



Innovative products and services for sustainable societal development: Current reality, future potential and challenges



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A B S T R A C T

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This special volume originates from the International Conference on Innovation and Management held at University of Vaasa in Finland in 2014. Talks with the key note speaker and Editor-in-Chief of the Journal of Cleaner Production led to an idea to develop a special volume about innovative products and services according to the themes of the conference. Thus, the purpose of this special volume is to explore different viewpoints of how innovative products and services may support sustainable societal development. There are five thematic areas with papers that describe new advancements in different industries and organizations. The included papers cover relevant theoretical background and present case studies and practical results. This special volume shows that great progresses are being made in different thematic areas but also that there are so much more waiting to be done for sustainable societal development. This volume indicates that cross-disciplinary approach is truly needed to achieve societal sustainable development. This requires people to change their mindsets and genuinely co-operate towards better future.

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1. Introduction

Sustainable development is a broad field that needs innovation. The challenges facing societies in seeking to make sustainable development a reality are complex and no single innovation will be sufficient for societies to make the necessary transitions to equitable, sustainable, liveable post-fossil carbon societies. Societies require a wide diversity of innovations make real progress. Therefore, multi-disciplinary thinking, co-operation, research and practice are needed. The best way to 'solve' the complex challenges presented by climate changes and numerous other problems is to search for, test, adapt and ensure widespread implementation of

truly effective, innovative solutions in a multi-disciplinary manner. It is essential to break away from the old, stagnant ways of thinking to create sustainable and equitable solutions. The objectives of this special volume (SV) of the Journal of Cleaner Production (JCLP) were based on this common-sense reasoning. The SV has the following themes: 1) Sustainable Energy Innovations, Green Products and Services; 2) Open Innovation and Collaboration for Sustainable Social Development; 3) Sustainable Operations and Supply Chain Management; 4) Remanufacturing and Networked Manufacturing; and 5) Knowledge Management for Sustainable Societal Development. Theme 1 Sustainable Energy Innovations, Green Products and Services was clearly the most popular theme in the SV with most submissions and papers in the SV. In the following sections the objectives of the SV and the content of the articles in the five themes are reviewed.

The first objective of the SV was to explore new innovations and their management in several thematic areas, which in different ways can contribute to sustainable societal development. The

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second objective of the SV was to explore holistic and innovative ways to combine advancements in different fields, and to develop overarching sustainable solutions. To meet these objectives, several thematic areas were addressed. The themes cover products and services as well as their production, operations, and supply chains. Parallel to these themes, Innovation management, Knowledge management and Information and Service technology were presented and reviewed. These themes cover tangible and intangible elements that are needed to develop, test and implement sustainable solutions. These themes are introduced and the findings presented in the articles are highlighted and contextualized.

2. Themes in this special volume

2.1. Sustainable energy innovations, green products and services

Guest editor: Peura, Pekka

Sustainable energy (SE) has become one of the key approaches for reforming the energy sector in the EU and worldwide to accelerate the transition to equitable, sustainable, post-fossil carbon societies. As the production of energy has caused and is causing major impacts on the environment, “Renewable energy is one of the most efficient ways to achieve sustainable development” (Goldemberg, 2007), and “One of the main tasks in this century (...) will be to manage a transition process to sustainable energy systems” (Haas et al., 2008). The concept of SE was recently reviewed, and redefined by (Peura, 2013) as follows: rational use of energy (RUE); energy efficiency and energy saving; renewable energy sources (RES); materials and other sources (biomass, wood, hydro, solar, geo, wind, wave, tidal, ocean thermal energy conversion (OTEC) ..., etc.), Integration of RUE and RES, as well as Sustainability Management.

There are many technologies for both RUE and for producing and utilising RES. They can be implemented as separate solutions or be designed and used in integrated systems. The integration of RUE and RES technologies and management will be the key to planning and implementing complete solutions. With different combinations of the RUE and RES technologies and regional RES energy, it will be possible to develop, implement, monitor and manage ‘solutions’ with different degrees of energy self-sufficiency. This concept can be applied to any target building, company, community, region, or nation or groups of nations. It is essential to establish governmental and corporate policies and management systems for avoiding a new field of ecological colonialism in the name of SE. The novelties in this field will arise from integrating separate technologies into system-wide level innovations including green products and services.

2.1.1. In this theme

There are five articles in this theme: “Study of institutional change in transportation,” by [de Leeuw and Gössling \(2016\)](#), in Volume 135, Pages 435–448; “Analysis of manufacturers’ portfolio decisions on the electric car market diffusion,” by [Kieckhafer et al. \(2017\)](#); “Research of the failures in bilateral energy exchange projects,” by [Phuc and Matsuura \(2017\)](#); “Analyses of the adoption of sustainable energy systems into corporate financial performance,” by [Marti \(2017\)](#); and “Exploration of the role of users in the green innovation processes of incumbent firms,” by [Purtik et al. \(2017\)](#).

De Leeuw and Gössling reviewed case studies, including Uber, to gain insights from early adopters for institutional environmental change in transportation in taxi operations. They validated and extended the process model for institutional change by [Greenwood et al. \(2002\)](#). Their proposed new model describes different phases of institutional change.

Kieckhafer, Wachter and Spengler applied the automotive market simulator (AMaSi) to analyse the leverage of manufacturers to support the market diffusion of electric vehicles. The model was parameterized for the German car market to simulate different product portfolio options. The authors documented that manufacturers’ portfolio decisions influence the market development of electric vehicles.

Phuc and Matsuura made research on the reasons behind the failure of coordination in bilateral energy exchange projects. They aimed at designing a sustainability framework for coordination of such bilateral energy exchange projects and to increase their feasibility. The authors proposed potential solutions and guidelines for bilateral energy exchanges.

Marti analysed whether the adoption of sustainable energy systems improves corporate financial performance. The dataset covered hundreds of multinational companies from 36 countries in the timeframe of 2008–2013. The results showed that the adoption of sustainable energy systems was beneficial for short-term corporate financial performance, and had no effect in the long-term.

Purtik et al. studied the role of users in the green innovation processes of incumbent firms. They made a comparative case study of e-mobility and smart housing by using three European incumbent firms to integrate users at different stages of the innovation process. Their results showed that firms may profit from an extensive user input throughout all phases of the innovation process to develop novel green products and services.

2.1.2. Current reality

The whole energy sector is experiencing many changes, a transition away from fossil-carbon fuelled towards RES systems globally. It is clear, that this process is primarily much more than merely technical changes, it is a comprehensive societal change process, where all societal and ecological spheres are or must be involved, including economy and regional economy, legislation, environmental matters, societal acceptance, policies and agreements etc. Also, it involves or must involve all stakeholders from energy utilities and manufacturers to institutions, municipalities, politicians, enterprises, farms and separate consumers and individual clients. Moreover, the roles are shifting for instance from merely being a customer to participating in decision-making and becoming an individual or collective producer of renewably-based energy.

In this transition, the theoretical and actual, real-world constellations are complicated. As in any innovation diffusion process, there are many perspectives and aspects that must be integrated in research and aligned in practical development. Business in this field is not “business-as-usual”, as there are many societal, global aspirations, actions, agreements and policies in the background, all having their impacts on the operational environment in the evolving sector. However, all technical innovations, societal concepts and investments must be installed in real time markets, where today the established prevailing systems are very strong and competitive.

2.1.3. Future potential and challenges

Future potential and challenges in this transition are highly obvious: Changes are taking place globally, in an accelerating pace, and continuously new emerging concepts and innovations are being developed, tested, adapted and implemented. The potential is enormous, purely technically and economically this will be one of the most profitable field of business in the coming 10–20 years. The vast challenges and potentials will, be the abatement of climate change, as the production of energy has traditionally been the main source of emissions. Recently, the significance of regional

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