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Introduction: Innovation for Sustainability

Nancy Bocken, Paavo Ritala, Laura Albareda
and Robert Verburg

Rationale and Aims—Why This Book, Why Now?

Grand challenges such as climate change, economic and social inequality, as well as resource scarcity are increasingly recognized across the policy, business and academic domains (Ferraro et al. 2015). Scientists have described that we have entered a new geological epoch, the Anthropocene, by which the impacts that human development

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have caused on Earth systems are putting our resilience at risk (Steffen et al. 2011). In this regard, nine “planetary boundaries” (Rocktröm et al. 2009) are highlighted: climate change, rate of biodiversity loss, interference with the nitrogen and phosphorus cycles, stratospheric ozone depletion, ocean acidification, global freshwater use, land use change, chemical pollution and atmospheric aerosol loading. This analysis has been integrated in international studies such as the latest Intergovernmental Report on Climate Change report (IPCC 2018a) that shows the pressing need to limit global warming.

Indeed, the most pressing issue of all is the climate change, because it is intertwined with several other sustainability issues. The IPCC (2018a) is clear on the ever more pressing need to tackle climate change to curb further devastating effects, including reduced crop yields, increasing sea levels, coral bleaching, extreme weather events, increased water stresses and droughts, slower economic growth and more people living in poverty. In order to limit global warming as per the Paris Climate Agreements, policy and business action need to be accelerated and ambitions need to be raised (IPCC 2018a). “Limiting global warming to 1.5 °C would require rapid, far-reaching and unprecedented changes in all aspects of society”, according to IPCC Chair Lee (IPCC 2018b: 1).

More broadly, the key sustainability challenges have been formalized in 17 sustainable development goals (SDG), developed from the Millennium Goals, including challenges around climate action, clean water and sanitation, zero hunger and reducing inequality. They were adopted by the UN in 2015 calling for new collaborative solutions by governments, businesses, researchers and civil society organizations (George et al. 2016). These grand challenges may be viewed as “the

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biggest business opportunity of our times”, as suggested by Porter and Kramer (2011). Resolving such challenges requires major innovation efforts, at the level of individual products and services, but also more broadly at the level of business models and social innovations, and major system-level transitions (Adams et al. 2016).

This edited collection—*Innovation for Sustainability*—seeks to highlight important opportunities and challenges for business in this regard.

While these themes are tremendously important, they are certainly not new. In fact, there are many books and thousands of journal articles written at the intersection of business and sustainability (Bansal and Song 2017). Also, the recognized need to tackle climate change is not new, but the evidence base is now ever more paramount, showing the pressing needs for business and policy to take action (IPCC 2018a, b). As a response, there are increasing numbers of academic contributions discussing the need for sustainability-oriented innovation (e.g. Adams et al. 2016; Hansen et al. 2009) and sustainable business model innovation (e.g. Stubbs and Cocklin 2008; Boons and Lüdeke-Freund 2013). However, with this progress the field has grown exponentially leading to divergence in the views and the conceptualizations used.

To bridge this gap, our edited collection incorporates contributions in the intersection of innovation and sustainability literature, representing a diversity of approaches in business, management and engineering. We also include cross-disciplinary approaches embedding, for example, political research, system analysis and experimental research. In doing so, we aim to provide a comprehensive overview of the opportunities and challenges related to innovation for sustainability. Combining work from both emerging and established scholars, this book examines the topic from four perspectives: (1) Systemic approach (2) Strategy and leadership, (3) Measurement and assessment, and (4) Tools, methods and technologies. These are precluded by short practitioner perspectives to introduce the four perspectives.

Furthermore, this book aims to be “solutions-driven”, providing both academically sound but also practically applicable insights for fostering sustainable innovation needed to tackle pressing sustainability issues. As a whole, the compilation of chapters provides a reflective as well as a critical understanding of the challenges that need to be solved. Thus,

from a business perspective the book provides multiple insights on how to approach innovation for sustainability, but without one predefined “recipe”. Rather, it gives a critical insight on different aspects of Innovation for Sustainability.

Overall, this book aims to be a key resource for Master students, Ph.D. students and MBAs, but also scholars, practitioners and decision-makers wanting to gain essential knowledge about the field of innovation for sustainability.

Defining Innovation for Sustainability

This book pursues to push forward the convergence in the disciplinary traditions of innovation management and sustainable business. While these fields have partly developed separately, we see the pursuit of positive environmental and social goals as innate to any innovation process. As such, this suggests that a separate field of *Innovation for Sustainability* would not be necessary in the future, as all innovation processes should include clear and traceable positive environmental, social and economic implications. This relates to what P. Drucker already wrote in 1954: “Every single social and global issue of our day is a business opportunity in disguise”. With this progress in mind, in this book we are suggesting an integrative definition of *Innovation for Sustainability (IfS)*, building on sustainability and innovation management fields. This definition is grounded both in our own thinking, as well as the variety of contributions in this book.

Innovation can be broadly described as a process of turning opportunity into new ideas and putting these into widely used practice (Tidd et al. 2005). It is vital for organizational survival, long-term growth and organizational competitive advantage (Teece 2010). Growing global resource, climate and humanitarian challenges have spurred organizations to embed social and environmental aspects as part of their economic value creation. Indeed, many companies nowadays see that long-term competitiveness can only be achieved this way (Hart and Milstein 2003; Porter and Kramer 2011). Thus, for an increasing number of firms, sustainability implies the creation, delivery and capturing of all three

dimensions of value—economic, social and environmental—as part of their business model (see, e.g., Boons et al. 2013; Inigo et al. 2017).

Accordingly, we argue that companies should (and do) increasingly pursue *Innovation for Sustainability*—rather than innovation as a purely profit-oriented pursuit (Adams et al. 2016). Furthermore, IfS is seen as both a process and an outcome of pursuits that increase economical, ecological and social aspects of value creation. Such innovation is all but easy, but when successful, the rewards are high for both innovating actors as well as the societies they are embedded in (e.g. Porter and Kramer 2011). In fact, IfS requires companies to foster complex transformation at both organizational and societal levels (e.g. Markard et al. 2012; Inigo and Albareda 2016).

Innovation for Sustainability is an overarching umbrella concept that relates to the growing development of new products and services, processes, technologies, organizational practices, business models and even whole “systems” at networks such as cities (Fig. 1.1) (Adams et al.

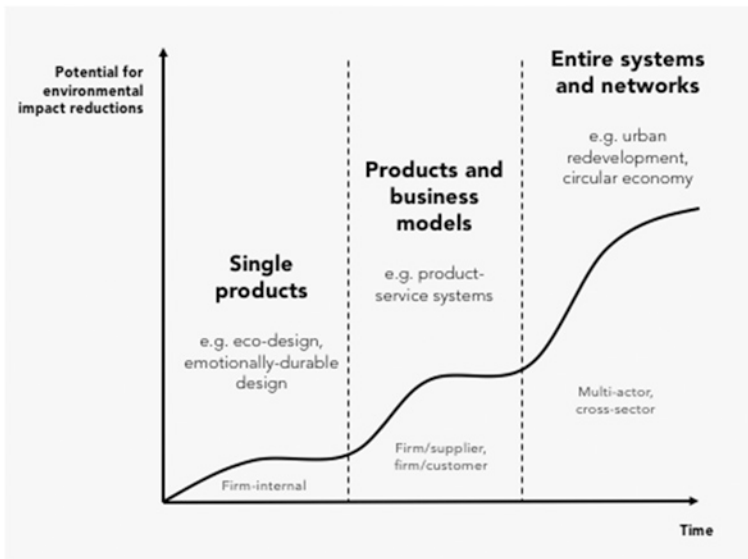


Fig. 1.1 Innovation for sustainability spectrum (Adapted from Konietzko et al. 2018; Adams et al. 2016 and Ceschin and Gaziulusoy 2016)

2016). It can also be regarded as a commercial introduction of products, services or product-service combinations, which, based on traceable assessment, has clear environmental and (or) social life cycle benefits over prior versions (Hansen and Grosse-Dunker 2013). Organizations of all types and sizes are pursuing such innovations. However, it should be noted that sustainability-oriented system-based innovations strongly benefit from hybrid forms of businesses (e.g. benefit corporations and social enterprises) that are emerging where the profit motif is less dominant, while social and environmental motives come to the foreground (Battilana and Dorado 2010).

In existing businesses, IfS is an *intentional change* to an organization's philosophy and values and to its products, services, processes or practices to create social and environmental value as well as economic returns (Adams et al. 2016). In new and emerging businesses, it is often about the *intentional design* of such organizations with social and environmental value. It is apparent from separate innovation and investment literatures that often one dimension (e.g. environmental focus such as cleantech or a social focus) is more dominant (Bocken 2015). As a result, in the more advanced and committed hybrid organizations, innovation for sustainability is growing as a complex adaptive system (Inigo and Albareda 2016) expanding innovation dynamics towards economic and social transformations.

In summary, IfS may be classified by the *innovation type* (e.g. technology, process, product/service or business model), the *dominant target* (ecological and/or social, coupled with economic) (Hansen et al. 2009) and *level of disruption* (incremental, radical) (Plieth et al. 2012). Typically, the assessment of impact will take a life cycle or value chain perspective (Hansen et al. 2009).

Based on the above discussion, we propose the following integrative definition for *Innovation for Sustainability (IfS)*:

Innovation for Sustainability is about the intentional introduction of (radically) new or (incrementally) improved products and services or entire systems, which, based on traceable comparative analysis, lead to environmental and (or) social benefits that surpass those of the prior products, services, or systems.

While this definition intends to be broad and inclusive, it is noteworthy to mention that the research field of innovation and sustainability is still nascent and the terminology has not converged. This is observable throughout the 23 chapters of this edited collection, where authors discuss concepts such as eco-innovation, sustainable innovation, sustainability-oriented innovation, sustainable-business model innovation. This is certainly a reflection of cross-disciplinary nature of the author teams, as well as the field at large. However, it might also provide to be of hindrance in the scholarly development of the field if authors use diverse concepts when referring to the same phenomena. As such, we believe that the converge in the terminology will gradually take place in the coming years, but at the moment the diversity of views might be beneficial in order to tease out all the necessary perspectives. Hopefully, our book will help in its part in facilitating the conceptual development and cross-disciplinary understanding of innovation for sustainability.

Structure and Contents of the Book

‘Innovation for Sustainability’—will incorporate four parts: (1) the big picture (systems approach), (2) strategy and leadership, (3) measurement and assessment, as well as (4) tools and metrics for sustainable innovation. Figure 1.2 visually summarizes the four parts in the book, which are mutually complementary, and provide an overarching view to innovation for sustainability, as discussed in the following.

Part I on this book focuses on the **Big Picture** of the phenomenon of innovation for sustainability. Together these five chapters develop the managerial understanding of the topic, including a critical approach to IfS. The first two chapters summarize and reflect insights from the academic literature. While Chapter 2 proposes an interesting discussion about the three main ontologies adopted by researchers, Chapter 3 provides an in-depth bibliometric literature review that classifies their dissemination. Chapters 4 and 5 provide detailed evidence based on how companies engage in IfS and build different business approaches: environmental factors affecting businesses (Chapter 4), and different profiles of circular business model innovation (Chapter 5). Chapter 6 then

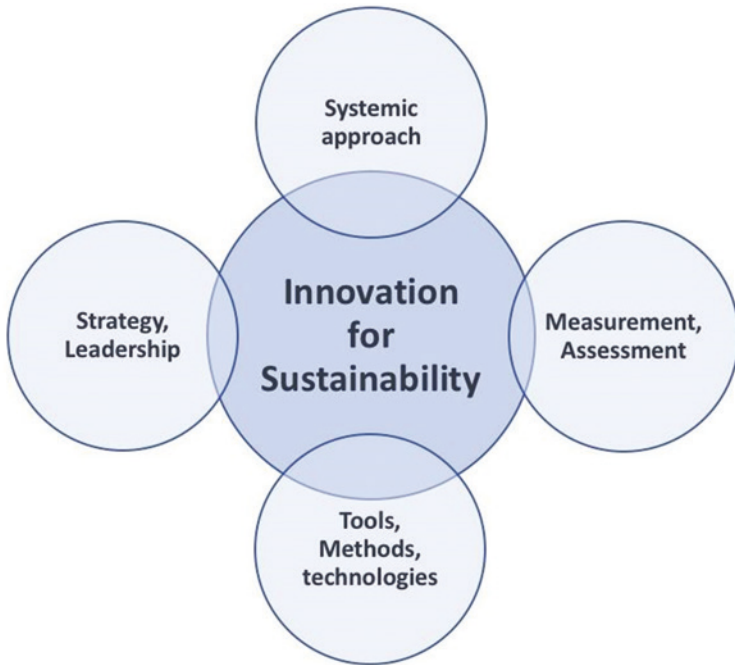


Fig. 1.2 Overview of book structure

explores the role of policymakers to support eco-innovation as key drivers to transition towards a green economy. In detail:

- **Chapter 2** adopts a system view to innovation for sustainability and introduces three perspectives on the role of business as a driver for change in innovation and Sustainable Development. These include sceptical, pragmatic and idealistic perspectives, each involving a complex adaptive system analysis of the role of businesses. Based on these perspectives, the chapter provides a critical and reflective outlook to the challenges and opportunities of innovation for sustainability.
- **Chapter 3** contributes to the big picture through a literature review and bibliometric analysis on innovation for sustainability. The impact and dissemination of this literature are classified five key discussions: strategic, operational, organizational, collaborative and systemic IfS.

The bibliometric analysis shows how IfS literature has expanded from Business Management, Strategy, Innovation and Operations to connecting to the main discussions in Environmental Sciences, Environmental Engineering and Ecology.

- **Chapter 4** studies how environmental factors affect the engagement of businesses in innovation for sustainability. Looking at the literature on dynamic capabilities and socio-technical transitions, the author draws on empirical evidence of eight cases of companies framing three different degrees of dynamism: reactive, challenging the environment and contributing to system building.
- **Chapter 5** studies how companies in different settings engage in developing circular business model innovation. Based on case analysis in Denmark, the authors build a model for circular business based on three main approaches: internal, hybrid and systemic circular business model innovation.
- **Chapter 6** investigates business-driven ecological innovation in green growth strategies. The authors explore the linkages between green growth and eco-innovation. The main argument is that the growing fields of eco-innovation and sustainable business models are drivers towards the transition to a green economy and must be adopted and supported in governmental policy strategies.

Part II of the book highlights **The Strategic and Leadership Aspects of Innovation for Sustainability (IfS)**. The different chapters illustrate the nature and practice of innovation-based sustainable business strategies on the basis of state-of-the-art theory and the results of a number of original case studies. Illustrations range from retail businesses (Chapter 10), fashion companies (Chapter 11), horse-industry entrepreneurs (Chapter 12) to more established corporates (see Chapters 8 and 9). Given that the main building blocks of innovation are individuals' knowledge and ideas, the way employees are led and managed is a crucial factor in determining whether organizations are able to execute those innovation-based sustainable business strategies. Therefore, in this part, also leadership practised for Ifs is highlighted in Chapters 7, 8 and 9.

- **Chapter 7** explores the leadership challenges associated with sustainability by highlighting the current research evidence on the links between leadership and (sustainable) innovation.
- **Chapter 8** provides an overview of the key leadership challenges in relation to sustainable innovation projects in large businesses. Examples from practice are provided and it shows that project managers are challenged by gathering the right information as well as to allocate resources wisely within sustainable innovation projects.
- **Chapter 9** provides the results of a case study on systemic innovation. This case shows that business leaders tend to hold back attempts at systemic innovation for sustainability due to structural impediments, uncertainty avoidance and conflicting aims within and between firms.
- **Chapter 10** shows an example how business models in the retail sector can be innovated in order to ensure smarter and more sustainable business models on the basis of a normative framework. Central to this framework are: redesign, experimentation, service-logic, the circular economy, alliances, results and three-dimensionality.
- **Chapter 11** features localism as a strategy for business model innovation for sustainability. As a strategy, localism can generate various forms of shared value. The geographic proximity seems to enable reconnections between resources, people, place, community and through environment that correlate with sustainability.
- In **Chapter 12** examples of strategies for enabling sustainable entrepreneurship are presented. This chapter shows that the choice for a specific sustainable entrepreneurship strategy highly depends on the valuation of environmental, economic and social sustainability factors.

Part III of the book focuses on **Measurement and Assessment of Sustainable Innovation**. As a whole, the five chapters in this part provide a good overview of the state of the art in the field. The first two chapters (Chapters 13 and 14) provide insights of the broad-based challenges and opportunities in measuring and assessing innovation for sustainability. The remaining three chapters, on the other hand, provide more detailed evidence on the assessment and details of innovation

processes for sustainable innovation. They include the interesting approach of “reversing materiality” (Chapter 15), design and systems thinking approach to sustainability impact (Chapter 16), as well as an examination of how strategic environmental goals affect product innovation (Chapter 17).

- **Chapter 13** details the measurement challenges in innovation performance measurement in general and combines those with the innovation for sustainability context. As a result, the chapter provides useful insights into how academics and practitioners can design different measurement schemes.
- **Chapter 14** develops a series of propositions regarding the assessment of the impact of sustainable business models. Here, the authors outline particular principles that would ideally describe the breadth and detail of such assessment.
- **Chapter 15** describes how companies can move from reactive materiality assessments to a more proactive approach. In particular, the authors suggest that firms can embed sustainable development goals (SDGs) in their strategic activities, effectively “reversing materiality”.
- **Chapter 16** draws from design sciences and systems thinking in describing how companies can better scale their sustainability impact. The chapter goes through principles that could help companies to be more adaptive and design-driven and provides several illustrative examples from practice in this regard.
- **Chapter 17** presents a mixed methods approach on explaining how companies’ strategic environmental goals affect product innovation. The authors find quantitative evidence that pursuing environmental goals can be successfully aligned with product innovation, and they illustrate these with qualitative insights.

Part IV describes *Tools, Methods and Technologies That Support Innovation for Sustainability*. It includes novel perspectives on tools and methods for IFS and explores the role of new technologies and developments. The first two chapters (Chapter 18 and 19) discuss the topic of experimentation for sustainability and the circular economy and provide company cases as examples. Chapters 19 and 21

contribute to the broader discussion on circular economy. Chapter 20 is about games and gamification and their role in sustainable innovation. Chapters 22 and 23 reflect on the role of digital technologies and platforms and their impacts on sustainability.

- **Chapter 18** discusses the topic of Experimentation for Sustainability. It contrasts “business experimentation for sustainability” to drive IfS with experimentation in the natural sciences. It provides insights on how the corporation Procter & Gamble experiments during the sustainable innovation process.
- **Chapter 19** describes a process-oriented approach to experimenting with circular business models including five broad stages. The case of the tools renting service pilot called Liiteri is introduced, which highlights various challenges and opportunities identified across the different process steps.
- **Chapter 20** describe game-based approaches to sustainable innovation and how two game-based approaches—serious games and gamification—have been applied to sustainable innovation. Through various examples, the chapter explores potential merits and drawbacks to game-based approaches.
- **Chapter 21** talks about the potential role of the circular economy as a particular “imaginary” and approach to drive institutional changes for sustainable innovation. The case of Sitra, the Finnish Innovation Fund, is described. It was found that the circular economy lens has a potential to create collective meaning towards innovation which fits the Finnish culture.
- **Chapter 22** focuses on the role of digital technologies in innovation for sustainability. It explores the linkages between specific digital technologies and their economic, social and environmental impacts, as well as potential positive and negative implications.
- **Chapter 23** discusses the potential role of online platforms in the circular economy. It develops a framework about the role of online platforms in the circular economy including online platforms as enablers of circular economy *markets*; ways to *operate* product-service systems; and places to *co-create* novel products and services.

The Way Forward—Better World with Innovation for Sustainability?

Is a better world possible with Innovation for Sustainability? This book presents a big picture view on IfS, notions of strategy and leadership, approaches to measurement and assessment, as well as views on tools methods and technologies to source the latest thinking and trends. Topics like the circular economy, digital platforms, experimentation and gamification emerged in this edited volume with international cross-disciplinary teams. As with any innovation, the outcome of such developments is hard to predict or control. For example, will car-sharing business models actually reduce the number of cars on the road or sustain incumbents' car sales? (see, e.g., Boons and Bocken 2018) Are energy efficient technologies (e.g. lights, appliances) leading to negative rebound effects such as using these more, because they are “efficient” anyways? (Greening et al. 2000)

However, as suggested in our previously mentioned definition of IfS, the intentional design and assessment of impact are crucial. This means IfS is performed by entrepreneurial thinkers in all kinds of organizations (e.g. start-ups, SMEs, hybrid organizations, large business), but also by citizens using and co-creating newly designed products and services. Moreover, policymakers are paving the way for different levels of innovation. The success of IfS thus depends on involvement at all actors at all levels, which has long been recognized in transitions studies (Geels 2002; Markard et al. 2012). However, a proactive stance as well as involvement of actors at all levels becomes ever more pressing with increasingly pressing sustainability issues.

This book is also about *change*—exploring what is next. Our main goal as editors was to search for trailblazers and pioneering trends in research and practice. Indeed, many of the chapters introduce novel organizational practices and strategies, as well as improved ways to assess and measure impact of innovation in sustainability context. Furthermore, much of the research included in this book shows the need for IfS to integrate with trends such as digitalization, as well as experimentation and gamification.

This book has also shown ways to *consolidation* of organizational practices and the implementation of sustainable business models.

We are entering the third decade on the twenty-first century. This will be an important period for business, sustainability and innovation. IfS displays multiple levels of action needed to interconnect individual sustainable leadership and entrepreneurship to the other levels of organizational transformation and systems transitions towards sustainable development. We see how business is becoming problem-solvers, aiming to provide solutions to grand challenges and fostering ways to adopt and build on SDG. IfS is not a secondary goal anymore; it is a core approach for creating value at multiple levels: products, services, business models and system-level transitions. This reflects a necessary way forward for scholarly development. Beyond using sustainability as a context or target for innovation, we ask scholars to be even more ambitious in their attempts to theorize and conceptualize IfS, as well as developing interdisciplinary action research-based approaches. For instance, recent attempts draw from circular design principles and combine those with a business model approach from management studies to advance understanding of circular economy transitions (e.g. Bakker et al. 2014; Bocken et al. 2016; den Hollander et al. 2017).

All in all, we have sought to contribute with a book that crosses topics, disciplines, as well as business and academia. We hope it will open up further debate and spur action to resolve our world's most pressing challenges through the lens of Innovation for Sustainability.

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