

Palgrave Studies in Sustainable Business  
In Association with Future Earth

**Series Editors**

Paul Shrivastava  
Pennsylvania State University  
University Park, PA, USA

László Zsolnai  
Corvinus University Budapest  
Budapest, Hungary

Sustainability in Business is increasingly becoming the forefront issue for researchers, practitioners and companies the world over. Engaging with this immense challenge, Future Earth is a major international research platform from a range of disciplines, with a common goal to support and achieve global sustainability. This series will define a clear space for the work of Future Earth Finance and Economics Knowledge-Action Network. Publishing key research with a holistic and trans-disciplinary approach, it intends to help reinvent business and economic models for the Anthropocene, geared towards engendering sustainability and creating ecologically conscious organizations.

More information about this series at  
<http://www.palgrave.com/gp/series/15667>

Nancy Bocken · Paavo Ritala  
Laura Albareda · Robert Verburg  
Editors

# Innovation for Sustainability

Business Transformations Towards  
a Better World

palgrave  
macmillan

*Editors*

Nancy Bocken  
Lund University  
Lund, Sweden

Laura Albareda  
Lappeenranta University of Technology  
Lappeenranta, Finland

Paavo Ritala  
Lappeenranta University of Technology  
Lappeenranta, Finland

Robert Verburg  
Delft University of Technology  
Delft, The Netherlands

ISSN 2662-1320

ISSN 2662-1339 (electronic)

Palgrave Studies in Sustainable Business In Association with Future Earth

ISBN 978-3-319-97384-5

ISBN 978-3-319-97385-2 (eBook)

<https://doi.org/10.1007/978-3-319-97385-2>

Library of Congress Control Number: 2018962747

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2019

Chapter 11 is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>). For further details see licence information in the chapter. This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Cover illustration: Sunset Avenue Productions/DigitalVision/Getty

This Palgrave Macmillan imprint is published by the registered company Springer Nature Switzerland AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

## Praise for *Innovation for Sustainability*

“This is an important book. Bringing to bear leading edge thinking in innovation on problems in sustainability is critically important, and the authors present a comprehensive approach that will become an invaluable resource to both scholars and practitioners.”

—Rebecca Henderson, *John and Natty McArthur University Professor,  
Harvard University, USA*

“Innovation stands out as a key factor in the urgent and challenging pursuit of improving economic, social and environmental sustainability. A transition to a new business paradigm, where a broader set of values than the mere financial ones are fully taken into account, requires disruptive changes to the way we think and act. This book offers a comprehensive view of the challenges that need to be overcome in order to increase innovation for sustainability, as well as concrete implications for both researchers and practitioners.”

—Mats Magnusson, *Professor, KTH Royal Institute  
of Technology, Sweden*

# Contents

- 1 Introduction: Innovation for Sustainability** 1  
*Nancy Bocken, Paavo Ritala, Laura Albareda  
and Robert Verburg*

## **Part I Systemic View—the Big Picture**

- 2 Innovation for Sustainability: Sceptical, Pragmatic,  
and Idealist Perspectives on the Role of Business  
as a Driver for Change** 21  
*Paavo Ritala*
- 3 Innovation for Sustainability: Literature Review  
and Bibliometric Analysis** 35  
*Laura Albareda and Arash Hajikhani*
- 4 Environmental Factors in Business Engagement  
in Innovation for Sustainability** 59  
*Edurne A. Inigo*

<b>5</b>	<b>Circular Business Model Innovation for Sustainable Development</b>	77
	<i>Eva Guldmann and Rikke Dorothea Huulgaard</i>	
<b>6</b>	<b>Business-Driven Ecological Innovations in Green Growth Strategies</b>	97
	<i>Jan Engelmann and Mohammad Al-Saidi</i>	
<b>Part II Strategy and Leadership for a Sustainability Transition</b>		
<b>7</b>	<b>Leadership, Innovation, and Sustainability</b>	117
	<i>Robert Verburg</i>	
<b>8</b>	<b>Leadership and Goal Setting for Sustainable Innovation Projects in Large Businesses</b>	135
	<i>Ilka Weissbrod</i>	
<b>9</b>	<b>Exploring the Pitfalls of Systemic Innovations for Sustainability</b>	157
	<i>Nina Tura, Genevieve Mortimer and Antero Kutvonen</i>	
<b>10</b>	<b>Toward Smart and Sustainable Business Models in Retail</b>	177
	<i>Sveinung Jørgensen and Lars Jacob Tynes Pedersen</i>	
<b>11</b>	<b>Business Model Innovation for Sustainability Through Localism</b>	193
	<i>Linn Meidell Dybdahl</i>	
<b>12</b>	<b>Identifying Strategies for Sustainable Entrepreneurship</b>	213
	<i>Tero Rantala, Minna Saunila, Juhani Ukko and Hannu Rantanen</i>	

<b>Part III Measurement and Assessment of Sustainable Innovation</b>	
<b>13 Sustainable Innovation Measurement: Approaches and Challenges</b>	233
<i>Nuwan Gunarathne</i>	
<b>14 Assessing the Impact of Sustainable Business Models: Challenges, Key Issues and Future Research Opportunities</b>	253
<i>Romana Rauter, Martina Zimek, Rupert J. Baumgartner and Josef-Peter Schöggel</i>	
<b>15 REVERSING MATERIALITY: From a Reactive Matrix to a Proactive SDG Agenda</b>	271
<i>Rob van Tulder and Laura Lucht</i>	
<b>16 Intentional Design for Diversity as Pathway to Scalable Sustainability Impact</b>	291
<i>Wouter C. Kersten, Jan Carel Diehl and Jo M. L. van Engelen</i>	
<b>17 How Firms' Strategic Environmental Goals Influence Product Innovation</b>	311
<i>Wolfgang Gerstlberger, Alex da Mota Pedrosa and Reynir Smari Atlason</i>	
<b>Part IV Tools, Methods and Technologies</b>	
<b>18 Experimentation for Sustainable Innovation</b>	335
<i>Ilka Weissbrod</i>	
<b>19 Experimenting with Circular Business Models—A Process-Oriented Approach</b>	353
<i>Maria Antikainen and Nancy Bocken</i>	

<b>20</b>	<b>Game-Based Approaches to Sustainable Innovation</b>	375
	<i>Katherine Whalen and Gerben Kijne</i>	
<b>21</b>	<b>Circular Economy Inspired Imaginaries for Sustainable Innovations</b>	393
	<i>Rumy Narayan and Annika Tidström</i>	
<b>22</b>	<b>The Impacts of Digital Technologies on Innovating for Sustainability</b>	415
	<i>Sabrina Schneider</i>	
<b>23</b>	<b>Online Platforms and the Circular Economy</b>	435
	<i>Jan Konietzko, Nancy Bocken and Erik Jan Hultink</i>	
	<b>Index</b>	451

## Notes on Contributors

**Laura Albareda** is Associate Professor at the School of Business and Management of Lappeenranta University of Technology and Visiting Professor at Deusto Business School. She has been Postdoctoral Fellow at the Carroll School of Management of Boston College. Her research focuses on business sustainability, cross-sector collective action and polycentric governance. She also works on sustainability-oriented innovation, value creation and sustainable business models. Her research papers have been published in specialised journals such as *Journal of Business Research*, *Business & Society*, *Journal of Business Ethics*, *Journal of Cleaner Production*, *Business Ethics: A European Review*. Her paper “Polycentric governance of privately owned resources in Circular Economy Systems”, co-authored by Patala, Albareda & Halme has been awarded by the Carolyn Dexter Award for Best International Paper 2018 and Organizations & the Natural Environment Division (ONE) Unorthodox Paper Award 2018 at the Academy of Management Annual Meeting, Chicago, August 2018.

**Dr. Mohammad Al-Saidi** is a Research Assistant Professor for sustainable development policy and planning at the Center for Sustainable Development with the College of Arts and Sciences, Qatar University.

He holds two master-level degrees in economics and political sciences and a Ph.D. in economics from Heidelberg University, Germany. Dr. Al-Saidi publishes on water policies, water-energy-food nexus and natural resources governance in developing countries, particularly in the context of Middle East and North Africa.

**Maria Antikainen** works as Principal Scientist at VTT. She is also an Adjunct Professor in the Department of Industrial Management, Tampere University of Technology, specialising in innovation in business networks. She leads scientific work and excellence development in Circular Economy at VTT. In specific, her research focuses on business model innovation, business model experimentations and consumer-driven services in the context of the Circular Economy. She has been leading and involved in multiple projects related to the CE (national and EU). She is a certified and experienced project manager (IPMA, Level C) and active publisher of her scientific work working as a reviewer in several academic journals and conferences.

**Dr. Reynir Smari Atlason** is an Assistant Professor at the University of Southern Denmark (SDU), Life Cycle Engineering, Dept. of Chemical Engineering, Biotechnology and Environmental Technology. He became a faculty member in 2015 after receiving his Ph.D. from the University of Iceland. Dr. Atlason is a co-founder of Circular Solutions, a sustainability consultancy located in Iceland and Denmark. His research has mainly focused on sustainable product development and Energy Return on Investment (EROI).

**Rupert J. Baumgartner** is professor of sustainability management. Since 2011, he is Director of the Institute of Systems Sciences, Innovation and Sustainability Research, and since 2012, Vice-Dean of the Faculty for Regional, Environmental and Educational Sciences at the University of Graz. He is board member of the International Sustainable Development Research Society (ISDRS).

Before joining the University of Graz, he was Senior Researcher in the field of strategic management and industrial ecology at the Åbo Akademi University in Finland and at the University of Leoben, Austria. He published more than 40 journal papers, 3 books and more

than 20 book sections. His main research interests are corporate sustainability management, sustainability assessment, LCA, industrial ecology/circular economy, interorganisational management and sustainability-oriented innovation. He was named as DuPont Young Professor 2016 and he was awarded with the Seraphine-Puchleitner-Price 2017 by the University of Graz as the best Ph.D. supervisor.

**Nancy Bocken** is Professor and Research Coordinator in Sustainable Business Management and Practice at Lund University, IIIIE in Sweden. She focuses on different approaches for sustainable business innovation such as experimentation and business model innovation. She is also Associate Professor at TU Delft, Industrial Design Engineering and Fellow at the Cambridge Institute for Sustainability Leadership, which develops and delivers executive programmes and education in sustainability leadership. She is also Visiting Professor at Lappeenranta University of Technology and Maastricht University. Nancy co-founded HOMIE who are involved in 'pay per use' business models, starting with washing machines, to drive sustainable consumption and 'circularity'.

**Dr. Alex da Mota Pedrosa** is Professor at the DSHS. Dr. Pedrosa's expertise is in the fields of new product and service development, organisational behaviour and research methods. His research interests include innovation management, innovation systems at different levels, organisational behaviour and research methods. He teaches courses in innovation management and methods as well as in public organisation.

**Jan Carel Diehl (1969)** received his M.Sc. and Ph.D. degrees in industrial design engineering from Delft University of Technology. In his present position, he is Associate Professor for the Design for Sustainability (DfS) research programme and Senior Researcher within the Delft Global Initiative and the LDE Centre for Frugal Innovation in Africa. The focus of his research is on Context Variation by Design (CVD) and Sustainable Product Service Systems (SPSS) especially applied in low-resource settings.

**Linn Meidell Dybdahl** works at the Nordic Institute for Studies in Innovation, Research and Education. Her research interest is innovation towards a more sustainable society, on both an organisational and

systemic level. She is particularly interested in sustainable business model innovation and sustainability transitions. In addition, Dybdahl is engaged in the idea of responsible research and innovation, promoting inclusive, reflexive and responsive research designs, to co-produce knowledge that can solve the grand challenges of our times. Her educational background is interdisciplinary, including training in innovation, entrepreneurship, communication, project management and psychology. Prior to her years in the institute sector, Dybdahl has worked as a communication specialist in several organisations. She has also several years of practical experience as a business developer, running strategy processes with start-ups.

**Jan Engelmann** is a Graduate Student from the Institute for Technology and Resources Management in the Tropics and Sub-Tropics at Cologne University of Applied Sciences. He holds a master degree in integrated water resources management (IWRM) and is now working in international cooperation in the field of climate policy. His particular interest of research is natural resource management and policy making in the MENA region and Africa.

**Dr. Wolfgang Gerstlberger** is Associate Professor for Integrative Innovation Management at the University of Southern Denmark (SDU). Prior to joining SDU, Wolfgang served as a head of an Endowed Chair “Innovation Management & Small Business Research” at Technical University (TU) Dresden. He holds a master’s and Ph.D. degree in social sciences, and a habilitation in business administration from Kassel University, Germany. His research and teaching interests are sustainable innovation management and systems, especially in the areas of renewable energy and energy efficiency technologies.

**Eva Guldman (1976)** is a Ph.D. Fellow in the Department of Planning, Aalborg University (AAU). She holds a M.Sc. in engineering from the Technical University of Denmark (DTU) in the field of Planning and Management. Eva has more than ten years of industry experience working with business intelligence, product portfolio management and project management at among others LEGO Company and Bang & Olufsen, which has provided her with insight into R&D, supply chain management, marketing and sales.

Eva's research focuses on implementation of circular economy at the company level. This includes research into circular business models, business model innovation, the role of business experimentation and other tools for business model innovation, as well as barriers to such innovation. The research comprises practice reviews, action research to co-create knowledge with industry and other qualitative research methods.

**Nuwan Gunarathne** is currently a doctoral candidate at the Griffith University, Australia. After years of teaching, consulting and research, he also serves as a Senior Lecturer in the Department of Accounting, University of Sri Jayewardenepura, Sri Lanka. He is a member of both the Chartered Institute of Management Accounting (UK) and the Institute of Certified Management Accountants of Sri Lanka. He has an M.B.A. from the Postgraduate Institute of Management (PIM), Sri Lanka, and a degree in business administration from the University of Sri Jayewardenepura. He has authored and co-authored many national and international publications in different spheres of management accounting, sustainability accounting, integrated reporting and accounting education. His articles have been published in several international journals such as *Journal of Accounting and Organizational Change*, *Accounting Research Journal* and *Financial Management and Managerial Auditing Journal*. Nuwan has presented papers in Finland, Australia, Sri Lanka, Indonesia, Germany and South Korea. He also spearheaded the launch of 'Environmental Management Accounting (EMA) Guidelines for Sri Lankan Enterprises' in 2014. Nuwan is also a committee member of the Environmental and Sustainability Management Accounting Network (EMAN) Asia Pacific (AP) and country representative of the Sri Lanka Chapter of EMAN-AP.

**Arash Hajikhani** is a Researcher and a Doctoral Student in School of Engineering Science at Lappeenranta University of Technology. He has been working and publishing on various aspects on Social Network Service (SNSs) platforms for evaluation and measurement of its socio-economic effects. He proposed advanced methods for operationalising SNSs data and a perspective for deep content analysis to comprehend brand presence. He conducted a study on transforming unstructured data in SNSs into a validated indicator for measuring

firms marketing innovation published in *International Journal of Innovation and Technology Management* (2016) and *World Scientific Book Chapters* (2017). His attempts on systematic processing of data sets such as SNSs, publication and patent data have been published in venues such as Association for Computing Machinery 2015, Hawaii International Conference on System Sciences 2017 and Academy of Management Conference 2018.

**Erik Jan Hultink, Ph.D.** is a Professor of new product marketing and Head of the Department of Product Innovation Management at the Faculty of Industrial Design Engineering, Delft University of Technology, Delft, the Netherlands. His research focuses on launch and branding strategies for new products. He has published on these topics in such journals as *Journal of the Academy in Marketing Science* and *Journal of Product Innovation Management*. He was the Founder and Director of the Master in Strategic Product Design at the Delft University of Technology, a programme that was recently ranked by Business Week as one of the world's top design schools. He is co-founder of the Dutch chapter of the Product Development and Management Association (PDMA). He regularly consults companies on the topic of new product marketing.

**Rikke Dorothea Huulgaard (1982)** is Postdoctoral Researcher in the Department of Planning, Aalborg University (AAU). She holds a Ph.D. degree based on the Ph.D. thesis *Ecodesign—A Study of the Ecodesign Directive and Ecodesign Practices at Grundfos, Bang & Olufsen and Danfoss Power Electronics*, and a M.Sc. in engineering, environmental management from Aalborg University. Before her career in academia, Rikke worked as an environmental consultant in the Department of Safety, Health and Environment at Bang & Olufsen, working with among other things product-related environmental issues in the product development process and compliance with environmental regulation. Rikke's research interests are sustainability, ecodesign and circular economy in a business and regulatory context.

**Dr. Edurne A. Inigo** is a Postdoctoral Researcher in responsible innovation at Wageningen University, the Netherlands. Her research

interests lie in the intersection of responsibility, sustainability and economic profitability in innovation, particularly from the approach of wider sociotechnical transitions. She has a background in law, business and political economy, and before joining academia, she worked in a boutique consultancy on sustainability and innovation projects and as a freelance consultant.

**Sveinung Jørgensen** is Associate Professor at Inland Norway University of Applied Sciences, Norway. He holds a Ph.D. degree from Karlstad University. He does research on the design and innovation of sustainable business models and field experiments on socially and/or environmentally beneficial behaviours. He serves on numerous boards, acts as a strategic business advisor and is an active public speaker.

**Wouter C. Kersten (1972)** received his M.Sc. degree in Industrial Engineering and Management from the University of Twente and M.Sc. in Environmental Science from the University of Greenwich. He amongst others worked at Tilburg University and since 2012 at Delft University of Technology at the faculty of Industrial Design Engineering. He was (co-)author of various book chapters, conference presentations, popular and academic articles on topics ranging from sustainability in the financial sector to entrepreneurship and design. He is coordinating the Context Variation by Design research theme and is currently pursuing a Ph.D. in that research area.

**Gerben Kijne** earned an engineering degree in the field of strategic product design at Delft University of Technology. Working in Amsterdam, Manchester and Copenhagen, he leads the alignment of stakeholder interests on tech-related projects in IoT, infrastructure, energy and applied gaming. He was awarded a spot on the 2016 Forbes 30 under 30 list for his work on a mobile game that encourages energy saving.

**Jan Konietzko** is a Ph.D. candidate at Delft University of Technology (NL) as part of a Marie Curie Innovative Training Network on circular economy financed by the European Commission. The goal of his research is to describe, analyse and design business model experiments that can trigger circular economy transitions, mostly at the level of the

innovation ecosystem. Prior to his Ph.D., he worked in various roles to analyse the sustainability performance of firms. His background is in sustainability science and economics.

**Antero Kutvonen, D.Sc.** holds a position as Postdoctoral Researcher in LUT and has been working in a research position there since 2007. He has published in several journals, such as the *Technology Analysis and Strategic Management* and *European Journal of Innovation Management*. His research deals with issues at the intersection of open innovation and strategy as well as management of innovation, business ecosystems and technology.

**Laura Lucht** is a Research Associate at the Partnerships Resource Centre, RSM Erasmus University. She researches the link between materiality and the Sustainable Development Goals (SDGs) in particular: *how can companies integrate sustainability in their core business and work towards positive impact?* She has been involved in several research projects on cross-sector partnerships, investigating the relevance, effectiveness and quality of these collaborations. This includes evaluating ongoing cross-sector partnerships for sustainable development and exploring conditions for successful partnerships. Laura holds a master's degree in international development with a regional focus on Latin America. Previously, she worked as project manager in the regional team Latin America at the Centre for the Promotion of Imports from developing countries (CBI).

**Genevieve Mortimer, Ph.D.** is a Project Manager at Climate-KIC Australia. She is working as a business sustainability consultant integrating engineering technologies, decision-making processes and organisational change strategies to solve complex problems. She has graduated as Doctor of Philosophy, focusing on sustainability and management from the School of Business, Economics and Social Science of the University of Hamburg. She has previously worked at the Thünen Institute for International Forestry and Forest Economics under a European Union Marie Curie Early Stage Researchers funded programme.

**Rumy Narayan** is a doctoral candidate at the School of Management, University of Vaasa, Finland. Her research focuses on sustainability

networks, innovation systems and sociotechnical transitions. Prior to her doctoral studies, she has been a business journalist, an information analyst, and sustainability consultant, manager and knowledge resource. In these roles, she has worked with companies like Walmart and Tetra Pak, and organisations like Environmental Protection Encouragement Agency (EPEA), a scientific research consultancy working with the Cradle-to-Cradle design concept and Indian Institute for Corporate Affairs (IICA), a think tank for the Ministry of Corporate Affairs, Government of India.

**Lars Jacob Tynes Pedersen** is Associate Professor and Head of the Centre of Ethics and Economics at NHH Norwegian School of Economics, Norway. He holds a Ph.D. degree from the same institution. He does research on the design and innovation of sustainable business models and field experiments on socially and/or environmentally beneficial behaviours. He is an active public speaker and strategic business advisor.

**Tero Rantala** is a Researcher and Doctoral Student at Lappeenranta University of Technology, Department of Industrial Engineering and Management. His current research focuses on performance management and measurement of university–industry collaborations. In addition, his current research interests involve different areas of performance management in digital business environments and sustainable business contexts.

**Hannu Rantanen** is a Professor of Industrial Management at the Lappeenranta University of Technology. His research concentrates on performance measurement and management in the private and public sector, and cost management in industrial enterprises. The latest research focus on productivity, digitalization in performance and sustainable business.

**Romana Rauter** is a specialist in the field of sustainability and innovation management. She works as an Assistant Professor at the Institute of Systems Sciences, Innovation and Sustainability Research at University of Graz. She received her Doctorate in Social and Economic Sciences with a thesis addressing the topic of interorganisational knowledge

transfer between research organisations and SMEs. She was a Visiting Scholar at the Nijmegen School of Management at the Radboud University Nijmegen, the Netherlands, in 2014, and at the IMED Business School, Passo Fundo, Brazil, in 2017. Recently, she acted as conference chair for the 2nd International Conference on New Business Models held in Graz, Austria, in 2017. Her current main research interests include sustainability innovation, new and sustainable business models as well as strategic sustainability management.

**Paavo Ritala, D.Sc. (Econ. & Bus. Adm.)** is a Professor of Strategy and Innovation at the School of Business and Management at Lappeenranta University of Technology (LUT), Finland. He is interested in questions and themes around organising heterogeneous systems and networks, where different actors and institutions co-evolve, collaborate and compete. His research has focused on the topics of value creation and appropriation, organisational renewal and innovation, networks, platforms and ecosystems, co-competition, as well as sustainable value creation and related business models. His research has been published in journals such as *Research Policy*, *Journal of Product Innovation Management*, *Industrial and Corporate Change*, *British Journal of Management* and *Technovation*. He is also closely involved with business practice over these topics through company-funded research projects, executive and professional education programme, and in speaker and advisory roles. Professor Ritala currently serves as an Associate Editor of *R&D Management*.

**Minna Saunila, D.Sc. (Tech.)** is a Senior Researcher at Lappeenranta University of Technology, School of Engineering Science. Her research covers topics related to innovation, service operations, as well as sustainable value creation. She has previously published among others in *Journal of Engineering and Technology Management*, *Technology Analysis and Strategic Management* and *Journal of Organizational Effectiveness: People and Performance*.

**Sabrina Schneider** is an Assistant Professor for Managerial Technology Management at the University of Kassel, Germany. Her research centres on the strategic implications of digital technologies on business and society.

**Josef-Peter Schögg** works as a Postdoctoral Researcher at the Centre for ECO2 Vehicle Design at KTH—Royal Institute of Technology in Stockholm. He holds a Ph.D. in environmental systems sciences in which he addressed the topic of supply chain-wide sustainability assessment. In his research at KTH, he focuses on design for sustainability in early stages of automotive engineering. Further research interests include life cycle analysis and sustainable product management in the context of a circular economy.

**Annika Tidström** is a Professor at the School of Management, University of Vaasa, Finland. Her research interests are related to business networks, industrial relationships, cooptation, tensions and strategy-as-practice. She has published several articles in journals such as *Industrial Marketing Management*, *Journal of Business and Industrial Marketing*, *Journal of Purchasing and Supply Management* and *Scandinavian Journal of Management*. Professor Tidström is an active member of the international cooptation research community and she is also involved in the Industrial Marketing and Purchasing (IMP) group.

**Nina Tura, D.Sc. (Tech.)** is a Researcher in Innovation Management Group, Industrial Engineering and Management Department at Lappeenranta University Technology (LUT), Finland. Currently, she is working with the topics of sustainability-oriented innovations, circular economy, platform-based business models and sharing economy. Her research has been published in journals such as *Technology Analysis and Strategic Management*, *International Journal of Innovation and Technology Management* and *International Journal of Innovation and Sustainable Development*. Her main interest areas include also teaching and (adult) pedagogy, and currently, she is preparing her master studies of specialist in adult education at the University of Eastern Finland.

**Juhani Ukko** is a Senior Researcher at Lappeenranta University of Technology, Department of Industrial Engineering and Management. He is also an Adjunct Professor at Tampere University of Technology. His current research interests involve different areas of performance management and measurement, related to operations management, digital services, innovation and sustainable business.

**Professor Jo M. L. van Engelen, M.Sc., Ph.D. (1959)** studied physics and mathematics at the University of Technology in Eindhoven and Business Administration at the University of Twente. He received his Ph.D. in 1989 from the University of Twente. In 1991, he was appointed Chaired Professor of Business Development and later Research Fellow at the Faculty that currently carries the name Economics and Business Administration of the University of Groningen. In 2010, he was appointed Chaired Professor of Integrated Sustainable Solutions at the Faculty of Industrial Design Engineering of Delft University of Technology. He was author or co-author of over ten books and more than 100 scientific articles.

**Rob van Tulder** is Full Professor of International Business at RSM Erasmus University Rotterdam. He is co-founder of the Department of Business-Society Management, one of the leading departments in the world studying and teaching about the contribution of business and leaders towards society. Dr. Van Tulder is founder and academic director of the Partnerships Resource Centre that studies the cross-sector partnerships between firms, NGOs and government for sustainable development. He published in journals like the *California Management Review*, *Journal of International Business Studies*, *Journal of Business Ethics*, *Journal of World Business*, *World Development*. His 20+ books deal with topics like: International Business-Society Management, Skills, Wicked Problems, Sustainable Development, Motivation, Cross-Sector Partnerships, Transition management, Technological change.

**Robert Verburg** is an Associate Professor in the area of technology and innovation management at Delft University of Technology, the Netherlands. His research interests focus on leadership, managing people, entrepreneurial behaviour, knowledge processes and innovation. He has published articles in management journals, such as the *Journal of Management* (JOM), *Group & Organization Management*, the *International Journal of Human Resource Management* (IJHRM), *Knowledge and Process Management* (KPM), *New Technology, Work and Employment* (NTWE), *Leadership Quarterly* (LQ), *European Management Journal* (EMJ) and the *International Journal of Project*

*Management* (IJPM). He is also involved with both master and executive teaching and he is the Director of Studies for the Management of Technology programme at Delft University.

**Dr. Ilka Weissbrod** is a Postdoctoral Researcher in business sustainability management at the Leuphana University of Lüneburg, Germany. Her research interests lie in the areas of exploratory corporate sustainable innovation activities and sustainable entrepreneurship. She has a background in climate science and business and a thorough grounding in sustainable innovation practice through hands-on experience as director of small enterprises and as consultant to large corporates.

**Katherine Whalen** is a Lund University doctoral student at the International Institute for Industrial Environmental Economics. She is responsible for researching business aspects of circular economy in MISTRA REES, a Swedish research programme on circular economy. Her interests include business model innovation, entrepreneurship and game-based learning. Katherine previously worked at Circle Economy, a non-profit, circular economy-focused organisation based in Amsterdam where she led the Circular Design Program. She holds engineering degrees from Webb Institute and Delft University of Technology.

**Martina Zimek** is a Ph.D. student at the Institute of Systems Sciences, Innovation and Sustainability Research at the University of Graz. She earned her master's degree in environmental system sciences with its subject focus on sustainability-oriented management. She made part of her master in Australia, Sydney (University of Western Sydney), focusing on topics of business administration. Since November 2015, she works as university assistant at the University of Graz, studying for a Ph.D. in the interdisciplinary doctoral programme at the Faculty of Environmental and Regional Sciences and Education; her current research interests are corporate social responsibility, sustainability performance, corporate sustainability assessment. The focus of her Ph.D. thesis is on operationalization of sustainability performance when systemic impacts are integrated.

# List of Figures

Fig. 1.1	Innovation for sustainability spectrum (Adapted from Konietzko et al. 2018; Adams et al. 2016 and Ceschin and Gaziulusoy 2016)	5
Fig. 1.2	Overview of book structure	8
Fig. 3.1	Core literature citations received for the 5 key IFS discussions over time	44
Fig. 3.2	Time series for core and peripheral literature publication numbers	45
Fig. 3.3	Distribution of subject category citations in the core and peripheral literature	46
Fig. 3.4	Most popular and cited publication venues for core and peripheral literature	47
Fig. 4.1	Levels of environmental dynamism and impact on firms' IFS engagement	66
Fig. 5.1	In a CBM, the business model is redesigned to encompass circular services and product design. Adapted from Osterwalder and Pigneur (2010), Bocken et al. (2016a) and Guldmann and Remmen (2018)	80
Fig. 6.1	Concepts and principles related to green growth (author's illustration, based on Prognos 2014)	103

Fig. 8.1	Ideal decision outcome of the relationship between sustainable innovation project uncertainty and corporate resources (building on Tidd and Bessant 2013)	138
Fig. 9.1	Decision-making challenges in innovation for sustainability	169
Fig. 15.1	Exemplary GRI G4 Materiality Matrix in which we position the 4 strategic options companies have and we indicate how walk and talk are related to the axes. <a href="https://g4.globalreporting.org/how-you-shouldreport/reporting-principles/principles-for-defining-report-content/materiality/Pages/default.aspx">https://g4.globalreporting.org/how-you-shouldreport/reporting-principles/principles-for-defining-report-content/materiality/Pages/default.aspx</a>	277
Fig. 16.1	Alignment of goal setting and level of (un)certainly of circumstances	301
Fig. 16.2	Combinations of adaptive vs. centralised design and management perspectives	303
Fig. 17.1	Research model	318
Fig. 18.1	General model of a process under investigation (Adapted from Montgomery 2001)	338
Fig. 18.2	Validated customer learning loop (Amended from Weissbrod and Bocken 2017, adapted from Ries 2011 and Blank 2013)	340
Fig. 18.3	Experimental learning method for sustainable innovation based on the lean startup approach (Adapted from Weissbrod and Bocken 2017)	347
Fig. 19.1	Series of rapid experimentations	358
Fig. 19.2	Business model experimentation process model (Source Developed from Bocken et al. [2018], Osterwalder et al. [2014], Schuit et al. [2017] and Antikainen et al. [2017])	361
Fig. 19.3	Rapid Experimentation Card (Source Antikainen et al. [2017])	363
Fig. 19.4	Liiteri rapid mode experimentation card (Antikainen et al. 2017)	369
Fig. 21.1	From CE-inspired imaginaries to sustainable innovations	404
Fig. 23.1	The roles of online platforms in enabling a circular economy: market, operate and co-create products, components and material	445

# List of Tables

Table 2.1	Sceptical, pragmatic, and idealist perspectives on innovation for sustainability	25
Table 4.1	Main features of the sample companies	65
Table 5.1	Model for Circular Business Model Innovation (CBMI)	87
Table 6.1	Green growth definitions of leading key institutions	101
Table 7.1	Different leadership perspectives which highlight moral/ethical dimensions	122
Table 8.1	Characteristics of conventional versus sustainable innovation	137
Table 9.1	Overview of the challenges of delivering systemic innovations for sustainability	163
Table 11.1	The fashion companies' business <i>models</i>	201
Table 12.1	Cluster analysis results	219
Table 12.2	The means of the sustainability factors in each cluster	221
Table 13.1	The typology of sustainable innovation	236
Table 13.2	Examples of KPIs for sustainable innovation performance	243
Table 13.3	Sustainable innovation performance measurement challenges and solutions	245
Table 14.1	Evaluation of assessment methods to weigh corporate activities related to business model building blocks (Author's illustration)	258

Table 15.1	Materiality of the SDGs and organizational alignment	284
Table 17.1	Logistic regression findings	319
Table 20.1	Game elements summarized by the authors based on Fullerton and Swain (2008)	377
Table 20.2	Overview of case examples discussed in the chapter	378
Table 22.1	Economic, social and environmental opportunities and challenges of digital technologies	420
Table 23.1	The roles of online platforms, how literature describes them and their key potential for a circular economy	438