’s quality (i.e. as an organization being sustainable in its internal operations), sustainable operations can be viewed as an ongoing process constituted through the dynamic relationships between organizational elements. As pointed out by Bateson, a strong proponent of systemic thinking and cybernetics, the unit of survival is a flexible organism-in-its-environment (Bateson, 1973, p. 426). Thus, processing for instance the “ocean garbage patches” (the
plastic waste found in the oceans) is not simply a question of finding a way to collect and reuse the plastic. Currently, the Great Pacific patch, one of five ocean garbage patches, is estimated to weigh 80 million tons and covers an area three times the size of continental France (Chen et al., 2018). Trying to recycle or even upcycle this amount plastic calls for system-wide adjustments in the global production and consumption network involved in the processing. It is not a question of finding one solution, but rather for a range of different organizations—each occupied in its own organizational niche, to co-adjust behaviors. Hence, not only a single or organization's behavior must change—so must the way this and other organizations relates to their specific context. Rather than seeing all organizations as facing the same challenge or seeing the challenge in the same way, an organization interacts and co-specifies its specific part of reality. Taking this view clearly complicates matters. First, understanding the impact realized from any initiative towards sustainability is not an easy task. There are intended as well as unintended consequences of actions which at first glance may seem as a straightforward way to increase sustainable consumption and reduce the impact on the world's scarce resources. One example concerns initiatives from developing biofuel from renewable sources such as corn, which effectively led to rising food prices and deterioration of soil qualities. Another example concerns the ongoing controversy regarding the sharing economy and whether is actually helps or hurts a sustainability agenda (Frenken, 2017). Second, there is the problem of value creation and value capture from sustainable operations. As pointed out by Beer (1981), viable systems both exist within larger viable systems and may contain viable sub-systems themselves, each interacting with its respective task environment. This is the general notion of recursiveness. Often, business actors do not see clearly the wider context of the system in which they are embedded and how sub- or meta-elements constitute task environments. Hence, for the operations managers at the now defunct company Better Place—which sought to develop a business model for recharging batteries for electric vehicles that could also be part of an intelligent power grid—this turned out to be underestimating the challenges of relating profitably to the niches of car manufacturers and power grid companies. In many ways, the Better Place case is one of operations management myopia—the inability to
engage a sufficiently wide lens in trying to understand how attempts to create systemic changes in business operations affects value creation and value capture. The myopic nature of firms—or any viable system for that matter—is well explained by Cyert and March (1963) and can be seen as both a blessing and a curse. On the one hand, and blending in Stafford Beer’s terminology, firms need to shield themselves from the overwhelming variety of “disturbances” coming their way. They will primarily act on “evidence based”, short-term feedback loops, trying to stick to the current strategy as long as possible (Cyert & March, 1963). On the other hand, firms need to be able to detect (perhaps slowly) failing current solutions and develop new ones in order to reinstate stability for the firm. This requires (at least temporarily) suppressing their entropic, myopic approach and gaining a better understanding of how the firm is embedded in a larger system. (Adner, 2012).

This conundrum calls for further conceptualization and research into the challenges of sustainable operations management. As we see it, the problem of integrating sustainability into the management of operations is a key issue for business to press forward and realize the strategic promises. Furthermore, there is a direct link between Boulding’s notion of the “spaceship earth economy” and the way sustainable operations management must be thought of in an organizational and wider business network or “ecosystem” context.

Drawing on insights from complexity theory and cybernetics, it can be argued that the failure to make a transformation from the current economic growth paradigm into a paradigm of resource preservation and reuse relates to the limited ability of the current socio-economic system to engage the interests and concerns of actors beyond narrow profit concerns (Espinosa, Harnden, & Walker, 2008). The traditional systems for governance and control have proven ineffective or weak in creating sufficient participation from economic actors. This is despite growing concerns about the state of the environment in broad areas of society. Hence, trying to install sustainable operations management principles through traditional means, such as controls through installing metrics and measures for performance, is an unengaging exercise, more often than not ending in obscurity. As pointed out several times, complex challenges such as the systemic challenges of transforming an entire production
ecosystem tend to become oversimplified and rigid through complex measuring (Ariely, 2010).

An alternative paradigm that may help to embrace complexity and engage actors on multiple levels is developed from Stafford Beer’s notion of operational system viability or VSM (Beer, 1981). A viable system is a complex entity capable of maintaining an identity, while engaging in complex exchange with that environment. Hence, the structural coupling between entities comes to the fore in a system perspective and must depart from the particular contextual features of this context, rather than from an abstract notion of “environment”. In other words, engaging in system redesigns to achieve sustainable operations calls for understanding the systemic features of the system in question. This differs from other approaches to sustainable operations, which characterizes sustainability as the competence or trait of a single organizational entity.

As briefly touched upon earlier, when discussing the myopic nature and behavior of firms, system viability is obviously closely linked to sustainability: both depart from the notion that organizational entities belong to an environment and that their interactions and structural couplings with this environment co-specify how they interact and in turn co-constitute the reproduction of both organizations and the environmental sub-set they inhabit. Also, both perspectives take into account that the lack of viability of any system means the cessation of that particular form (Espinosa et al., 2008). It follows from a complexity perspective that the different elements that constitute the viable ecosystem must relate to each other in a different manner. Creating sustainable operations must start with the realization among actors that all actions have system-wide ramifications and ongoing collaboration and co-constitution is necessary for the results to gain fruition. Next, widespread self-regulation, with an eye on how actions constitute the reality for an immediate task environment rather than following abstract goals, is probably a second issue. Take as an example of these principles the calls for buying and retailing local organic produce by retailers. Empowering local retail supports local capacity building, increases consumer awareness and commitment as well as reduces the cost of transportation, storage and handling of global goods (Caldwell, 2016). There is a meta-goal stated by the retail organization to increase the number of local suppliers suppling to the
store, but obviously, local store purchasers must make considerable adjustments with respect to their context and must participate and negotiate these conditions with central purchasing units. Thus, each retail store is structurally coupled and interacts with its own niche, but all are linked in a more abstract conceptualization of an environment. In order to manage sustainability, a corporate-wide control system must allow for local alignment in the viable systems (here the retail units) while maintaining an overall focus on increasing sustainability. More generally, the managerial and organizational mindsets undergirding sustainable operations management in particular contexts must start from an appreciation of how units interrelate in order to address what is perceived. Business networks comprise resources and activities controlled by different actors. However, they differ with respect to the structural coupling between these and thus also differ in the actors’ acknowledgement of what belongs inside and outside the boundaries of a viable system.

The present book builds on our notion that the cybernetic perspective constitutes a powerful way forward for sustainable operations management. However, it is also an acknowledgement that much insight and further conceptualization is needed before it is possible to build momentum for this idea in academic research. When it comes to sustainable operations management, theoretical development is still in its infancy. Paradigmatic closure is too early and there is a need for more theoretical diversity and discussion to avoid premature lock-in.

At the same time, we think grounding these discussions in a broader meta-theoretical framework building on the cybernetic notion of control is a way forward. The design of this book reflects this idea. We have developed a framework based on the contributions, which we believe offers them justice and creates synergy between the contributions. The four parts each reflect what are considered the principal questions for the development of a new management control paradigm vested in complexity or systems thinking. Continuing our use of systems thinking and cybernetics as the overarching perspective for this book, we use de Leeuw’s (1976) control paradigm to provide the internal structure of the book. More specifically, we consider the four necessary conditions for effective control as specified by this paradigm, and dedicate a separate part to each condition. Placing ourselves in the role of “controller”, aiming to make
Effective control leading to more sustainable operations

Part I: SOM Strategy and Management

Part II: Theory building within SOM

Part III: Selected practices, methods and tools for SOM

Part IV: SOM Capability development

Fig. 1.2 The conceptual relationship between the four parts of the book (building on de Leeuw’s (1976) control paradigm)

Our operation a more sustainable one, we need to fulfill the following conditions if we are to exert effective control. This model is presented in Fig. 1.2.

1. We need to have a goal, guiding us in our control actions. Hence, in the book, we address this condition in the first part of the book, dedicated to SOM Strategy and Management.

2. Second, we need a model of the system we try to control, helping us to understand how it behaves under certain conditions. Therefore, the second part of the book is dedicated to Theory Building Within SOM.

3. Third, we need information about the state of the operation and its current performance. Hence, the third part of the book covers Selected Practices, Methods and Tools for SOM, supporting the mapping and analysis of current practice.

4. Fourth, we need sufficient steering capability, in order to make progress towards reaching the goal. This condition is addressed in the final part of the book covering SOM Capability Development.
The notion of goals as the starting point for the layout of this book builds on the recognition that companies must also take sustainability issues into account in order to ensure long-term success and survival (Hart, 2015; Starik et al., 2017). Thus, in a sustainable business context, strategy and management research builds on more general insights from these disciplines but seeks to apply this in the context of sustainability. The first chapter in Part I outlines the current state of strategy research related to sustainable operations management and the three chapters that follow in this section deal with the flexibility of environmental regulations, organizational drivers and barriers to circular supply chain operations and the strategic impact of inconsistent norms in buyer-supplier relations in the apparel industry.

In Part II we are concerned with theoretical perspectives, as outlined in the cybernetic framework. Managers need a mental model in order to identify what they seek to influence and control in order to reach these strategic aims. There are also still many avenues to explore and considerable theoretical work to be done in order to further conceptualization and maturation of the field. Although these perspectives share similarities in some respects, they also differ fundamentally in others. The first chapter in this part outlines theoretical developments in the field of sustainable operations management. The remaining chapters in this part are concerned with business models in the circular economy and the enabling role of circular supply chains, disentangling sustainability-oriented innovation and how it links to environmental sustainability in the aviation industry. The final chapter in this part concerns the impact of negative social and environmental events on the market value of supply chain partners.

Furthermore, as displayed also in the model, Fig. 1.2, some idea of the present-day state of affairs is required to understand the starting point for management measures. This is the theme of Part III. It has also a strong emphasis on pragmatism, predominantly touring technical papers and best-case examples (Seuring & Müller, 2008; Min & Kim, 2012). For this reason, it has been heralded by managers and other practitioners. Much of the current research relating to sustainable operations management has its starting point in reports and studies of practical experiences with sustainable operations initiatives and draws general insights from these. Part III presents studies of the maximization of retained value of product recovery.
based on circular economy principles, sustainable intermodal train transport, mapping logistics services in sustainable production and consumption systems and finally, the green performance map.

Finally, dynamic alignment and co-constitution calls for learning and variety in the organizations involved, which is the theme of Part IV. This necessitates ongoing development of capabilities to meet the need for sufficient requisite variety. In this final part of the book, we focus on research that is concerned with the capabilities needed for organizational transition and integration of sustainability as an operations management principle. Part IV presents two contributions, concerned with different aspects of capability development, namely first linking green supply chain management skills and environmental performance and secondly, information exchange and processing in buyers and suppliers in green public procurement: an absorptive capacity perspective.

References


In the first part of this book, we shall focus on fulfilling the first necessary condition set out in our model for effective control of a sustainable operation practice, outlined in the introduction (see Chap. 1). We are concerned with the process of organizational goal setting. In order to give operations management control measures a sense of direction, some form of strategic goal setting is needed. The notion of goals builds on the recognition that companies must also take sustainability issues into account in order to ensure long-term success and survival. Thus, in a sustainable business context, strategy and management research builds on more general insights from these disciplines but seeks to apply them in the context of sustainability. Much of the debate on strategy formulation and goal setting within sustainable operations management departs from pre-existing models and theoretical perspectives on competitive strategy. However, as also discussed by Poul Houman Andersen in Chap. 2, additional sustainability models have been formulated as well, which seek to emphasize multiple goals for organizational strategy. Each of the three subsequent chapters in this section of the book provides a specific perspective on this issue.

Chapter 3, written by Ramakrishnan Ramanathan, is concerned with the role of environmental regulations. He explores and confirms the hypothesis that operations innovation is significantly higher in firms that face more flexible environmental regulations than in firms that face relatively more inflexible environmental regulations.
The purpose of the following Chap. 4, by Roland Levering and Bart Vos, sheds light on how organizations adopt and implement sustainable practices in order to support the transition towards circular supply chain operations. The research context is a so-called “Green Deal”, a Dutch government-supported program in which over 40 private and public organizations voluntarily committed themselves to a transformation towards a circular supply chain model.

The final Chap. 5 in this part by Ulla Normann Christensen is concerned with the set of norms governing the relational exchange between suppliers and buying companies and the changes to these norms brought about by the introduction of sustainability requirements. She finds that suppliers have experienced that the behavior of buying companies has become more transactional. The norm set of buying companies has changed and may be divided into two: a previous set of norms and a sustainability-related set of norms.