Technology Innovation Management Review

December 2015
Volume 5 Issue 12

Budapest, Hungary. By Loris Silvio Zecchinato

Living Labs and User Innovation

Welcome to the December issue of the *Technology Innovation Management Review*. We welcome your comments on the articles in this issue as well as suggestions for future article topics and issue themes.

Carleton UNIVERSITY

www.timreview.ca

Technology Innovation Management Review

December 2015
Volume 5 Issue 12

Publisher

The *Technology Innovation Management Review* is a monthly publication of the Talent First Network.

ISSN

1927-0321

www.timreview.ca

Overview

The *Technology Innovation Management Review* (TIM Review) provides insights about the issues and emerging trends relevant to launching and growing technology businesses. The TIM Review focuses on the theories, strategies, and tools that help small and large technology companies succeed.

Our readers are looking for practical ideas they can apply within their own organizations. The TIM Review brings together diverse viewpoints – from academics, entrepreneurs, companies of all sizes, the public sector, the community sector, and others – to bridge the gap between theory and practice. In particular, we focus on the topics of technology and global entrepreneurship in small and large companies.

We welcome input from readers into upcoming themes. Please visit timreview.ca to suggest themes and nominate authors and guest editors.

Contribute

Contribute to the TIM Review in the following ways:

- Read and comment on articles.
- Review the upcoming themes and tell us what topics you would like to see covered.
- Write an article for a future issue; see the author guidelines and editorial process for details.
- Recommend colleagues as authors or guest editors.
- Give feedback on the website or any other aspect of this publication.
- Sponsor or advertise in the TIM Review.
- Tell a friend or colleague about the TIM Review.

Please contact the Editor if you have any questions or comments: timreview.ca/contact

About TIM

The TIM Review has international contributors and readers, and it is published in association with the Technology Innovation Management program (TIM; timprogram.ca), an international graduate program at Carleton University in Ottawa, Canada.

Editorial: Living Labs and User Innovation

Chris McPhee, Editor-in-Chief
Seppo Leminen, Dimitri Schuurman,
Mika Westerlund, and Eelko Huizingh, Guest Editors

From the Editor-in-Chief

Welcome to the December 2015 issue of the *Technology Innovation Management Review* – the first of two issues on the theme of **Living Labs and User Innovation**. It is my pleasure introduce our guest editors for December and January: **Seppo Leminen** (Laurea University of Applied Sciences and Aalto University, Finland), **Dimitri Schuurman** (iMinds and Ghent University, Belgium), **Mika Westerlund** (Carleton University, Canada), and **Eelko Huizingh** (University of Groningen, Netherlands).

Also on the topic of living labs, I am also pleased to announce the publication of a new title in our Best of TIM Review book series. Edited by **Mika Westerlund** and **Seppo Leminen**, *Living Labs: Best of TIM Review* is now available as a Kindle ebook from Amazon (amzn.to/1T7obql). With a foreword contributed by **Bror Salmelin**, Advisor on Innovation Systems for the European Commission, the book commemorates the 10th anniversary of the birth of the living labs movement in Europe. Note that all of the net proceeds from the sales of our Best of TIM Review ebooks will be used to offset the operational costs of publishing future issues of the TIM Review.

This current issue features five new articles on living labs. It also includes a summary of a recent TIM Lecture given by **Chris Hobbs**, entitled "When Are Software Systems Safe Enough?" The lecture covered the changing nature of safety-critical software over the last 20 years, including a brief discussion of the standards that are directing development in the medical, industrial, and automotive fields.

We hope you enjoy this issue of the TIM Review and will share your comments online. We welcome your submissions of articles on technology entrepreneurship, innovation management, and other topics relevant to launching and growing technology companies and solving practical problems in emerging domains. Please contact us (timreview.ca/contact) with potential article topics and submissions.

Chris McPhee
Editor-in-Chief

From the Guest Editors

We are glad to introduce the December issue of the *Technology Innovation Management Review* on the theme of **Living Labs and User Innovation**. Due to the large number of high-quality proposals for this special issue, we are also proud to announce that the next issue of the TIM Review (January 2016) will also offer articles on Living Labs and User Innovation.

Continuing the TIM Review's history of productive collaborations with the International Society for Professional Innovation Management (ISPIM; ispim.org), the selected articles in the December and January issues were mainly developed from papers submitted to the living lab track in ISPIM 2015 Innovation Conference held in Budapest from June 19–22, 2015.

In recent years, the TIM Review has played an important role in developing and catalyzing research on living labs. This is the fourth thematic issue on Living Labs since the first issue on this theme was published in September 2012. With the publication of the December and January issues on this theme, the journal will have published nearly 30 articles in this area. This body of work is a clear example of the further academic development and adolescence of the field of living lab research.

Prior literature proposes living labs as the latest stage on a continuum of versatile forms of open and user innovation (cf. Leminen et al., 2012; Schuurman, 2015), with three distinctive principles that sets them apart from other forms of open innovation and collaborative innovation: the active involvement of users in innovation activities, public–private–people partnerships and real-life environments (cf. Leminen, 2015; Schuurman et al., 2012). This "European school" of living lab thinking is beneficial to involve users in innovation activities (McPhee et al., 2015).

This issue of TIM Review provides five theoretically and practically oriented articles for managers and innovation developers as well as researchers and other parties of interest. The five selected articles offer insights into living labs activities in different European countries and

Editorial: Living Labs and User Innovation

Chris McPhee, Seppo Leminen, Dimitri Schuurman, Mika Westerlund, and Eelko Huizingh

offers various perspectives on living lab phenomena: openness versus closedness, business models, actor roles, spaces, and context.

The first article is by **Seppo Leminen**, **Taija Turunen**, and **Mika Westerlund**, from Laurea University of Applied Sciences in Finland, Aalto University in Finland, and Carleton University in Canada. The article suggests different degrees of openness in versatile innovation networks. The authors identified four key areas characterized by openness or closedness in innovation networks: governance, motivation, interaction, and innovation practices. The article concludes that such key characteristics of openness can be applied to innovation networks to better understand their operation and management.

The second article is by **Olivier Rits**, **Dimitri Schuurman**, and **Pieter Ballon** from iMinds, Vrije Universiteit Brussel, and Ghent University in Belgium, who take a business model perspective on user involvement within living lab projects. The authors introduce a practical framework to design and implement business models for innovations developed in living labs, based on the experience of projects at iMinds Living Labs with small and medium-sized enterprises over the past few years. Such a framework makes a significant contribution to the literature of living labs given that business models are an under-researched topic in the context of living labs.

In the third article, **Anna Ståhlbröst** and **Josefin Lassinantti**, from Luleå University of Technology in Sweden, adopt crowdsourcing to analyze living lab innovation processes. The article introduces stages within the innovation process in living labs and couples the core role of facilitators to these stages. The article contributes to the literature of living labs by proposing four roles of crowd engagement. The authors emphasize that, to reap the benefits of crowdsourcing in living labs, managers must maintain an ethical and inclusive innovation process.

The fourth article is by **Birgitta Bergvall-Kåreborn**, **Carina Ihlström Eriksson**, and **Anna Ståhlbröst** from Luleå University of Technology and Halmstad University in Sweden, who propose a conceptual tool – places and spaces – to facilitate the organization of innovation activities within living labs. The authors offer a pragmatic perspective to the literature of living labs to study how the concepts of place and space are integrated in design situations and how different types of places and spaces can facilitate or hinder innovation.

Finally, the fifth article, contributed by **Yvonne Franz**, **Karin Tausz**, and **Sarah-Kristin Thiel** from Austrian Academy of Sciences, Austriatech, and the University of Salzburg, discusses contextuality and co-creation within urban living labs. By means of three case studies, the authors argue that urban living labs have the capability to go beyond testing and improving new products. The cases illustrate that innovation in an urban living lab context is embedded in appropriate social, structural, and institutional frameworks, which facilitate civil society involvement. Therefore, the authors propose living labs as an instrument to support urban studies within the domains of socio-spatial environment, living together, and urban policies.

To sum up, we have gathered five articles that introduce diverse perspectives that will help managers and researchers to understand and develop living lab organizations and projects, and to apply living lab principles in their daily practice.

Seppo Leminen, Dimitri Schuurman,
Mika Westerlund, and Eelko Huizingh
Guest editors

References

Leminen, S. 2015. *Living Labs as Open Innovation Networks – Networks, Roles and Innovation Outcomes*. Doctoral dissertation. Helsinki, Finland: Aalto University.

Leminen, S., Westerlund, M. & Nyström, A.-G. 2012. Living Labs as Open-Innovation Networks. *Technology Innovation Management Review*, 2(9): 6–11.
http://timreview.ca/article/602

McPhee, C., Leminen, S., & Westerlund, M. 2013. Editorial: Living Labs. *Technology Innovation Management Review*, 3(11): 3–4.
http://timreview.ca/article/739

Schuurman, D. 2015. Bridging the Gap between Open and User Innovation? Exploring the Value of Living Labs as a Means to Structure User Contribution and Manage Distributed Innovation. Doctoral Dissertation. Ghent University and Vrije Universiteit Brussel VUB.

Schuurman, D., & Marez, L. D. 2012. Structuring User Involvement in Panel-Based Living Labs. *Technology Innovation Management Review*, 2(9): 31–38.
http://timreview.ca/article/606

Editorial: Living Labs and User Innovation

Chris McPhee, Seppo Leminen, Dimitri Schuurman, Mika Westerlund, and Eelko Huizingh

About the Editors

Chris McPhee is Editor-in-Chief of the *Technology Innovation Management Review*. He holds an MASc degree in Technology Innovation Management from Carleton University in Ottawa, Canada, and BScH and MSc degrees in Biology from Queen's University in Kingston, Canada. Chris has over 15 years of management, design, and content-development experience in Canada and Scotland, primarily in the science, health, and education sectors. As an advisor and editor, he helps entrepreneurs, executives, and researchers develop and express their ideas.

Seppo Leminen holds positions as Principal Lecturer at the Laurea University of Applied Sciences and Adjunct Professor in the School of Business at Aalto University in Finland. He holds a doctoral degree in Marketing from the Hanken School of Economics and a doctoral degree in Industrial Engineering and management in the School of Science at Aalto University. His research and consulting interests include living labs, open innovation, value co-creation and capture with users, relationships, services and business models in marketing, particularly in Internet of Things (IoT), as well as management models in high-tech and service-intensive industries. Results from his research have been reported in *Industrial Marketing Management,* the *Journal of Technology and Engineering and Management, Management Decision,* the *International Journal of Technology Management,* the *International Journal of Technology Marketing,* the *International Journal of Product Development,* and the *Technology Innovation Management Review,* among many others.

Dimitri Schuurman holds a PhD (2015) and Master's degree in Communication Sciences (2003) from Ghent University in Belgium. He joined the research group iMinds – MICT – Ghent University in 2005 and started working at iMinds Living Labs in 2009. Together with his iMinds colleagues, Dimitri developed a specific living lab offering targeted at startups and SMEs, in which he has managed over 50 innovation projects. As a senior researcher, Dimitri is currently responsible for the methodology and academic valorization of living lab projects. He also coordinates a dynamic team of living lab researchers from iMinds – MICT – Ghent University. His main interests and research topics are situated in the domains of open innovation, user innovation, and innovation management. In early 2015, he finished his PhD entitled *Bridging the Gap between Open and User Innovation? Exploring the Value of Living Labs as a Means to Structure User Contribution and Manage Distributed Innovation.*

Mika Westerlund, DSc (Econ), is an Associate Professor at Carleton University in Ottawa, Canada. He previously held positions as a Postdoctoral Scholar in the Haas School of Business at the University of California Berkeley and in the School of Economics at Aalto University in Helsinki, Finland. Mika earned his doctoral degree in Marketing from the Helsinki School of Economics in Finland. His current research interests include open and user innovation, the Internet of Things, business strategy, and management models in high-tech and service-intensive industries.

Eelko Huizingh is an Associate Professor of Innovation Management at the Faculty of Economics and Business, University of Groningen in the Netherlands. His academic research focuses on the intersection of innovation and entrepreneurship, marketing, and information technology. He has authored over 300 articles, has edited more than 20 special issues of journals, and has published several textbooks. His consulting activities include support of companies in their strategy and innovation efforts. He is also the Director of Scientific Affairs for the International Society for Professional Innovation Management (ISPIM; ispim.org) and the Director of Huizingh Academic Development (HAcademic.com), through which he has run more than 50 workshops around the world to help both junior and senior academics to publish for career advancement and to attract funding through improved written communication.

Citation: McPhee, C., Leminen, S., Schuurman, D., Westerlund, M., & Huizingh, E. 2015. Editorial: Living Labs and User Innovation. *Technology Innovation Management Review,* 5(12) 3–5. http://timreview.ca/article/947

Keywords: living labs, user innovation, open innovation, closed innovation, business models, spaces and places, context, innovation networks, crowdsourcing, urban living labs

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

> *"Become dangerously open to all points of view. Are you dangerously open, or safely closed?*
>
> Bryant McGill
> In Simple Reminders: Inspiration for Living Your Best Life

This study argues that there are different degrees of openness and closedness in innovation activity, and it highlights the need for more research on the "grey areas" between totally open and totally closed innovation, particularly in innovation networks where multiple stakeholders collaborate for innovation. Here, we focus on four key aspects of innovation networks, as characterized by their degrees of openness or closedness: governance, motivation, interaction, and innovation practices. The categorization is based on a review of theory and an empirical analysis of three distinct innovation networks, two of which represent the open living lab model, and one of which exemplifies the traditional closed innovation model. Our results can help managers improve efficiency in innovation networks by better understanding the grey areas between open and closed in innovation.

Introduction

Innovation is increasingly perceived as collaboration beyond company boundaries rather than intra-organizational action (Berchicci, 2013). Consequently, involving customers and users as co-developers of innovation has become a trend in many industries. Despite the obvious benefits of developing new products and services that better serve market needs, there are several challenges. Ideas from customers and users are often considered more radical, original, and valuable, but ideas from in-house developers are often more realizable (Edvardsson et al., 2010). Moreover, innovation drawing on external sources calls for open structures and processes.

Today's intense competition and short lifecycles require faster development of products and services (Duhamel et al., 1995). Many innovators find it difficult and costly to gain sufficient understanding of customers. Thus, companies no longer attempt to grasp the details of user needs alone, but operate through innovation networks characterized by openness and collaboration as well as heterogeneous actors (Edvardsson et al., 2012; Leek & Canning, 2011). In particular, they reassign the design aspect of innovation development to users who can help with the innovation and create new ideas (Edvardsson et al., 2010; de Vries, 2006).

The living labs model (Budweg et al., 2011; Dell'Era & Landoni, 2014; Leminen, 2015; Leminen & Westerlund, 2012; Nyström et al., 2014; Westerlund & Leminen, 2011) is a particularly interesting form of multi-actor collaboration. In living labs, stakeholders form public–private–people partnerships of firms, public agencies, universities, and users all collaborating to create, prototype, validate, and test new technologies, services, products, and systems in real-life contexts (Leminen et al., 2012). Despite the growing popularity of living labs that are essentially open innovation networks but that can also utilize characteristics associated with closed innovation such as selective or restricted participation, there is scant research on the "grey areas" between open and closed innovation in living labs (Leminen & Westerlund, 2013).

Hence, previous research presents open and closed innovation as distinct alternatives (Almirall & Casadeus-

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Masanell, 2010; Leminen & Westerlund, 2011). The open innovation literature discusses innovation activities that involve customers, users, and other stakeholders, whereas closed innovation refers to innovation activities that come about within a single organization. Kviselius and colleagues (2012) call for more research on the characteristics of these two modes. We aim to understand the grey areas between open and closed in innovation networks, whereas the main body of existing research focused on either totally open or totally closed innovation. To achieve these objectives, we focus on the following research questions:

- What are the characteristics of open and closed innovation networks?

- How do the grey areas between open and closed innovation show up in innovation networks?

The article is structured as follows. First, we review the theoretical foundations of open and closed innovation, and we present living labs as a form of open innovation network. Then, we describe our research methodology and provide empirical findings on the grey areas between open and closed innovation in innovation networks. Finally, we discuss our findings, comment on the managerial challenges, and offer practical recommendations.

Theoretical Background

People today live in a world of networks that redefine their lifestyles. It is becoming a challenge to develop offerings that meet hyper-differentiated consumer demands (Arakji & Lang, 2007). Many firms no longer attempt to grasp the details of consumer needs alone, but reassign product development to external sources of ideas, such as customers and users, who can help generate ideas and create new innovations and value (Edvardsson et al., 2010). Although the idea about "prosumers" (producer–customers) is not new (Dahlander et al., 2008) only recent research has underlined the prolific role of users as innovators (cf. Bogers et al., 2010; Leminen et al., 2015).

Customer insight speeds up the development processes and lowers costs, because it is otherwise expensive to try to understand user needs. Zaltmann (2003) argues that at least 80 per cent of new products and services fail when launching them into market. Thus, integrating customers and users into innovation development as co-developers is increasingly popular. Co-development is about co-opting the competences of customers and bringing users into the innovation and design processes (Edvardsson et al., 2010). This approach enables a firm to understand users' actual behaviours, needs, and future trends, but it requires openness in processes and structures.

Although firms draw on their own expertise to access markets, openness refers to the pooling of knowledge for innovative purposes, where the contributors have access to the inputs of others and cannot exert exclusive rights over the innovation (Chesbrough & Appleyard, 2007). Value created through an open process approaches that of a public good and causes fear of losing intellectual property rights. According to Cassiman and Valentini (2009), firms should simultaneously consider the type of research and development (R&D) to be performed and the organization of R&D that includes the exposure of the project to knowledge from outside the firm.

Dahlander and Gann (2010) discuss forms of openness via pecuniary and non-pecuniary benefits, and via inbound and outbound innovation. Respectively, pecuniary and non-pecuniary refer to direct and indirect benefits to the firm. Inbound innovation refers to the internal use of external knowledge and outbound innovation refers to external exploitation of internal knowledge (Huizingh, 2011). Open innovation assumes that openness is a strategic choice of a firm to use external and internal ideas and their paths to market (Chesbrough 2003). Laursen and Salter (2006) introduced "external search breadth" and "external search depth" to characterize a firm´s strategy to acquire external knowledge to exploit innovative opportunities. Almirall and Casadeus-Masanell (2010) found "discovery" and "divergence" effects related to open innovation.

Openness is evident in innovation networks. Bergvall-Kåreborn and Ståhlbröst (2009) consider openness as an "iterative process cycle" in a network. Pisano and Verganti (2008) discuss networks through the choice of "governance" (hierarchical or flat) and "participation" (open or closed). Westerlund and Leminen (2011) suggest that the "degree of openness" and networking increase when a firm advances towards user-driven innovation. Schweisfurth, Raasch, and Herstatt (2011) put forward five characteristics of openness, and Huizingh (2011) describes innovation types with the help of innovation process and innovation outcome. Finally, Drechsler and Natter (2012) argue that openness is a manager's key strategic decision. Table 1 summarizes previous research that helps us identify the characteristics of openness in innovation networks.

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Table 1. Openness and closedness in innovation networks

Construct	Characteristics of Construct	Definition of Construct	Sources
Open and closed innovation	Open and closed innovation paradigms	Openness as choice of using external or internal ideas and their paths to market	Chesbrough (2003)
	Discovery and divergence	Open innovation allows discovery of new product landscapes	Almirall & Casadesus-Masanell (2010)
Openness	External search breadth and depth	Openness as individual firm's external search strategies and external performance	Laursen & Salter (2006)
	Pecuniary and non-pecuniary benefits; inbound and outbound innovation	Openness as inbound and outbound processes	Dahlander & Gann (2010)
	Innovation process (open or closed) and innovation outcome (open or closed)	Openness as a taxonomy of innovation processes and outcomes	Huizingh (2011)
	Iterative process cycle (generate needs, design, and evaluate)	Openness as a process with stakeholders	Bergvall-Kåreborn & Ståhlbröst (2009)
Open and closed network	Governance (hierarchical or flat) and participation (open or closed)	Openness as a choice of governance and participation in collaboration networks	Pisano & Verganti (2008)
Degree of openness	Degree of openness (open or closed) and type of co-creation (producer-led or customer-led)	Openness as a stepwise model for a company becoming an open innovation company	Westerlund & Leminen (2011)
	Firms innovation strategy, scarce firm resources, appropriability regime, and market dynamics	Openness as a usage of external information in innovation	Drechsler & Natter (2012)
Openness, open innovation	Types of actors, motivation, contractual framework (transparency, accessibility, and IP contribution), decision right, and innovation process (phases)	Openness as a taxonomy of five characteristics	Schweisfurth et al. (2011)

Framework

We focus on the characteristics of openness (cf. Pisano & Verganti, 2008; Schweisfurth et al., 2011; Westerlund & Leminen, 2011) to comprehend openness and closedness in networks. We deem that innovation networks comprise different types of actors; Leminen, Westerlund, and Nyström (2012) identified these actors in living labs as utilizers, enablers, providers, or users. Figure 1 illustrates our framework and its four key characteristics of openness or closedness in innovation networks: governance, motivation, interaction, and innovation practices.

Governance

Pisano and Verganti (2008) propose a two-by-two matrix to distinguish between diverse innovation networks. They demonstrate governance to be one of the key elements of networks. Mulder, Velthausz, and Kriens, (2008) identify governance as one of six perspectives to

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

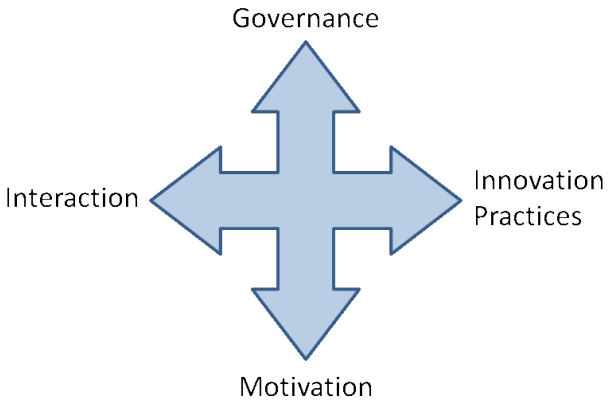

Figure 1. Framework for analyzing openness and closedness in innovation networks

influence open innovation networks, and Chiaroni Chiesa, and Frattini (2010) address networks crucial for firms to move from a closed innovation mode to open innovation. Schweisfurth, Raasch, and Herstatt (2011) propose that allocation of decision-making rights, such as task definition, task allocation, and selection of result, differ across open innovation procedures. Leminen, Westerlund, and Nyström (2012) argue that the actor making decisions on goal setting varies between different open innovation networks.

Prior literature assumes that networks differ by their management structure, density, and connectivity. Lay and Moore (2009) argue that "collaborative networks" are complex, focus on innovation, and are coordinated by "hubs", whereas "coordinated networks" aim at high volumes and efficiency, and are coordinated by a "concentrator". Centralized networks are good for simple problems; coordination and decentralized networks are suited to complex problems (Lazer & Friedman, 2007). Chesbrough (2003) emphasizes the management of internal and external ideas when targeting new markets and Von Hippel (2007) shows that open innovation networks are self-coordinated and aim to solve problems of interest to their stakeholders.

Interaction

Interaction between companies and those beyond organizational boundaries is essential in innovation networks (Pisano & Verganti, 2008). The literature views open innovation as a process with predefined phases that address collective innovation, user innovation networks, commons-based peer production, crowdsourcing, and open source innovation (Schweisfurth et al., 2011) and living labs (Gong et al., 2012; Kang, 2012; Lin et al., 2012). In living labs, phases are often documented from an adaptor´s perspective on innovation (Bendavid & Cassivi, 2012), detailed descriptions of execution in living activities (Gong et al., 2012), parts of new product development and commercialization processes (Katzy et al., 2012; Katzy, 2012), and evidence of systemic thinking (van der Waltand & Buitendag, 2009). Predefined phases may not exist, given that innovation activities are continually redirected based on interaction with users in innovation networks (Westerlund & Leminen, 2011).

The level of interaction is important. Sjödin, Eriksson, and Frishammar (2011) found that, although the level of interaction in terms of collaboration intensity varies across stages from closed to open modes of innovation, early collaboration paves the way for collaboration in later stages. The open innovation literature (Bogers et al., 2010; von Hippel, 2007) describes different innovation approaches; for example, user-driven innovation is based on tight interaction with users, whereas user-centric innovation assumes looser interaction. The users' roles in networks, such as co-creator, co-developer, tester, or informant, describe the depth of interaction (Leminen et al., 2014).

Innovation practices

Innovation practices in networks address foundational aspects, such as the transparency of innovation development, accessibility to innovation processes, and intellectual property (IP) issues. Transparency refers to an actor's right to inspect a design and to observe its development in the network, and accessibility refers to a network member's right to participate in the development process by making modifications to previous solutions or contributing new solutions. IP management needs to attend to public commons or the retention of IP rights by a single actor in the form of patents (Schweisfurth et al., 2011).

IP portfolios constitute an important driver of open innovation (Lichtenthaler, 2010). According to Drechsler and Natter (2012), the degree of openness can range from closed to multiple levels of openness, and firms pursuing open innovation may be concerned about ineffective IP protection. IP commons in open innovation draw on copyleft thinking, which concerns the extent of the IP that can be released while enabling initiators to benefit from the innovation (Rajala et al., 2012). By actively acquiring, commercializing, and out-licensing IP in the markets, open innovation contrasts closed innovation processes (Lichtenthaler, 2010).

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Motivation
Motivations to participate are elemental, because being motivated means being compelled or encouraged to act (Battistella & Nonino, 2012). Actors' motivations can be differentiated by the degree of motivation and their reasons to participate. Schweisfurth, Raasch, and Herstatt (2011) argue that motivation in innovation networks comprises both individual and organizational motives, and they categorize motivations by financial, technological, and socio-political dimensions.

The distinction between different types of motivations builds on attitudes, intentions, and goals that lead a participant to act, think, and behave in a certain way (Battistella & Nonino, 2012). We draw on the classification of intrinsic and extrinsic motivations (Battistella & Nonino, 2013; Ryan & Deci, 2000). Network actors are motivated by intrinsic factors, for example, the perceptions of being part of the community and having a social identity, but they also influence the development of neighbourhood (Leminen & Westerlund, 2012). Extrinsic motivations concern all actions that lead, directly or indirectly, to economic advantages for the contributor. The reward incentives include monetary rewards (Antikainen et al., 2010), free products (Ståhlbröst & Bergvall-Kåreborn, 2011), and sharing of intellectual property rights (Battistella & Nonino, 2012).

Research Design

We apply a multiple case study design (cf. Yin, 2009) to analyze the grey areas between open and closed innovation in three innovation networks. We chose two living lab cases to represent openness and one conventional innovation network that uses a closed approach. The empirical research was based on inductive methods and compounds sources of evidence: interviews with key actors and other actors when necessary, internal documentation, and workshop participation. We used secondary data such as annual reports and marketing material for data triangulation (Diefenbach, 2009).

The cases were chosen because their approaches to innovation development enabled us to explore the grey areas between open and closed innovation. We used the following criteria for case selection: i) they represented innovation networks, ii) multiple actors were engaged in the development of innovation, and iii) innovation took place in real or simulated every-day life with users. We also utilized researcher participation for observation, but due to large network sizes and limited time and resources, were unable to interview every actor in each innovation network. Thus, we focused on the core actors.

From 2008 to 2011, we conducted 53 semi-structured interviews with managers from 10 organizations as well as 9 users. The informants included CEOs, CTOs, sales directors, researchers, project managers, project coordinators, and users. Interviews were carried out through face-to-face meetings and by phone, and they were audio-recorded for transcription and analysis. We cannot reveal the identities and organizations of the informants due to confidentiality reasons, but our findings describe the goals, activities, and outcomes of each network.

Data analysis
The unit of analysis was an actor's perception of openness. We first mapped the driving actor in each case in accordance with Leminen, Westerlund, and Nyström (2012). Next, we identified user roles following the categorization by Leminen and colleagues (2014). Then, we analyzed the interaction to understand how innovation activities are organized in networks, and we investigated the cases from the perspectives of innovation practice (Schweisfurth et al., 2011) and motivation (Ryan & Deci, 2000).

We coded the transcribed interviews using theme-based coding, in which relevant quotes were placed under each theme in our framework (i.e., governance, motivation, interaction, and innovation practices). By doing so, we followed Roberts (1997) and Neuendorf (2002) in making meaning out of the cases using content analysis and coding. Finally, we summarized the results and interpreted the characteristics in terms of openness and closedness. The outcomes were compared, discussed, and agreed upon by all authors. Table 2 synthesizes the phases of our data analysis process.

Description of Case Networks

Both Case 1 and Case 2 are living labs dominated by open idea generation. The living lab network represented by Case 1 focuses on prototyping of ideas for the retail industry. It is driven by a regional development organization and includes firms providing technological and methodological solutions, universities, users (e.g., students, employees, residents) and a firm utilizing the results. The living lab network represented by Case 2 develops mobile augmented-reality services with occupants from a particular geographic area and other users (e.g., students). It is driven by a firm utilizing the results, which provides tangible and intangible expertise for other stakeholders (e.g., universities) in the network.

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Table 2. Data analysis process used in this study

Phase	Task	Outcome
1. Open coding	• Organize cases • Identify actors in each case	• Overview of innovation networks
2. Focused coding	• Identify driving actors in each case network • Identify user roles each case network • Describe innovation mechanism and governance of innovation networks	• Map of formerly identified driving actors (cf. Leminen et al., 2012) • Determination of prior identified user roles (Leminen et al., 2014) • Detecting innovation mechanisms
3. Identifying innovation dynamics in networks	• Analyze interaction • Identify innovation practices and motivations • Compare data to theory	• Detection of interaction across networks • Map of formerly identified characteristics (cf. Schweisfurth et al., 2011) and motivations (cf. Ryan & Deci, 2000) in innovation
4. Theorizing based on codes	• Synthesize three previous phases	• Characteristics of openness in innovation networks

Case 3 is characterized by closed innovation. The network is formed around a building infrastructure where players have their own agendas and goals regarding innovation. The dominant player is closest to the customer and therefore can acquire customer information and take over the market. It has access to customer knowledge (e.g., user preferences) and can involve customers in innovation processes for designing the usability of a building. The suppliers are used to bring incremental innovations to the completion of a project.

Next, we analyzed the cases in relation to the framework to illustrate how these networks are governed, how the decisions are made, which way the interaction occurs, what kind of innovation practices these networks employ, and what the essential motivations are.

Findings

The following subsections reveal the characteristics of openness and closedness in the three investigated innovation networks. Two of the networks are living labs perceived as open innovation networks (Case 1 and Case 2), whereas Case 3 is perceived as a closed innovation network. Table 3 summarizes the innovation mechanisms in our cases.

Governance

The openness of innovation is related to the type and degree of governance (i.e., structure) in the network. There were flat hierarchical structures driven by an enabler in Case 1 (the regional development organization) and a utilizer in Case 2 (the mobile device manufacturer). They set the overall goals. The outcomes kept forming based on ongoing actions.

"We wanted to know about the purchasing behaviour of different customers in the daily consumer goods trade and understand how to improve their shopping experience through online services." (Case 2, User expert)

"We had the [living lab's] goals, which were approved by the enabler. They kept changing, which is vital in the [living lab] concept – who sets the goals, how do we reach them, and what is the most important goal? [...] If the participants trust each other, we can get good results, organize [the living lab] better, and point out everyone's responsibilities and strengths […] and share the workload accordingly." (Case 2, Project manager)

In addition to the mutual goal, each actor had their own objectives, for example, seeking business references, developing a prototype, or validating existing

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Table 3. Summary of the three innovation network cases

	Case 1: Dominated by open idea generation and prototyping	**Case 2:** Dominated by open idea generation	**Case 3:** Individual innovations
Objective	Develop and test services as a pilot in the retail industry; develop prototypes and concepts within the electronic and mobile business together with users	Develop augmented-reality services for a new mobile gadget in cooperation with users	Build new housing infrastructure (project-based business)
Dominator of Innovation Network	Enabler, regional development organization	Utilizer, company	Organization closest to the customer interface having the investment capacity (utilizer)
Actors	Enabler (regional development organization), provider (universities, ICT companies), users, and utilizer (retailer)	Enabler, provider (universities, ICT companies), user, and utilizer (mobile company)	Provider (investor), utilizer (builder), user
User Roles	Co-creator, co-developer	Co-creator, co-developer	Co-creator, informant
Innovation Outcome	Incremental innovation; prototypes and concepts co-developed with users from a geographical area, students, and researchers	Radical innovation; mobile augmented-reality services; utilizer co-developed innovation with occupants from a geographical area, researchers, and students	Incremental innovation for usability of buildings (interior design solutions, lighting solutions, air ventilation systems)

concepts. The flat hierarchical structures enabled collaborative processes, the transition of knowledge between the actors, and common learning process. They were major outcomes besides the prototypes, concepts, and services.

In Case 3, the network structure was hierarchical, and each player had their predefined roles. Each network actor had defined the desired outcome before the launch of the project. Case 3 was dominated by a hierarchical setting in the beginning of the project. However, this changed later when interaction increased dramatically as actors started to collectively search for innovative means to complete the project.

"It seems like the end user is not [participating] in any way yet…will not get their voice out or we don't even think about it." (Case 3, Manager)

The decision rights were held by the actor that had the investment capacity. Thus, the utilizer was responsible for steering the network by setting the targets and timescale for the project, but the hierarchical structure flattened in time as each member was allowed to reach their target by any means.

Interaction and innovation practices

The living lab networks in Case 1 and Case 2 were characterized by flexible interaction between the actors. They relied on technology when agreeing on innovation sessions, preparing material for the sessions, or sharing results from the previous sessions. Sessions encompassed face-to-face interaction. Actors participated actively in innovation and were encouraged to contribute new solutions. Sessions stressed solving upcoming challenges in the network, as well as sharing knowledge. In Case 1, network actors provided project-re-

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

lated knowledge to new entrants when an initial player exited, thus ensuring the continuation of the project.

"We first brainstormed and participants generated service ideas for [Company A]… But then, we took a step backwards [...} to reach the objective; i.e., to understand daily consumer goods buying processes, their context, and perceived challenges…" (Case 1, Living lab expert)

"When we emphasize co-creation, [users] will plan the characteristics, options, and delivery of the service together with us […] but when we become user-centered, user input [information and suggestions] is filtered by our R&D team and tested with the users […] We no longer take users into the innovation development as peers." (Case 2, Project Manager)

The previous excerpts illustrate that openness and closedness varied during the innovation. Accordingly, intellectual property rights (IPR) were discussed before the start of the living lab projects, but they did not become an issue because all participants had the right to use the outcomes of the study. However, it was deemed a good idea to keep track of participants' contributions in case such issues would be raised at a later stage.

"We should [know] who's participating and who contributes what. Although it's open innovation, IPR are a big question and there may be legal issues later if it's unclear who did what [in the innovation]. We need tools that can provide some kind of control of access and monitoring of participant contributions." (Case 2, Director)

An example of challenges was the design of carbon prototypes of gadgets when the actual prototypes were still on a product line. The flexible interaction in Case 2 enabled the project to proceed in a different way than originally planned.

"The original plan didn't make sense. It's better to make people more committed and not just show prototypes during a focus group interview but study [people's use experiences] in their daily life contexts." (Case 2, Project manager)

Users' roles cannot be underestimated, because users were equal co-creators of innovation rather than objects of research and observation. In Case 1, they kept shopping diaries and analyzed their shopping behaviour. In Case 2, users participated in the planning of focus group sessions, technology demonstrations and user experience field studies, attended relevant events, and co-analyzed the results.

Case 3 was dominated by a hierarchical setting in the beginning of the project. This changed after the launch of the project, when interaction increased dramatically as actors started to collectively search for innovative means to complete the project.

"We don't have any conflicts of interest (in the network)… but, from my point of view, the biggest challenge is the lack of conceptualization… so that each (network participant) would understand." (Case 3, Manager)

Although in Case 3 the initial phases were undertaken in offices, the project completion took place at the construction site where actors could share ideas and discuss the project's realization. Surprises were unavoidable and the plans could change because of the conditions at the site (e.g., humidity, temperature, light). Actors had to solve problems that were unknown in the early phase.

"We have a hierarchy in place… well, we have certain people who take ownership… those are the utility managers… they are taking care of the whole... if we encounter any unforeseen problems we contact the network partners." (Case 3, Manager)

Motivation

Case 1 and Case 2 required intrinsic and extrinsic motivation. External rewards (e.g., token gifts, course marks, or formal recognition) were not key motivators, but the users' desire to develop their competences, living areas, or products and services were more prominent. The actors shared the overall motivation and enthusiasm to develop new prototypes, products, and services in both cases, which resulted in incremental innovation in Case 1 and radical innovation in Case 2. In addition, each participant had their individual motives.

"[Overall, participants] need to be motivated and there have to be those who are 110 percent committed." (Case 1, Project Manager)

"The most important motivations were course credits [counted towards my university degree] and the employment certificate, but I also liked the small, unexpected token gifts from the partner companies once the project was finished." (Case 1, User 1)

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

"Recognition [of our participation came] in the final speech, a box of chocolates, and an USB memory stick… but the most important prize from participation was the experience that I gained." (Case 1, User 2)

Case 3 highlighted extrinsic rewards as motivators. The task had predefined goals that needed to be fulfilled. However, as the process went on, the actors started to transfer ideas and practical tips on the site, which resulted in incremental innovations throughout the project. This process reflects the motivational factors related to the community: being a part of a group and being capable of transferring ideas seem to foster innovation.

Innovation activity had also negative effects. Some innovations conflicted with the initial design, which resulted in unpredicted challenges (e.g., problems arose in air ventilation systems because the lighting was installed in a different way from the initial plan). In Case 3, the innovation process should probably have followed either the closed or the open model throughout the process. The combination of these two processes resulted in conflicts between the initial design (target) and the process (deployment). Table 4 summarizes the findings from our cases.

Table 4. Findings from the three cases

Innovation Mechanism	Case 1: A Living Lab Network	Case 2: A Living Lab Network	Case 3: A Conventional Innovation Network
Governance			
Structure	Flat hierarchical	Flat hierarchical	Hierarchical
Project objective definition	Centralized, enabler driven	Centralized, utilizer driven	Decentralized
Activity definition	Decentralized	Decentralized	Centralized, provider driven
Activity allocation	Decentralized	Decentralized	Centralized, provider driven
Result settlement	Decentralized	Decentralized	Decentralized
Interaction			
Type of interaction	Flexible innovation interaction	Flexible innovation interaction	Interaction via technological solutions
Level of interaction	Deep	Moderate	Low
Innovation practices			
Transparency	Yes	Yes	To some extent
Accessibility	Yes	Yes	No
IP commons	Yes	Yes	No
Motivation			
Intrinsic	Yes	Yes	No
Extrinsic	Yes	Yes	Yes

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Summary of the cross-case analysis
Our cases represented opposite innovation models: the living lab networks represented by Case 1 and Case 2 characterized open idea generation and Case 3 represented a conventional project-based business network. Case 1 and Case 2showed that there should not be predefined outcomes, but that a project is a vehicle for discovering and validating unexplored areas. The conventional network (Case 3) had predefined goals, but interaction generated fresh ideas and inventions whose value were not fully understood nor deployed.

Openness increases the degree of freedom. Governance and decision making in the living lab networks represented by Case 1 and Case 2 were decentralized as compared to centralized decision making in the conventional network represented by Case 3. The modes of governance were selected based on intended outcome and the way of working. We argue that this may reflect the underlying assumptions or development stage of the industries when working with the users and customers (cf. Westerlund & Leminen, 2011).

Hierarchies, processes or methods do not limit possibilities. Rather, they helped actors to find unconventional solutions to problems in the living lab networks represented by Case 1 and Case 2. In the conventional network represented by Case 3, all the deviations dealt with the agreed procedures. The representatives of the utilizer informed the firm's steering group of the changes but it did not affect the project level. The living lab networks represented by Case 1 and Case 2 reflected flexible interaction, whereas the conventional network represented by Case 3 showed more structured interaction. This interaction ranged from co-development and co-creation to more formalized activities such as observation and surveys.

Transparency, accessibility, and intellectual property (IP) commons were open in the living lab networks represented by Case 1 and Case 2, but were closed in the conventional network represented by Case 3. Transparency and accessibility are by definition open when applying open innovation and controlled in conventional projects with closed innovation, in which only some of the participants have full rights to participate in activities. Case 1 and Case 2 showed evidence of both intrinsic and extrinsic motivations, and the conventional network represented by Case 3 relied only on extrinsic motivation.

Conclusions

Our analysis suggests that there are different degrees of openness and closedness in innovation networks. These "grey areas" between total openness and total closedness are evident when multiple stakeholders pursue the co-development of innovation in networks. We identified four key characteristics of openness:

1. Governance (structure and decision making rights)

2. Motivation (intrinsic and extrinsic)

3. Interaction (type of interaction and level of interaction with users)

4. Innovation practices (transparency, accessibility, and IP commons)

Our findings bring new knowledge on the grey areas of open and closed innovation. The key characteristics of openness can be applied to innovation networks to better understand their operation and management. Our findings also highlight the importance of interaction, which supports the view of Dutilleul Birrer, and Mensink (2010), who suggest that the focus in open processes should be on the analysis of obstructions rather than on processes. We found that interaction varies by the degree of openness and depends on the driving party in the network.

This study contributes to the innovation management literature by showing that the grey areas between total openness and total closedness are affected by various elements:

1. Driving party in the network: who leads the innovation activity?

2. Decision: when should the innovation be open or closed?

3. Interaction: how does the interaction take place within the network actors?

4. Role: what are the different roles of users and stakeholders in innovation networks?

Managers contemplating innovation development need to reframe their innovation practices based on the

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

characteristics of open networks, especially considering the interaction, not the process. Understanding the grey areas between open and closed innovation in innovation networks helps managers to set up an efficient innovation management process. Although innovation in networks is increasingly popular, the extant literature lacks knowledge of grey areas between the ideal open and closed modes. This gap provides many opportunities for further research.

Acknowledgements

An earlier version of this paper was presented at the Cambridge Academic Design Management Conference (CADMC), Cambridge, UK, 4–5 September, 2013.

About the Authors

Seppo Leminen holds positions as Principal Lecturer at the Laurea University of Applied Sciences and Adjunct Professor in the School of Business at Aalto University in Finland. He holds a doctoral degree in Marketing from the Hanken School of Economics and a doctoral degree in Industrial Engineering and management in the School of Science at Aalto University. His research and consulting interests include living labs, open innovation, value co-creation and capture with users, relationships, services and business models in marketing, particularly in Internet of Things (IoT), as well as management models in high-tech and service-intensive industries. Results from his research have been reported in *Industrial Marketing Management,* the *Journal of Technology and Engineering and Management, Management Decision,* the *International Journal of Technology Management,* the *International Journal of Technology Marketing,* the *International Journal of Product Development,* and the *Technology Innovation Management Review,* among many others.

Taija Turunen is an Assistant Professor in the Department of Management Studies at Aalto University's School of Business in Finland. Taija holds a doctoral degree in Industrial Engineering and Management from Aalto University's School of Science. During her academic career, Taija has managed several research projects in the area of service operations management and service innovation. Before joining academia, Taija worked as a management consultant in the field of industrial service operations.

Mika Westerlund, DSc (Econ), is an Associate Professor at Carleton University in Ottawa, Canada. He previously held positions as a Postdoctoral Scholar in the Haas School of Business at the University of California Berkeley and in the School of Economics at Aalto University in Helsinki, Finland. Mika earned his doctoral degree in Marketing from the Helsinki School of Economics in Finland. His current research interests include open and user innovation, the Internet of Things, business strategy, and management models in high-tech and service-intensive industries.

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

References

Almirall, E., & Casadesus-Masanell, R. 2010. Open Versus Closed Innovation: A Model of Discovery and Divergence. *Academy of Management Review,* 35(1): 27–47. http://dx.doi.org/10.5465/amr.2010.45577790

Antikainen, M., Mäkipää, M., & Ahonen, M. 2010. Motivating and Supporting Collaboration in Open Innovation. *European Journal of Innovation Management,* 13(1): 100–119. http://dx.doi.org/10.1108/14601061011013258

Arakji, R. Y., & Lang, K.R. 2007. Digital Consumer Networks and Producer–Consumer Collaboration: Innovation and Product Development in the Video Game Industry. *Journal of Management Information Systems,* 24(2): 195–219. http://dx.doi.org/10.2753/MIS0742-1222240208

Battistella, C., & Nonino, F. 2012. Open Innovation Web-Based Platforms: The Impact of Different Forms of Motivation on Collaboration. *Innovation: Management, Policy & Practice,* 14(4): 557–575.

Battistella, C., & Nonino, F. 2013. Exploring the Impact of Motivations on the Attraction of Innovation Roles in Open Innovation Web-Based Platforms. *Production Planning & Control,* 24(2–3): 226–245. http://dx.doi.org/10.1080/09537287.2011.647876

Bendavid, Y., & Cassivi, L. 2012. A 'Living Laboratory' Environment for Exploring Innovative RFID -enabled Supply Chain Management Models. *International Journal of Product Development,* 17(1/2): 23–42. http://dx.doi.org/10.1504/IJPD.2012.051150

Berchicci, L. 2013. Towards an Open R&D System: Internal R&D Investment, External Knowledge Acquisition and Innovative Performance. *Research Policy,* 42: 117–127. http://dx.doi.org/10.1016/j.respol.2012.04.017

Bergvall-Kåreborn, B., & Ståhlbröst, A. 2009. Living Lab: An Open and Citizen-Centric Approach for Innovation. *International Journal of Innovation and Regional Development,* 1(4): 356–370. http://dx.doi.org/10.1504/IJIRD.2009.022727

Baumeister, R. F., & Leary, M. R. 1995. The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Motivation. *Psychological Bulletin,* 117(3): 497–529. http://dx.doi.org/10.1037/0033-2909.117.3.497

Bogers, M., Afuah, A., & Bastian, B. 2010. Users as Innovators: A Review, Critique, and Future Research Directions. *Journal of Management,* 36(4): 857–875. http://dx.doi.org/10.1177/0149206309353944

Budweg, S., Schaffers, H., Ruland, R., Kristensen, K., & Prinz, W. 2011. Enhancing Collaboration in Communities of Professionals Using a Living Lab Approach. *Production Planning & Control,* 22(5-6): 594–609. http://dx.doi.org/10.1080/09537287.2010.536630

Cassiman, B., & Valentini, G. 2009. Strategic Organization of R&D: The Choice of Basicness and Openness. *Strategic Organization,* 7(1): 43–73. http://dx.doi.org/10.1177/1476127008100129

Chiaroni, D., Chiesa, V., & Frattini, F. 2010. Unravelling the Process from Closed to Open Innovation: Evidence from Mature, Asset-Intensive Industries. *R&D Management,* 40(3): 222–245. http://dx.doi.org/10.1111/j.1467-9310.2010.00589.x

Chesbrough, H. 2003. The Era of Open Innovation. *MIT Sloan Management Review, 4*4(3): 35–41.

Chesbrough, H., & Appleyard, M. M. 2007. Open Innovation and Strategy, *California Management Review,* 50(1): 57–76. http://dx.doi.org/10.2307/41166416

Dahlander, L., & Gann, D. 2010. How Open Is Innovation? *Research Policy,* 39: 699–709. http://dx.doi.org/10.1016/j.respol.2010.01.013

Dahlander, L., Frederiksen, L., & Rullani, F. 2008. Online Communities and Open Innovation: Governance and Symbolic Value Creation. *Industry & Innovation,* 15(2): 115–123. http://dx.doi.org/10.1080/13662710801970076

Dell´Era, C., & Landoni, P. 2014. Living Lab: A Methodology between User-Centred Design and Participatory Design. *Creativity and Innovation Management,* 23(2): 37–154. http://dx.doi.org/10.1111/caim.12061

Diefenbach, T. 2009. Are Case Studies More Than Sophisticated Storytelling? Methodological Problems of Qualitative Empirical Research Mainly Based on Semi-Structured Interviews. *Quality and Quantity,* 43: 875–894. http://dx.doi.org/10.1007/s11135-008-9164-0

Drechsler, W., & Natter, M. 2012. Understanding a Firm´s Openness Decisions in Innovation. *Journal of Business Research,* 65: 438–445. http://dx.doi.org/10.1016/j.jbusres.2011.11.003

Dutilleul, B., Birrer, F., & Mensink, W. 2010. Unpacking European Living Labs: Analysing Innovation's Social Dimensions. *Central European Journal of Public Policy,* 4(1): 60–85.

Edvardsson, B., Kristensson, P., Magnusson, P., & Sundström, E. 2012. Customer Integration within Service Development—A Review of Methods and an Analysis of Insitu and Exsitu Contributions. *Technovation,* 32: 419–429. http://dx.doi.org/10.1016/j.technovation.2011.04.006

Edvarsson, B., Gustafsson, A., Kristensson, P., & Witell, L. 2010. Service Innovation and Customer Co-Development. In P. Maglio, C. Kieliesz ewski, & J. Spohrer (Eds.), *Handbook of Service Science.* New York: Springer, 561–577.

Gong, G., Hsiao, M., Hsieh, M.-D., Liu, L., Chiu, T., Lin, L.-C., Chen, K.-T., Chen, B., Lin, H.-H., Fang, E., Wang, M., & Wen, J.Y.-C. 2012. Application of the Living Lab Concept: Empirical Validation in Taiwan's Minsheng Community. *International Journal of Automation and Smart Technology,* 2(3): 209–229. http://dx.doi.org/10.5875/ausmt.v2i3.135

Huizingh, E. 2011. Open Innovation: State of the Art and Future Perspectives. *Technovation,* 31: 2–9. http://dx.doi.org/10.1016/j.technovation.2010.10.002

Kang, S.-C. 2012. Initiation of the Suan-Lien Living Lab – A Living Lab with an Elderly Welfare Focus. *International Journal of Automation and Smart Technology,* 2(3): 189–199. http://dx.doi.org/10.5875/ausmt.v2i3.132

Katzy, B. 2012. Designing Viable Business Models for Living Labs. *Technology Innovation Management Review,* 2(9): 19–24. http://timreview.ca/article/604

Katzy, B. G., Baltes, G. H., & Gard, J. 2012. Concurrent Process Coordination of New Product Development by Living Labs – An Exploratory Case Study. *International Journal of Product Development,* 17(1/2): 23–42. http://dx.doi.org/10.1504/IJPD.2012.051156

The Grey Areas Between Open and Closed in Innovation Networks

Seppo Leminen, Taija Turunen, and Mika Westerlund

Kviselius, N. Z., Andersson, P., Ozan, H., & Edenius, M. 2012. Living Labs as Tools for Open Innovation. *Communications & Strategies,* 74(2): 75–94.

Laursen, K., & Salter, A. 2006. Open for Innovation the Role of Openness in Explaining Innovation Performance among UK Manufacturing Firms. *Strategic Management Journal,* 27: 131–150. http://dx.doi.org/10.1002/smj.507

Lay, P., & Moore, G. 2009. The Key to Competitive Advantage in Today's Global Bazaar. In J. Word (Ed.), *Business Network Transformation:* 1–16. San Francisco: Jossey-Bass.

Lazer, D., & Friedman, A. 2007. The Network Structure of Exploration and Exploitation. *Administrative Science Quarterly,* 52: 667–694. http://dx.doi.org/10.2189/asqu.52.4.667

Leminen. S. 2015. *Living Labs as Open Innovation Networks-Networks, Roles and Innovation Outcomes.* Doctoral dissertation.Helsinki, Finland: Aalto University.

Leminen, S., Nyström, A.-G., & Westerlund, M. 2015. A Typology of Creative Consumers in Living Labs. *Journal of Engineering and Technology Management,* 37: 6–20. http://dx.doi.org/10.1016/j.jengtecman.2015.08.008

Leminen, S., & Westerlund, M. 2013. Incremental and Radical Service Innovation in Living Labs. In B. Christiansen, S. Yildiz, & E. Yildiz (Eds.), *Transcultural Marketing for Incremental & Radical Innovation:* 281–295. Hershey, Pennsylvania: Information Science Reference.

Leminen, S., & Westerlund, M. 2012. Towards Innovation in Living Labs Network. *International Journal of Product Development,* 17(1/2): 43–59. http://dx.doi.org/10.1504/IJPD.2012.051161

Leminen, S., & Westerlund, M. 2011. *On Becoming a User-Driven Firm: Slow-Cooked for Extra Goodness?* Paper presented at the 2011 World Conference on Mass Customization, Personalization, and Co-Creation (MCPC): Bridging Mass Customization & Open Innovation, San Francisco, USA, November 15–19, 2011.

Leminen, S., Westerlund, M., & Nyström, A.-G. 2012. Living Labs as Open-Innovation Networks. *Technology Innovation Management Review,* 2(9): 6–11. http://timreview.ca/article/602

Leminen, S., Westerlund, M., & Nyström, A.-G. 2014. On Becoming Creative Consumers – User Roles in Living Labs Networks. *International Journal of Technology Marketing,* 9(1): 33–52. http://dx.doi.org/10.1504/IJTMKT.2014.058082

Lichtenthaler, U. 2010. Intellectual Property and Open Innovation: An Empirical Analysis. *International Journal of Technology Management,* 52(3/4): 372–391. http://dx.doi.org/10.1504/IJTM.2010.035981

Lin, W.-Y., Lin, C.-T., Wang, Y.-H., & Chen, R.-T. 2012. The Transformation of Users in Living Lab Construction: The Case of Eco-City Living Lab. *International Journal of Automation and Smart Technology,* 2(3): 231–240. http://dx.doi.org/10.5875/ausmt.v2i3.140

Mulder, I., Velthausz, D., & Kriens, M. 2008. The Living Labs Harmonization Cube: Communicating Living Lab's Essentials. *The Electronic Journal for Virtual Organizations and Networks,* 10: 1–14.

Neuendorf, K. A. 2002. *The Content Analysis Guidebook.* Thousand Oaks, CA: Sage.

Nyström, A.-G., Leminen, S., Westerlund, M., & Kortelainen, M. 2014. Actor Roles and Role Patterns Influencing Innovation in Living Labs. *Industrial Marketing Management,* 43(3): 483–495. http://dx.doi.org/10.1016/j.indmarman.2013.12.016

Pisano, G. P., & Verganti, R. 2008. Which Kind of Collaboration Is Right for You? *Harvard Business Review,* 86(12): 80–86.

Rajala, R., Westerlund, M., & Möller, K. 2012. Strategic Flexibility in Open Innovation – Designing Business Models for Open Source Software. *European Journal of Marketing,* 46(10): 1368–1388. http://dx.doi.org/10.1108/03090561211248071

Roberts, C. W. (Ed.) 1997. *Text Analysis for the Social Sciences: Methods for Drawing Statistical Inferences from Texts and Transcripts.* Mahwah, NJ: Lawrence Erlbaum.

Ryan, R., & Deci, E. 2000. Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology,* 25: 54–67. http://dx.doi.org/10.1006/ceps.1999.1020

Schweisfurth, T., Raasch, C., & Herstatt, C. 2011. Free Revealing in Open Innovation: A Comparison of Different Models and Their Benefits for Companies. *International Journal of Product Development,* 13(2): 95–118.

Sjödin, D. R., Eriksson, P.-E., & Frishammar, J. 2011. Open Innovation in Process Industries: A Lifecycle Perspective on Development of Process Equipment. *International Journal of Technology Management,* 56(2/3/4): 225–240. http://dx.doi.org/10.1504/IJTM.2011.042984

Ståhlbröst, A., & Bergvall-Kåreborn, B. 2011. Exploring Users Motivation in Innovation Communities. *International Journal of Entrepreneurship and Innovation Management,* 14(4): 298–314. http://dx.doi.org/10.1504/IJEIM.2011.043051

van der Walt, J., & Buitendag, A. 2009. Community Living Lab as a Collaborative Innovation Environment. *Issues in Informing Science and Information Technology,* 6: 421–436.

von Hippel, E. 2001. Innovation by User Communities: Learning from Open-Source Software. *MIT Sloan Management Review,* 42(4): 82–86.

von Hippel, E. 2007. Horizontal Innovation Networks: By and for Users. *Industrial and Corporate Change,* 16: 293–315. http://dx.doi.org/10.1093/icc/dtm005

de Vries, E. J. 2006. Innovation in Services in Networks of Organizations and in the Distribution of Services. *Research Policy,* 35: 1037–1051. http://dx.doi.org/10.1016/j.respol.2006.05.006

Westerlund, M., & Leminen, S. 2011. Managing the Challenges of Becoming an Open Innovation Company: Experiences from Living Labs. *Technology Innovation Management Review,* 1(1): 19–25. http://timreview.ca/article/489

Zaltman, G. 2003. *How Customers Think: Essential Insights into the Mind of the Markets.* Boston: Harvard Business School Press.

Yin, R. K. 2009. *Case Study Research: Design and Methods.* Thousand Oaks, CA: Sage.

Citation: Leminen, S., Turunen, T., & Westerlund, M. 2015. The Grey Areas Between Open and Closed in Innovation Networks. *Technology Innovation Management Review,* 5(12): 6–18. http://timreview.ca/article/948

Keywords: innovation, innovation network, living lab, openness, closedness, open innovation

Exploring the Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

> *"Luck is a matter of preparation meeting opportunity."*
>
> Lucius Annaeus Seneca (4 BC – AD 65)
> Writer, philosopher, and statesman

Business model and living lab research both have similar objectives – to maximize the probability of successful market introduction of innovative solutions – be it through different means. Yet, there are still only few studies or reports discussing both, with those studies that do touch the subject staying at a high level. iMinds Living Labs has gained a lot of experience in combined living lab and business model innovation projects and, rather than being competing approaches, our results have shown that these two research methodologies can be complementary, where the combined approach turns out to be more powerful than each individual approach used alone. The goal of this article is to promote the inclusion of business model research in a model of "a living lab as a service" (and vice versa) by explaining the benefits and by introducing a practical framework to implement such combined research tracks based on the experience at iMinds Living Labs over the past few years.

Introduction

The definition of a "living lab" is still an unresolved and largely semantic discussion (Baccarne et al., 2013). However, most definitions focus on: i) the collaboration between different stakeholders – including end users – during the innovation process and ii) combining technological research with user research. But, even if they recognize the need to involve multiple stakeholders, including business partners, this involvement in most living lab approaches extends no further than collecting some general feedback from a number of business representatives during the ideation or evaluation stage. The explication and validation of the actual business model of the innovation in question is seldom included within a living lab project.

For those studies and reports that do take the business model aspect into account, we can generally categorize them into three different focus areas:

1. The largest group of studies focuses on multi-actor living lab consortia and considers the collaboration model between these partners as a key issue in securing a sustainable and long-term collaboration agreement (Garcia-Guzman et al., 2013; Grezes et al., 2013; Mulvena et al., 2010; Niitamo et al., 2006; Nikolov & Antonova, 2012; Pitse-Boshomane et al., 2008; Schaffers et al., 2009). In these studies, the lack of a good business model is considered to be a major possible roadblock to open innovation within living labs. The living labs from these studies do not focus on a "living lab as a service".

2. A smaller group of studies focusses on the business model of the living lab platform itself as a way to become self-sufficient and generate enough revenues from the services provided (Garcia-Guzman et al., 2013; Grezes et al., 2013; Katzy, 2012; Mulvena et al., 2010). These studies discuss what the market needs from living lab platforms, stipulating best practices of the type of assets (resources) and activities (services) a living lab should offer to the market. It is interesting to note that, among these studies, almost none includes business model research as a possible service for living lab actors.

3. Finally, a third group of studies state that a living lab project *might* provide insights not only on user needs and practices, but also on new business model opportunities (Agerskov et al., 2013; Grezes et al., 2013; Katzy, 2012; Mulvena et al., 2010; Niitamo et al., 2006;

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

> Nikolov & Antonova, 2012; Schaffers et al., 2009; Schuurman et al., 2011; Svensson & Eriksson, 2009). However, after making such general statements, the focus of these studies usually turns entirely back towards the user research part, leaving the business model aspect undefined and providing no practical guidelines whatsoever on how to make the link.

None of the mentioned studies discusses the need to consider the business model of the innovation itself during the living lab project. In terms of the three levels of analysis for living labs (cf. Schuurman, 2015), the business model is only considered on the macro level, whereas only minor attention is dedicated to the business model within a living lab project (meso level) or towards concrete business model support methods and tools (micro level). Svensson and Eriksson (2009) are the only authors that explicitly state the importance of addressing the business model of the innovation itself early on in the process. Interestingly, their study also takes the viewpoint of the small or medium-sized enterprise as point of departure, but unfortunately does not discuss this topic in detail.

In sum, most of the living lab community is considering business models mainly in order to optimize their own operations and sustainability. Moreover, the few studies from the living lab literature that do mention business model services for innovation projects on top of the living lab platform, remain high-level without providing any insights into guidelines or results, or without explicitly explaining the benefits. Within this article, we address this gap by promoting the inclusion of business model research in a "living lab as a service" model (and vice versa). We begin by describing the benefits of a business model research perspective on living labs. Next, we share our experiences using a practical framework to implement combined research tracks at iMinds Living Labs. We conclude by discussing the implications of our contribution and our future research areas.

A Business Model View of Living Labs

Similar to the situation with living labs, many different definitions have been put forward within the business model literature. Some studies (e.g., Al-Debei & Avison, 2010; Nenonen & Storbacka, 2010) even consist of meta-analyses of the different definitions in order to abstract the different elements of the business model construct. Most literature on business models stresses their importance for successful innovation (Magretta, 2002; Shafer, 2005; Teece, 1986, 2010; Voelperl, 2005; Zott, 2010). Additionally, most business model literature focuses on one or more of the following levels:

1. *The framework level:* This level defines what a business model is, lists the building blocks that make up the business model, and clarifies the link with strategy. The intention is usually to provide clear guidelines and a comprehensive list of choices involved in business model design (e.g., Cassadesus-Masanell, 2010; Magretta, 2002; Nenonen, 2010; Shafer, 2005; Teece, 2010; Zott, 2010).

2. *The analysis level:* This level tries to define successful design rules for innovative or successful business models, by describing what works. Compared to the purely descriptive character of the framework level, the analysis level provides clear advice and tools for analysis – mostly focusing on the coherency between the choices defined at the framework level (Cassadesus-Masanell, 2010; Giesen, 2007; Magretta, 2002; Teece, 2010; Zott, 2010).

3. *The process level:* This level stipulates the processes involved in designing or (more often) innovating the business model. This level is the least covered by business model literature and the small literature base is more practitioner-oriented and tackles topics such as when to innovate or change the business model and which triggers or trends to follow (Giesen, 2007; Shafer, 2005; Voelpel, 2005).

From this literature overview, we conclude that there is a lack of studies dealing with an actual iterative process of designing, experimenting with, and redesigning business models. As discussed earlier, living labs involve external actors (e.g., users, consumers, stakeholders, and partners) in a highly iterative lean innovation process to uncover important external contextual factors and validate assumptions about customer behaviour (Schuurman et al., 2013). In that respect, we consider living labs as the perfect vehicle to support business model design at the process level. Popular business model references implicitly support our claim:

- Magretta (2002): “Ultimately, models like this fail because they are built on faulty assumptions about customer behavior.”

- Shafer (2005) mentions “flawed assumptions” at different levels in the business model framework as a cause of business model problems.

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

- Voelpel (2005): "Research indicates that the creation of a dramatically new customer value proposition(s) and/or sensing potential breakthrough change in customer behaviour are often the initial driving forces behind sound new business models."

- Casadesus-Masanell (2009) points out that business models do not operate in isolation and have different outcomes and consequences depending on the "context".

- Teece (2010): "A business model is successfully pioneered only after considerable trial and error … once articulated, it likely will have to be tested and retested, adjusted and tuned as the evidence with respect to provisional assumptions becomes clarified."

- Teece (2010): "What business model pioneers often posses – or develop – is an understanding of some 'deep truth' about the fundamental needs of customers and how competitors are or are not satisfying those needs, and of the technological and organizational possibilities (and trajectories) for improvement."

Unfortunately, most references do not explicitly detail how to deal with these challenges and concepts, and living labs have not been recognized within the business model literature as a powerful approach to support business model research at the process level.

In conclusion, even if both living lab and business model research have similar objectives, and even though at least the business model community recognizes the usefulness of the concepts provided in a living lab approach, we see no structural linking between both research streams. In a way, this is not at all surprising given that both living lab and business model research are still rather young disciplines that both lack clear and broadly accepted definitions. Therefore, within the next section, we will provide some practical guidelines on how to integrate both research tracks based on our own experiences gained within more than 50 projects carried out within iMinds Living Labs.

The iMinds Living Lab Approach

Over the past three years, the living labs department at the iMinds (iminds.be) digital research and entrepreneurship hub in Flanders, Belgium, has been conducting a series of living lab projects specifically targeted at individual small and medium-sized enterprises (SMEs) (see Schuurman, 2015). Within these more than 50 projects at iMinds Living Labs, the need of SMEs to include business model aspects as part of the living lab exercise gradually came to the forefront.

Before business modeling activities were embedded into the living lab projects, the project outline consisted of an iterative series of user research steps. These steps were meant to support companies in exploring, validating, or testing their innovative solutions with end users (Figure 1).

These innovation projects start with a kick-off meeting during which the living lab researchers, together with the instigator (i.e., the individual or group of individuals from whom the idea or need at the start of the living lab originates, and who enter into the living lab process as clients), log the assumptions about the users and stakeholders and agree on the corresponding research questions.

In a second step, the living lab researchers scan the environment or assess the "state of the art" (SotA). This step aims to obtain a good view of the market from a user perspective and is the basis for the next research steps. Based on the maturity of the innovation and the type of research questions to be answered, a selection is

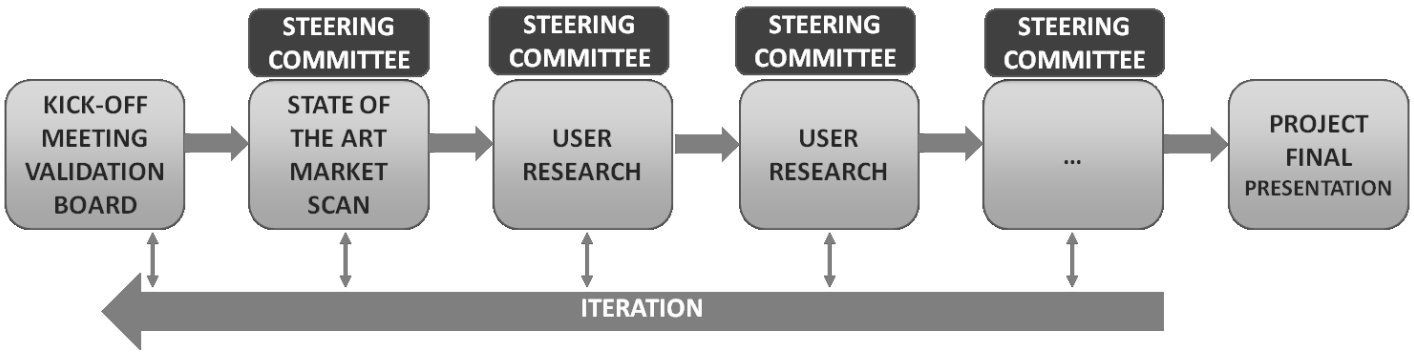

Figure 1. The iMinds Living Labs "pre-business model" innovation project outline

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

made from a broad portfolio of user research methodologies including surveys, co-creation sessions, field tests, etc. At the end of the project, a final overview and summary of lessons learned is discussed with the project instigator.

Clearly, no specific business model research was conducted within these "traditional" living lab projects that are in line with the focus of living labs literature on user research. However, because some small and medium-sized enterprises (SMEs) had specific questions regarding the business model, the involvement of business model researchers was included as an "addendum" in some living lab projects. This involvement gradually increased.

Next, we discuss the gradual development of the integration of business model research within living lab projects from project-based business model activities to the 360° innovation projects.

Phase 1: Project-based business model activities

Because the need to include proper business model aspects became clear to us gradually, the first business model steps were purely opportunity driven. In other words, when there was a demand for some kind of business model activity, an opportunistic search was launched for external business model expertise. However, these trials were "single shots", where the business model researchers were operating outside of the living lab project (Figure 2).

The MADUF project (Schuurman et al., 2011) was the first large living lab project that had a business modelling research question. One of the desired objectives of the project was to analyze the market as a whole and the corresponding opportunities in order to abstract some policy recommendations. Business modelling efforts were therefore focused on a market-centered view using value network and stakeholder analysis as the main methods (Norman & Ramirez, 1993; Stabell & Fjeldstad, 1998).

The next experience with business modelling within a living lab context occurred during an SME project on new business models in the music industry. Again, the living lab researchers did not provide any business model activities in this project, but were working with a customer that was proactively and openly linking the end-user needs and insights with sustainable business model design (Baccarne et al., 2013). This project raised the awareness of the possible strong link and mutual interest between the living lab research and the business model design.

However, as discussed by Baccarne, Schuurman, and Seys (2013), a couple of weaknesses in the approach were identified, the most important being that both user and business model research were too separated from each other along the full innovation track. However, it was concluded that there was scope for increased cross-disciplinary cooperation between user research and business model research in all of the iMinds Living Labs projects.

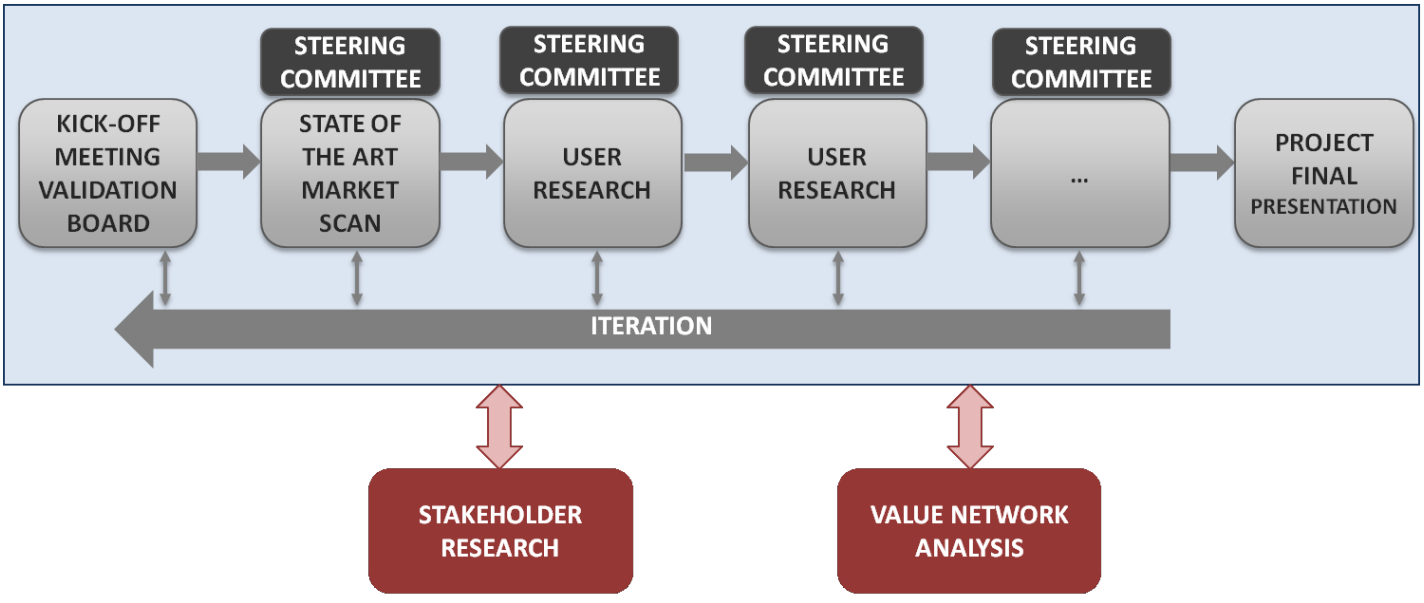

Figure 2. One-shot trials of business model activities within a living lab context through “external” business model expertise

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

Phase 2: Concluding business model workshops
In the next phase, iMinds internalized the business modelling activities within the living lab projects by including the business model researchers right from the start (i.e., during business development and project definition). This process allowed the researchers to capture and understand the business modelling expertise and needs from the instigator side from the very beginning. Thus, the living lab track was redesigned to include the following steps (Figure 3):

1. Kick-off meeting: where the customer explains the innovation concept and is asked to explicate the envisioned business model. However, the formulated research questions remained strongly focused on the end-user aspects given that the researchers were using the validation board from the lean startup approach (Ries, 2011), considering only customer segments, customer needs, and the solution.

2. State of the Art (SotA): consisting of an "environmental scan" via desk research pertaining to the market from both an end-user and business model perspective.

3. A combination of user and stakeholder research steps: dependent upon the specific needs of the innovation instigator, and taking the importance of the business partners into account.

4. A final business model workshop: to link the gathered insights to the business model design and formulating a set of recommendations for the overall strategy related to the innovation.

The benefit of this approach lies in the fact that living lab researchers are forced to generate user research results that are more actionable and practical due to the broader strategic view. The main advantage of planning these business model workshops at the end of the track is that one can discuss strategy based on validated facts and a lot of data. Without the inputs of the living lab research on users and the ecosystem, it would be much harder to counter opposing beliefs. The disadvantage is that, for some projects, the outcome of the business model workshop implied the need to fundamentally change the innovation concept or business model to maximize probability of successful market introduction. The participants found the living lab track to be useful, however, both the researchers and the instigators felt that the business model issues should have been tackled sooner in the process (see Rits et al., 2015). Given the living lab's iterative approach, an earlier examination of business model issues would have allowed the lab to pivot and start exploring, validating, or testing the adapted innovative concept sooner.

Another downside was that stakeholder research happened before the business model workshop, whereas it was deemed necessary to bring up the business model before in order to understand the research questions for that specific stakeholder. These downsides were taken into account and resulted in the development of a third phase.

Phase 3: Steering business model workshops
In a next phase, the business model workshop was moved forward in the process. The earliest moment when this could take place was deemed to be right after the SotA (Figure 4). By doing rearranging the process, the living lab researchers were able to discuss the business model before any of the user or stakeholder research steps were carried out, while still allowing the business model researchers to get to grips with the particular characteristics of the target market and the prevailing trends.

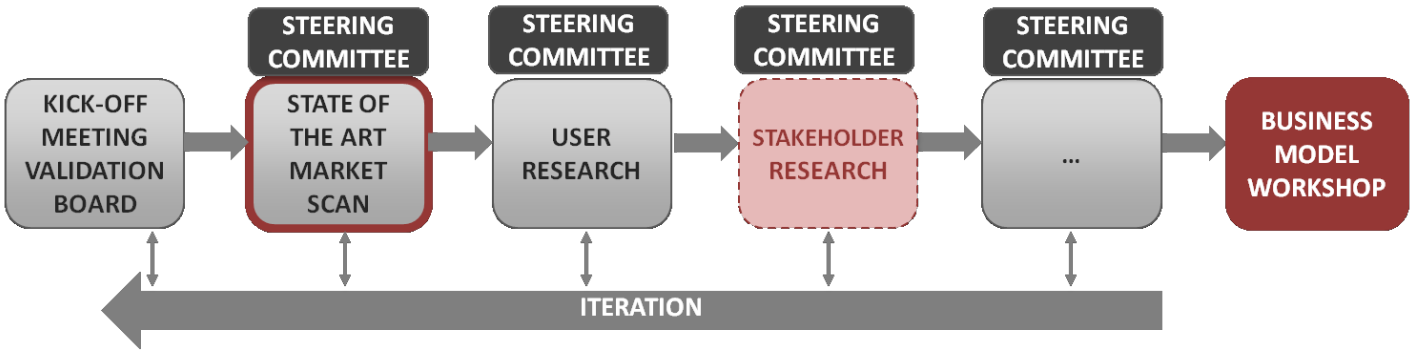

Figure 3. Living lab project outline with concluding business model workshops

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

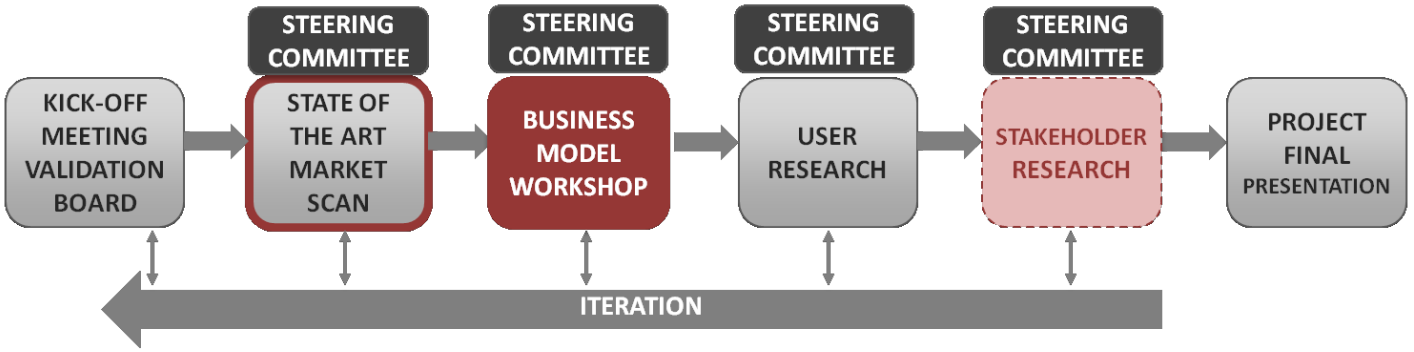

Figure 4. Living lab project outline for steering business model workshops

The advantage of this approach is that living lab researchers were able to detect possible high-impact issues with the business model design at a much earlier stage. Moreover, it made it easier to understand the stakeholder issues and plan for the proper stakeholder research steps, also in view of highly exploratory stakeholder research questions.

However, it rapidly turned out that, triggered by the initial business model workshop, instigators wanted to discuss these results in a broader context and link it to the earlier discussion on the business model. This discussion constrained the organization of the living lab project because it was hard to plan the required business modelling efforts for those unforeseen additional steps.

Phase 4: Full 360° innovation

The concluding business model workshop concept clearly showed that a living lab track is able to provide much more information and insights besides the obvious user needs and usage of the innovation itself. Living lab user research is able to uncover the relevant usage context (e.g., time, location, trigger, community) for all the different phases of the customer-buying experience journey (Chan & Mauborgne, 2005). This approach helps the instigator to fine-tune the different value aspects of the full business model with links to marketing, distribution, ecosystem, pricing, etc.

From an assessment point of view, the living lab researchers saw that the required fundamental adaptation for some of the projects was mainly driven by the combination of a lack of resources and a misalignment with the current strategy. Resources and strategy are strongly linked, because strategy will define which resources are required, and resources will define (to some degree) which strategy can be pursued. However, resources are limited – particularly for SMEs – and it is important to carefully plan which resources should be dedicated to which activities. Resources are required not only for value creation itself, but also for value delivery, value capture, and the value consumption parts of the business model. This discovery led to the understanding that, in highly iterative tracks (as typically in a living lab context), the resource view and strategy view (i.e., the business model view) are required at all times to ensure the instigator will be able to sustainably profit from the innovation (Teece, 1986).

However, the benefits do not only flow from living lab to business model, but also the other way around. The different components of any business model framework are strongly interlinked with the end user, which is a central and key component in most business model frameworks. When shaping the user research, the context of the user is important. Taking the full business model view into account helps living lab researchers to be more specific, allowing for more valuable and relevant feedback from users and stakeholders.

With the three lessons described above in mind and looking for a way to alleviate the operational strain from the steering business model concept, iMinds Living Lab redesigned the innovation track by embedding user, stakeholder and business model research in every single step and from the very start (Figure 5), enabling 360° innovation. In practice, the business model workshops are now embedded as part of the steering committees, during which the user and stakeholder aspect were already being discussed.

Discussion and Conclusion

A lot of the academic literature on business models still struggles with the exact definition and outline of the concept and deals with meta-analyses of definitions and single case studies illustrating best and worst practices in order to abstract the underlying dynamics, char-

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

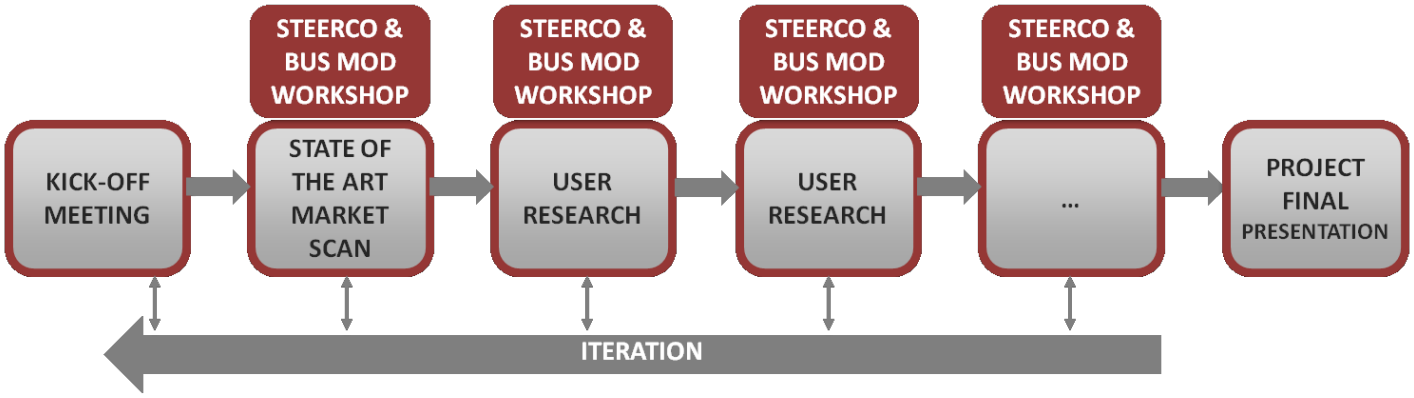

Figure 5. Outline for a living lab project labeled as 360° innovation

acteristics, and constructs that define a business model. The more practically oriented literature on business models offers practical frameworks and tools that consist of different (supposedly) critical elements in order to allow managers to log these aspects. Although it is stated that a business model consists of dynamic elements that determine the eventual outcome of a business model, the field lacks concrete tools and approaches to investigate these dynamic elements and to test the different elements of the business model in practice. With this article, we introduced the idea of integrating business model research with living lab research, because living lab researchers actively involve end users and stakeholders in the innovation development process by means of multiple research methods and including real-life experimentation and validation. This experimental approach allows business model researchers to consider the business implications of the different phases of any business by means of concrete research data that enables to capture the "dynamic aspects" of the business model: from value creation, to value distribution, to value consumption. and finally, to value capture.

Within this article, we have demonstrated how the practical integration of living lab research with business model research has evolved within the iMinds Living Labs organization in four phases. Starting from the innovation track design to the forth and last design – the 360° innovation track – we have discussed the mutual benefits of strongly linking and embedding user research and business model research into the same innovation track. Contrary to the statement by Katzy (2012), that business model insights from living lab tracks would be difficult to sell, the experience gained by iMinds Living Labs has turned this aspect (business modelling services) into one of the key services, next to that of user research, panel management, prototyping, and living lab methodology.

Moreover, the combined approach has challenged the living lab researchers to adapt and improve the design and implementation of a living lab innovation track. This ability to design and manage efficient integrated innovation tracks is drawing a lot of interest from partnering institutions and stakeholders. As a result, a growing part of the activities of the iMinds Living Lab researchers is to educate and train other organizations in designing and managing highly iterative innovation tracks with combined user and business model research. To support our own integrated innovation tracks and to educate partner organizations, the iMinds Living Lab team is working on a dedicated and customized toolbox – the Living Lab Assumption and VAlidation (LLAVA) matrix – as part of next steps and further research: for a first version of this matrix, see Rits, Schuurman, an Ballon (2015). The LLAVA matrix logs and explicates the different elements and characteristics of the business model (the framework level), as a dynamic tool to point out assumptions that need to be researched in subsequent stages of the living lab project and as a starting point of discussion for the innovation instigator to decide upon the next steps to be taken in terms of the innovation development (the process level), and it enables both the project instigators and the involved researchers to dynamically assess and test the critical aspects of the business model: alignment with company goals, internal consistency, and robustness (the analysis level). This toolbox is currently being tested in all iMinds Living Labs projects, so future research will be able to analyze the concrete outcomes and impacts of our approach.

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

About the Authors

Olivier Rits graduated as an Engineer in Applied Physics from Ghent University in Belgium. Olivier joined Alcatel-Lucent as a business developer where he worked on the go2market strategy for innovative solutions, both on networking and applications. He joined iMinds in 2013, focusing on the intersection between technology, business, and innovation. Olivier leads the business model practice at the iMinds Living Labs, where he is responsible for the methodologies used and providing business support to startups, SMEs, and larger organizations.

Dimitri Schuurman holds a PhD (2015) and Master's degree in Communication Sciences (2003) from Ghent University in Belgium. He joined the research group iMinds – MICT – Ghent University in 2005 and started working at iMinds Living Labs in 2009. Together with his iMinds colleagues, Dimitri developed a specific living lab offering targeted at startups and SMEs, in which he has managed over 50 innovation projects. As a senior researcher, Dimitri is currently responsible for the methodology and academic valorization of living lab projects. He also coordinates a dynamic team of living lab researchers from iMinds – MICT – Ghent University. His main interests and research topics are situated in the domains of open innovation, user innovation, and innovation management. In early 2015, he finished his PhD entitled *Bridging the Gap between Open and User Innovation? Exploring the Value of Living Labs as a Means to Structure User Contribution and Manage Distributed Innovation.*

Pieter Ballon is the Director of iMinds Living Labs, the International Secretary of the European Network of Living Labs, and a Professor at Vrije Universiteit Brussel in Belgium. He specializes in business modelling, open innovation, and the mobile telecommunications industry. Formerly, he was senior consultant and team leader at TNO. In 2006–2007, he was the coordinator of the cross issue on business models of the Wireless World Initiative (WWI), which united five integrated projects in the European Union's 6th Framework Programme. Pieter holds a PhD in Communication Sciences from Vrije Universiteit Brussel and a MA in Modern History from Katholieke Universiteit Leuven.

Further Reading

Outside the scientific literature, we recommend two handbooks that bundle a set of best practices for living lab research:

1. *The KC3 Business Model* from the European Network of Living Labs (ENoLL) discusses the need for a business model for cross-border living lab collaboration, positioning it in the first group of living lab literature.
   tinyurl.com/zej2nwp

2. *The Living Lab Methodology Handbook* from the Botnia Living Lab mentions business modelling as part of the service offering, but only at a high level, positioning it in the third group of living lab literature.
   tinyurl.com/z362nd4

Acknowledgements

An earlier version of this paper was presented at the XXVI International Society for Professional Innovation Management (ISPIM) Conference – Shaping the Frontiers of Innovation Management, Budapest, Hungary, 14–17 June, 2015.

References

Agerskov, M. L., & Hoj, J. C. L., 2013. Lessons Learned from the Danish EV Living Lab. EVS 27 International Battery, Hybrid and Fuel Cell Electric Vehicle Symposium. *World Electric Vehicle Journal,* 6: 0969.

Al-Debei, M. M., & Avison, D. 2010. Developing a Unified Framework of the Business Model Concept. *European Journal of Information Systems,* 19(3): 359–376.
http://dx.doi.org/10.1057/ejis.2010.21

Baccarne, B., Schuurman, D., & Seys, C. 2013. *Living Labs as a Navigation System for Innovative Business Models in the Music Industry.* Paper presented at the XXIV ISPIM Conference, Helsinki, Finland, June 16–19, 2013.

Ballon, P. 2007. Business Modelling Revisited: The Configuration of Control and Value. *info,* 5(9): 6–19.
http://dx.doi.org/10.1108/14636690710816417

Breuer, H., & Mahdjour, S. 2012. *Lean Venturing: Entrepreneurial Learning to Model and Grow New Business.* Paper presented at the 5th ISPIM Innovation Symposium, Seoul, Korea, Dec 9–12, 2012.

Casadesus-Masanell, R., & Ricart, J. E. 2010. From Strategy to Business Models and onto Tactics. *Long Range Planning,* 43(2): 195–215.
http://dx.doi.org/10.1016/j.lrp.2010.01.004

The Benefits of Integrating Business Model Research within Living Lab Projects

Olivier Rits, Dimitri Schuurman, and Pieter Ballon

Chan, K. W., & Mauborgne, R. 2005. *Blue Ocean Strategy: How to Create Uncontested Market Space and Make Competition Irrelevant*. Boston, MA: Harvard Business Press.

Coorevits, L., & Schuurman, D. 2014. *Hypothesis Driven Innovation: Lean, Live and Validate.* Paper presented at the XXV ISPIM Innovation Conference, Dublin, Ireland, June 8–10, 2014.

García-Guzmán, J., del Carpio, A. F., de Amescua, A., & Velasco, M. 2013. A Process Reference Model for Managing Living Labs for ICT Innovation: A Proposal Based on ISO/IEC 15504. *Computer Standards & Interfaces,* 36(1): 33–41. http://dx.doi.org/10.1016/j.csi.2013.07.004

Giesen, E., Berman, J., Bell, R., & Blitz, A. 2007. Three Ways to Successfully Innovate Your Business Model. *Strategy & Leadership,* 35(6): 27–33. http://dx.doi.org/10.1108/10878570710833732

Grezes, V., Fulgencio, H., & Perruchoud, A. 2013. *Embedding Business Model for Sustainable Collaborative Innovation in African Living Labs.* Paper presented at the IEEE IST-Africa Conference & Exhibition, Nairobi, Kenya, May 15–17.

Katzy, B. 2012. Designing Viable Business Models for Living Labs. *Technology Innovation Management Review,* 2(9): 19–24. http://timreview.ca/article/604

Magretta, J. 2002. Why Business Models Matter. *Harvard Business Review:* 80(5): 86–92.

Mulvenna, M., Bergvall-Kåreborn, B., Wallace, J., Galbraith, B., & Martin, S. 2010. *Living Labs as Engagement Models for Innovation.* Paper presented at eChallenges, Warsaw, Poland, October 27–29, 2010.

Nenonen, S., & Storbacka, K. 2010. Business Model Design: Conceptualizing Networked Co-Creation. *International Journal on Quality and Service Sciences,* 2(1): 43–59. http://dx.doi.org/10.1108/17566691011026595

Niitamo, V.-P., Kulkki, S., Eriksson, M., & Hribernik, K. A. 2006. State-of-the-Art and Good Practice in the Field of Living Labs. In *Proceedings of the 12th International Conference on Concurrent Enterprising, ICE2006:* 341–348.

Nikolov, R., & Antonova, A. 2012. *Developing Experiential Living Lab as Platforms for Embedded Innovation.* Paper presented at the 18th International Conference on Engineering, Technology and Innovation (ICE) / IEEE, Munich, Germany, June 18–20, 2012. http://dx.doi.org/10.1109/ICE.2012.6297635

Normann, R., & Ramirez, R. 1993. From Value Chain to Value Constellation: Designing Interactive Strategy. *Harvard Business Review,* 71; 65–77.

Osterwalder, A., Pigneur, Y., & Clark, T. 2010. *Business Model Generation.* Hoboken, NJ: Wiley.

Pitse-Boshomane, M. M., Marais, M. A., Morris, C., Roux, K., van Rensburg, R., Herselman, M., Makan, A., & Mulder, I. 2008. *Catalysing Innovation: The Promise of the Living Lab Approach in South Africa.* Paper presented at the Prato CIRN 2008 Community Informatics Conference, Prato, Italy, November 9–11, 2008.

Ries, E. 2011. *The Lean Startup.* New York: Crown Business.

Rits, O., Schuurman, D., & Ballon, P. 2015. *Exploring the Benefits of Combining Business Modelling with Living Labs.* Paper presented at the XXVI ISPIM Conference: Shaping the Frontiers of Innovation Management, Budapest, Hungary, 14–17 June, 2015.

Shafer, S. M., Smith, H. J., & Linder, J. C. 2005. The Power of Business Models. *Business Horizons,* 48(3): 199–207. http://dx.doi.org/10.1016/j.bushor.2004.10.014

Schaffers, H., Merz, C., & Guzman, J. G. 2009. Living Labs as Instruments for Business and Social Innovation in Rural Areas. In *Proceedings of the 2009 ICE Conference,* Leiden, The Netherlands, June 22–24, 2009.

Schuurman, D., De Moor, K., De Marez, L., & Evens, T. 2011. A Living Lab Research Approach for Mobile TV. *Telematics and Informatics,* 28(4): 271–282. http://dx.doi.org/10.1016/j.tele.2010.11.004

Schuurman, D., Marez, L. D., & Ballon, P. 2013. Open Innovation Processes in Living Lab Innovation Systems: Insights from the LeYLab. *Technology Innovation Management Review,* 3(11): 28–36. http://timreview.ca/article/743

Schuurman, D. 2015. *Bridging the Gap between Open and User Innovation? Exploring the Value of Living Labs as a Means to Structure User Contribution and Manage Distributed Innovation.* Doctoral Dissertation. Ghent University. Faculty of Political and Social Sciences; Vrije Universiteit Brussel. Faculty of Economic and Social Sciences, Ghent; Brussels, Belgium.

Svensson, J., & Eriksson, C. I. 2009. *Open Innovation in Small Enterprises – A Living Lab Approach.* Paper presented at the XX ISPIM Conference Vienna, Austria, June 21–24, 2009.

Teece, D. J. 1986. Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy. *Research Policy,* 15(6): 285–305. http://dx.doi.org/10.1016/0048-7333(86)90027-2

Teece, D. J. 2010. Business Models, Business Strategy and Innovation. *Long Range Planning,* 43(2-3): 172–194. http://dx.doi.org/10.1016/j.lrp.2009.07.003

Stabell, C., & Fjeldstad, O. 1998, Configuring Value for Competitive Advantage: On Chains, Shops, and Networks. *Strategic Management Journal,* 19: 413–437.

Voelpel, S., Leibold, M., Tekie, E,. & von Krogh, G. 2005. Escaping the Red Queen Effect in Competitive Strategy: Sense-Testing Business Models. *European Management Journal,* 23(1): 37–49. http://dx.doi.org/10.1016/j.emj.2004.12.008

Zott, C., & Amit, R. 2010. Business Model Design: An Activity System Perspective. *Long Range Planning,* 43(2): 216–226. http://dx.doi.org/10.1016/j.lrp.2009.07.004

Citation: Rits, O., Schuurman, D., & Ballon, P. 2015. Exploring the Benefits of Integrating Business Model Research within Living Lab Projects. *Technology Innovation Management Review*, 5(12): 19–27. http://timreview.ca/article/949

Keywords: business model, living labs, value network, value proposition, innovation, collaboration, user research

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

> *"There are more ideas on earth than intellectuals imagine. And these ideas are more active, stronger, more resistant, more passionate than "politicians" think. We have to be there at the birth of ideas, the bursting outward of their force: not in books expressing them, but in events manifesting this force, in struggles carried on around ideas, for or against them. Ideas do not rule the world. But it is because the world has ideas (and because it constantly produces them) that it is not passively ruled by those who are its leaders or those who would like to teach it, once and for all, what it must think."*
>
> Michel Foucault (1926–1984)
> Professor and philosopher

Around the globe, crowdsourcing initiatives are emerging and contributing in a diversity of areas, such as in crisis management and product development and to carry out micro-tasks such as translations and transcriptions. The essence of crowdsourcing is to acknowledge that not all the talented people work for you; hence, crowdsourcing brings more perspectives, insights, and visions to, for instance, an innovation process. In this article, we analyze how crowdsourcing can contribute to the different stages of innovation processes carried out in living labs and thus contribute to living labs by strengthening their core role as innovation process facilitators. We have also identified benefits and challenges that need to be grappled with for managers of living labs to make it possible for the crowd to fully support their cause.

Introduction

Today, there is a growing trend of organizations tapping into the wisdom of the crowd to contribute to their innovation processes to create value (Ye & Kankanhalli, 2013). This trend has been fuelled by IT that enables companies to reach and engage a crowd on a global scale (Ye & Kankanhalli, 2013). Examples can be seen in LEGO's use of crowdsourcing to develop new models (Schlagwein & Andersen, 2014), Dell's use of crowdsourcing for their IdeaStorm initiative (Di Gangi & Wasko, 2009), and Procter and Gamble's Connect+Develop program, which has been relying on external sources for more than half of its innovation tasks (Huston & Sakkab, 2006). These crowds can contribute to activities such as collecting data, identifying problems, carrying out tedious work, rendering ideas, engaging in co-creative activities, voting for an idea, and developing solutions to a problem (Prpić et al., 2015). In addition, crowdsourcing has also shown to be very efficient for activities such as developing marketing videos, translating, mapping information, interpreting photos, and developing software. However, the impact and full potential of crowdsourcing initiatives does, to a large extent, remain to be seen given that the understanding of crowdsourcing is in its infancy (Ye & Kankanhalli, 2013). Currently, many organizations do not have sufficient insights regarding how the crowd can be engaged in innovation processes, and how the results from the crowd can be used to support their cause (Boudreau & Lakhani, 2013).

In Europe, there is another evolving concept that also strives to support the development of innovation and create value by involving users. That concept is called the "living lab", and it aims to support user-centered in-

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

novation processes in real-world contexts, and hence it often acts as an open innovation network (Leminen et al., 2012) and innovation intermediary organization (Cleland et al., 2012).In this article, we align our approach with Bergvall-Kåreborn and colleagues (2009), who defined a living lab as a user-centric innovation milieu built on everyday practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values. Due to the focus on carrying out innovation activities in real-life contexts, living lab processes involves a plethora of stakeholders, both locally and globally, and thus require supportive innovation processes. Therefore, living labs need to be well equipped with processes to support the development of various types of innovations in a diversity of contexts, with a variety of users, and in different countries.

In living labs, the innovation processes generally consists of four main phases: i) exploration, ii) design, iii) implementation, and iv) test and evaluation (e.g. Almirall et al., 2012; Ståhlbröst & Bergvall-Kåreborn, 2008). In this article, we argue that these four phases could be supported by different crowdsourcing initiatives, thus making it possible for the living lab to remain specialized in a core area. Our view is that a living lab is one instantiation of innovation processes, meaning that the usage of crowdsourcing initiatives could apply to innovation processes being carried out in other premises as well. Hence, the purpose of this article is to relate contemporary crowdsourcing initiatives to living lab innovation process and subsequently analyze the potential benefits and challenges this approach could raise for living labs.

Research Methodology

The methodology for this research started with a literature review in which crowdsourcing and innovation processes were in focus. In this study, we searched journals within the area of information systems and within innovation management, looking for papers published between 2006 and 2014 following the recommendations from Hart (2003) and von Brocke and colleagues (2009). Using the search terms "crowdsourcing" and "innovation process", we found relevant articles that we then examined for evidence of crowdsourcing contributing to innovation processes. Based on that, we applied a snowballing approach, searching both backwards and forwards to find relevant articles. The literature was then combined with desktop research of different crowdsourcing initiatives with the objective to analyze the activities and the mode of the initiative as well as how the initiative could be labelled. We started by analyzing the most common crowdsourcing sites such as InnoCentive, Amazon Mechanical Turk, and Quirky, and then continued to dig further into a variety of initiatives with a focus on initiatives that could support innovation process and initiatives that were driven by third parties, hence excluding company-centered initiatives such as Dell´s IdeaStorm. We used a qualitative and reflective approach, meaning that we reflected on the results from one paper or platform and then looked further. To guide our analysis, we started by categorizing the described activities and then analyzing what the crowd is actually doing by means of the platform for each initiative. We categorized the initiatives according to what the crowd contribute with and the essence of the initiative. To support our categorization, we examined the role of the crowd, asking for instance, whether the crowd members were primarily problems owners, solvers, creators, or data providers or testers. Thereafter, we labelled each initiative according to existing categories of crowdsourcing as suggested by Howe (2009). He defines four basic categories of crowdsourcing applications: i) crowd wisdom; ii) crowd creation or user-generated content; iii) crowd voting; and iv) crowd funding. In this process, we discovered that these categories did not cover all the different aspects of crowdsourcing that we had identified, hence labels such as "crowd innovation", "crowd engagement", and "crowd testing" emerged. The term "crowd testing" stems from the literature (Zogaj & Bretschneider, 2013). The other terms result from our analysis of the essential elements of the crowdsourcing initiatives and our interpretation of the existing four categorizes as inadequate to catch the kernel of the initiative and the motivators related to it. For instance, with crowd engagement, even though the crowd jointly creates the content, and thus could be related to crowd creation, the essence of what the crowd contributes with and create is more strongly related to wanting to change the society and contribute to a common good. This can, for instance, be seen in initiatives such as HarassMap (harassmap.org), where the crowd marks the geographical location of where they have been sexually harassed in a city.

Mapping Crowdsourcing Initiatives to Living Lab Innovation Processes

The concept of crowdsourcing was first coined in 2006 by Jeffrey Howe (2006a), who defined crowdsourcing as follows:

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

> *"Simply defined, crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer–production (when the job is performed collaboratively), but is also often undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the large network of potential labourers."*

Even though the term was coined recently, actions to engage crowds have been ongoing for a long period of time. For instance, engaging citizens in research activities such as gathering weather data has been done for at least 50 years. And, involving people outside an organization in idea generation has a long history. The main differences between these initiatives and today's crowdsourcing trend are that today, the process can be facilitated by an ICT-based platform and it can have a global reach (Boudreau & Lakhani, 2013).

In the beginning of the development of crowdsourcing as a concept, many organizations largely engaged the crowd in micro-tasks as suggested by Howe (2006b). However, today, the concept of crowdsourcing has been broadened; it does not only refer to situations where an open call is used, but also includes situations where people join forces and create value. Examples include the Fukushima Daiichi nuclear disaster, where the crowd built Geiger meters, installed them on cars, bicycles, etc. to get more useful and accurate radiation measures than the Japanese government provided. This crowd activity ended up with more than 150 million data points to be compared with the 30,000 provided by the government (Burns, 2014; Massung et al., 2013) . Other situations where the crowd creates the content and core value of a service can be seen in initiatives such as Airbnb or Uber (Hamari et al., 2015). The main aim of crowdsourcing is to mobilize the distributed and diverse competences and expertise held by the crowd (Zhao & Zhu, 2014). It is driven by meta-trends such as the rise of the entrepreneurial startup culture, the growth of freelancers or independent employees, an expanded global marketplace, and the friction between transparency and monetization.

A crowd can be engaged in many different ways and with different purposes, each answering to certain motivators for the crowd. Thus, to facilitate engagement of crowds in innovation activities, the task may be divided into smaller sub-tasks depending on the complexity of the task and the variety of the outcomes (Ye & Kankanhalli, 2013). Members of the crowd are also motivated differently to participate in the crowd initiatives: some of them are driven by the desire to collaborate and contribute their small part to a larger cause, as seen for instance in community activism initiatives (Massung et al., 2013) or other societal challenges as in OpenIdeo where they are motivated by a collectiveness (Hajiamiri & Korkut, 2015). Other crowds are more motivated by a challenge and solving a problem and thus having the opportunity to win a prize as in InnoCentive or NineSigma, two initatives that focus on connecting companies with experts to solve a complex problem (Ye & Kankanhalli, 2013), or by a desire to spend free time on meaningful activities (Kaufmann et al., 2011). Participation may be perceived as being fun (Lakhani & Wolf, 2005; Rotman et al., 2014), entertaining, or enjoyable. or as a learning opportunity (Maher et al., 2011; Nov, 2007). Other relevant motivators are reputation building (Rotman et al., 2014), career building (Casalo, 2009), rewards (Ye & Kankanhalli, 2013), and recognition (Hajiamiri & Korkut, 2015). In sum, crowds are motivated differently depending on the essence of the crowd's efforts. It is therefore important to understand what triggers the specific crowd that is expected to contribute to a specific process to encourage the development of a vigorous and lively crowd that is willing to do the work expected of it in the innovation process.

In the following sections, we have aligned the different crowdsourcing initiatives to the four different phases of living lab innovation processes (Almirall et al., 2012; Ståhlbröst & Bergvall-Kåreborn, 2008):

1. **Exploration (or contextualization):** refers to gaining understanding of the situation and the potential it offers for innovation

2. **Design (or concretization):** refers to the design of the innovation in all its different maturity levels

3. **Implementation/Realization:** focuses on exposing the innovation to the real-world context

4. **Evaluation and test (or feedback):** refers to the process of using and reflecting on the use of the innovation in the real world context

Exploration

In living labs, one of the core activities is to develop innovations centred on human needs and values (e.g., Ståhlbröst, 2012). Thus, in the living lab, the starting point for innovation is a real-world situation, where there is an opportunity to improve people's lives. A

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

deep understanding of human needs and values is needed as well as deep insights into contemporary problems and challenges from a societal perspective. To support this process, a variety of stakeholders need to be involved to gain as comprehensive and rich a picture of the situation as possible, and we see that different crowdsourcing initiatives can contribute to this process.

The focus for many living lab projects has been to engage end users, or potential users, of an innovation in the process to gain their insights (e.g., Bergvall-Kåreborn et al., 2010; Dell'Era & Landoni, 2014; Svensson et al., 2010). We argue that broadening the scope and including crowds that want to accomplish changes by, for instance, contributing to, shedding light on, or investigating societal issues could contribute valuable insights and real-world experiences to the innovation process in living labs. Given that a crowd-based approach differs from the current focus on end users in living labs and that crowds include a broad range of people beyond only potential users, input from crowds would make it possible for a living lab to obtain a good view of trends and issues that are important to solve in society. Crowds could also be involved in smaller investigations that could contribute to a deeper understanding of a situation or they could be involved in simpler tasks such as idea generation and brainstorming, which can render many ideas quickly. Thus, we see that involving a diversity of crowds in the exploration phase (see Table 1 for examples) could create value for living labs by offering both support in carrying out tasks as well as facilitating better insights.

Design

In living labs, the design process is always viewed as a co-creative process in which many stakeholders should be involved to influence the innovation in focus (e.g., Krogstie, 2012). Innovations are co-created in interaction between users (or user representatives), developers, and designers. This interaction often takes place in a physically co-located arena where the team can jointly design ideas, concepts, and prototypes by means of different methods and tools (Bergvall-Kåreborn et al., 2010). On some occasions, parts of the process are carried out online and the team can share a collaborative workspace where suggestions for different design solutions are posted and comments/suggestions for improvements are given (e.g., Følstad & Karahasanovic, 2012).

From our perspective, we see that different crowd initiatives that are innovative, creative, and diverse could contribute to the design phase in living labs. Potential assignments for the crowd could be, for instance, to carry out programming tasks, to develop design suggestions, or to contribute to solving complex problems. In this process, design competitions could be used, which would make it possible to generate a great variety of creative ideas, while at the same time externalizing the risk of failure (Ye & Kankanhalli, 2013). Hence, opening up the design process and involving different types of crowds can be beneficial for the living lab as well as for the innovation as such: heterogeneous skills and insights come together and thus leverage the innovation potential. In this process, strong motivational factors

Table 1. Crowdsourcing initiatives supporting exploration

Label	Mode/Type of Activity	Action in Exploration	Examples of Initiatives
Crowd creation	Collaboration	Generating ideas	OpenIdeo (openideo.com)
Crowd engagement	Collaboration	Influencing society and communities (e.g., as activists)	HarassMap (harassmap.org) Urban water mappers (publiclab.org/wiki/urban-waters-mapping-nola)
Crowd science	Collaboration	Investigating and researching on background information; providing data	Zooniverse (zooniverse.org) Kaggle (kaggle.com)
Crowd work	Compensation	Generating ideas; brainstorming	Amazon (requester.mturk.com) Freelancer (freelancer.com)

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

for the crowd are to have fun and to receive recognition for their efforts, hence it is important to make the winning solution visible and recognizing the winners. In sum, involving crowds in the design phase (see Table 2 for examples) could create value for living labs in terms of increased insights and perspectives as well as increased efficiency due to the co-creative activities.

Implementation/Realization

The implementation phase is of vital importance for living labs, where the innovation activities are to be carried out in real-world contexts; thus, this phase needs to handled efficiently and effectively. In this phase, the focus is to expose the innovation to the complexity of the context with different users, competing systems, contextual factors, and the users' experiences of using the innovation "for real". To support this process, it is important for the living lab to have an extensive network that can offer implementation contexts that are suitable for different innovations. The implementation context can be very diverse including, for instance, private households, public buildings, city contexts, or even smartphones, because the implementation must be carried out in the context in which the innovation is expected to operate. In this process, dynamic and large crowds such as those used by Amazon Mechanical Turk or Freelancer (focusing on matching workers with micro-tasks from requesters) could contribute and offer private contexts where the crowd can install the innovation in their context, if it is for instance an ICT-based innovation that is implemented. However, based on our analysis of current crowdsourcing initiatives, implementation in public contexts is not usually supported. Hence, it is still important to maintain the network of partners surrounding the living lab, but developing and maintaining their own user panels or communities becomes of less importance.

In the implementation stage, some funding might also be needed to make it possible for the innovation to reach the market and become fully implemented. Including the crowd in this process, through crowdfunding, could then give a hint of how interesting the crowd members interpret the innovation to be: if they are not willing to contribute to its financing, the market potential of the innovation might be weak. However, if the opposite is true and the crowd wants to fund the development and implementation of the innovation, this finding could contribute significantly to the living lab process and it might also give indications of its market potential. Hence, involving the crowd in the implementation phase (see Table 3 for examples) can create value for the living lab in terms of access to different contexts and use situations. Involving the crowd can also give a first insight of how the innovation is valued by the crowd, which gives the living lab the opportunity to take action on how to proceed with the innovation and thus be a living lab in a dynamic sense.

Test and evaluation

The living lab test and evaluation phase is often applied in innovation projects as a means to obtain user insights on the experiences of using the innovation (e.g., Wendin et al., 2015). In this process, users are usually involved in their own real-world context to test or evaluate the innovation to ensure that the solution answers their needs and creates value for them (Almirall & Wareham, 2011). If the innovation is in its early stages, this

Table 2. Crowdsourcing initiatives supporting design

Label	Mode/Type of Activity	Action in Design	Examples of Initiatives
Crowd labour	Collaboration	Programming software	SourceForge (sourceforge.net) Topcoder (topcoder.com)
Crowd creation	Collaboration	Innovating in collective design	OpenIdeo (openideo.com)
Crowd wisdom	Competition	Solving complex problem as experts	NineSigma (ninesigma.com) xPrize (xprize.org)
Crowd creation	Competition	Creative creation	99 designs (99designs.com) eYeka (eyeka.com)

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

Table 3. Third-party crowdsourcing initiatives supporting implementation/realization

Label	Mode/Type of Activity	Action in Implementation/ Realization	Examples of Initiatives
Crowdfunding	Collaboration	Funding	KickStarter (kickstarter.com) Gofundme (gofundme.com)
Crowd work	Compensation	Working for hire to perform micro-tasks	Amazon Mechanical Turk (mturk.com) Freelancer (freelancer.com)

process might be performed in a physical meeting during which the innovation is demonstrated and the users give their feedback, or in later stages, the tests can be performed in real-world contexts where the users use the innovation into their own context and then follow instructions and answer questions related to their experiences of using it. In this process, we see that different crowd initiatives can contribute, depending on the innovation to be tested. For instance, initiatives such as Testbirds, which focuses on supporting tests of applications and websites with crowd members, could be used for testing usability of an IT system, or Freelancer or Amazon Mechanical Turk could be used to test the usefulness of the innovation and evaluate experiences of using the system. Here, a structured test process with clearly defined tasks and goals is important, as is having a large number of potential testers. To motivate the crowd to carry out this type of task, some form of compensation may help, depending on the time and efforts expected from the crowd members. Thus, the value being created for the living lab by involving crowds in the test and evaluation is increased knowledge and understanding of how the innovation is being used, which gives direction to future changes and adjustments of the innovation. In addition, involving third-party crowds in the test and evaluation phase makes the process more efficient because the living lab does not need to recruit, maintain, or communicate with their own crowds.

Discussion and Conclusions

In this section, we summarize the main issues identified that we argue will be of importance for the future understanding of how living lab innovation process can utilize the power of the crowds and leverage their innovation process. When reflecting on the potential benefits for living lab initiators to engage in contemporary crowdsourcing initiatives, three core areas emerged. First, it is likely that the administration within the living lab organization can be decreased because time and money can be saved on the management of participants in living lab activities. Also, it can provide access to a broader network during the innovation process. Second, utilizing contemporary crowdsourcing initiatives presents good opportunities for keeping track of current trends and emerging issues and also to connect with the people engaging in these ideas. Potentially, this benefit is of specific value for smaller living lab initiatives that might not otherwise have the resources to access this kind of knowledge and networks. Last, we see that the overall innovation capacity could be leveraged. By being able to utilize innovative ideas from an international perspective (such as Openideo, which focuses on developing and involving a global community) while at the same time engaging a context-aware crowd from the region (e.g. Botnia Living Lab, which mainly has a local crowd) and then infusing ideas from the global community to the local community , can boost the innovation capacity and thus widen the range of possible successful innovations. It is also possible to more carefully target important characteristics such as usability knowledge (e.g., Testbirds), design skills (e.g., 99designs), or true user experience (e.g., Harassmap).

Closely linked to the benefits are the identified corresponding challenges in making them happen, that is, the challenges in leveraging the innovation possibilities. We argue that, when different crowds are involved in the innovation process, living lab managers might need to embrace a dynamic approach that focuses on following the crowd from a close distance and being prepared to take actions to, for instance, motivate or to stimulate the crowd. Working with people and crowds also makes it difficult to predict exactly what will come out of the crowd even if the requirements of the expected outcome are clearly defined and communicated through,

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

for instance, micro-tasks to be carried out. The solution is to a large extent determined by the participant's interpretation and previous experience related to the task. In addition, interacting with different crowds in the process makes it possible to work with many ideas in parallel, which can boost the innovation process given that ideas from one crowd can be implemented into another crowd, thus stimulating new perspectives and discussions.

Next, we argue that the innovation interaction with crowds might have an effect on how we see the end solution or, more specifically, how we view the crowd participant's role in the solution. This is a matter of value capture and value creation. When crowds are involved, they might be the ones creating the value of an innovation, such as gathering data or designing the innovation. But, the value of the innovation might still be captured by the initiator of the innovation. Here, it is important that the living lab manager consider how they wish to assign ownership of the final innovation: should it be co-owned among all contributors, or should the initiator of the process own it? Traditionally, the innovations brought forward by living labs are owned by the actor initiating the living lab process or by the initiator of the problem, usually a company. Crowds are also involved in different ways: some crowds are mainly opinion leaders whereas others offer important resources to make the innovation come to life, such as in Kickstarter, a company that crowdfunds innovation. This change of role will likely challenge the way participants and their contributions are viewed, and it will likely affect how the ownership of the innovation is discussed and realized.

Finally, we argue that the way a living lab engages with a crowdsourcing initiative will be of outmost importance. As seen by the motivators for the exemplified crowds, we conclude that a living lab must make efforts to identify the proper incentives and ways to communicate with – and engage – crowds. Some crowds are driven by the sheer enjoyment of contributing to an issue they view as important, and for them it is important to feel that they are doing exactly that. A likely consequence of this situation is that it can become a challenge to obtain sufficient insights if the problem in focus is being presented as a predetermined solution that the living lab wants some response to, because it will limit their creativity and innovativeness. Other crowds are motivated by more individualistic drivers, such as receiving attention for their contribution or to receive some micropayment for their efforts, and as mentioned before, others see themselves as part of the solution. In all cases, making sure each crowd is engaged in the proper manner will be key for leveraging the innovation potential. In the end, success will depend on the mindset of the living lab managers, who must be brave enough to follow the power of the crowd and live with the process, and thus truly become part of a "living lab".

In Figure 1, we have depicted the essence of our discussion in a matrix where the level of engagement of the crowd and the crowd perspective render four different crowd roles. Here, the crowd perspective represents the different views of the crowd where they can be seen as factors that mainly provide data (e.g., sensor data, energy consumption data) or sponsor initiatives (e.g., money). The level of crowd engagement also influences which role the crowd take. When the level of engagement is high, the crowd put in their own resources to co-create or sponsor the innovation, whereas if the level of engagement is low, the crowd mainly contribute with their ideas or their data – they might test and give input, but their efforts do not require a high level of engagement.

By applying this matrix in living lab processes, living lab managers can gain support in determining which crowdsourcing initiate they should focus on using in their innovation process. For instance, if the living lab manager wants to have people who are active and has a high level of engagement in the process – which also requires a high level of engagement from the living lab manager – they might want the crowd members to play the role of co-creators, as in OpenIdeo. In a similar vein, if the living lab manager wants to have a crowd that mainly contributes with data and has a low level of engagement, they might want to engage a crowd focusing on being providers as in, for instance, Testbirds where the crowd mainly contributes to a small well-defined and structured task.

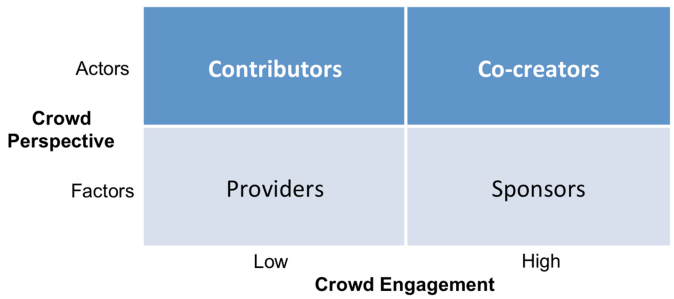

Figure 1. Four roles of the crowd in crowdsourcing initiatives, as derived from a matrix of crowd engagement and perspectives in crowdsourcing

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

This study represents a first step towards understanding, from a theoretical perspective, how crowds can be engaged in, and contribute to, living lab innovation processes. In future research, it would be interesting to study the actual impact and contribution crowds can have in living lab innovation processes. In this study, we report on a limited number of crowdsourcing initiates, but due to the rapid growth within the area, and also the emerging challenges the area face, a more comprehensive study of the different initiatives and their potential would be valuable for living labs to reap the benefits of crowdsourcing.

About the Authors

Anna Ståhlbröst is Associate Professor in Information Systems at Luleå University of Technology, Sweden. Her research is focused on the phenomena of living labs and open, user-driven innovation processes, with special interest in end-user needs and motivations. Anna's research is related to different application areas such as domestic IT use, energy efficiency, and smart cities. She has participated in several international and national innovation and research projects, and she is currently involved in the projects IoT Lab, USEMP, and Privacy Flag, which are financed by the European Commission. Anna has contributed to the field with more than forty journal and conference articles.

Josefin Lassinantti is a PhD student in Information Systems at Luleå University of Technology in Sweden, where she received a licentiate degree in 2014. Her research focuses on open data as an arena for citizen innovation and value creation by applying a social constructivist lens and adding theories from the innovation field, thus aiming to contribute to the field of public administration and e-government. In parallel with research, she teaches courses related to design of mobile and computer interactions, with a special interest in maintaining a good balance between acknowledging both the innovative possibilities of new ICT as well as its societal consequences. Josefin is also involved in the IoT Lab project, financed by the European Union's 7th Framework Programme.

Acknowledgements

An earlier version of this paper was presented at the XXVI International Society for Professional Innovation Management (ISPIM) Conference – Shaping the Frontiers of Innovation Management, Budapest, Hungary, 14–17 June, 2015.

References

Almirall, E., & Wareham, J. 2011. Living Labs: arbiters of mid- and ground-level innovation. *Technology Analysis & Strategic Management,* 23(1): 87–102. http://dx.doi.org/10.1080/09537325.2011.537110

Almirall, E., Lee, M., & Wareham, J. 2012. Mapping Living Labs in the Landscape of Innovation Methodologies. *Technology Innovation Management Review,* 2(9): 12–18. http://timreview.ca/article/603

Bergvall-Kåreborn, B., Howcroft, D., Ståhlbröst, A., & Melander-Wikman, A. 2010. *Participating in Living Lab: Designing Systems with Users.* Paper presented at the Human Benefit through the Diffusion of Information Systems Design Science Research: IFIP WG 8.2/8.6 International Working Conference, Perth, Australia, March 30 – April 1.

Bergvall-Kåreborn, B., & Ståhlbröst, A. 2009. Living Lab: An Open and Citizen-Centric Approach for Innovation. *International Journal of Innovation and Regional Development,* 1(4): 356–370. http://dx.doi.org/10.1504/IJIRD.2009.022727

Boudreau, K. J., & Lakhani, K. R. 2013. Using the Crowd as an Innovation Partner. *Harvard Business Review,* 91(4): 60–69.

Burns, R. 2014. Moments of Closure in the Knowledge Politics of Digital Humanitarianism. *Geoforum,* 53: 51–62. http://dx.doi.org/10.1016/j.geoforum.2014.02.002

Casalo, L. V. 2009. Determinants of Success in Open Source Software Networks. In J. Cisneros, C. Flavian, & M. Guinaliu (Eds.), *Industrial Management & Data Systems,* 109: 532–549.

Cleland, B., Mulvenna, M., Galbraith, B., Wallace, J., & Martin, S. 2012. Innovation of eParticipation Strategies Using Living Labs as Intermediaries. *Electronic Journal of e-Government,* 10(2): 120–132.

Dell'Era, C., & Landoni, P. 2014. Living Lab: A Methodology between User-Centred Design and Participatory Design. *Creativity & Innovation Management,* 23(2): 137–154. http://dx.doi.org/10.1111/caim.12061

Di Gangi, P. M., & Wasko, M. 2009. Steal My Idea! Organizational Adoption of User Innovations from a User Innovation Community: A Case Study of Dell IdeaStorm. *Decision Support Systems,* 48(1): 303-312. http://dx.doi.org/10.1016/j.dss.2009.04.004

Leveraging Living Lab Innovation Processes through Crowdsourcing

Anna Ståhlbröst and Josefin Lassinantti

Følstad, A., & Karahasanovic, A. 2012. Online Applications for User Involvement in Living Lab Innovation Processes. In *Proceedings of e-Society 2012:* 257–264. IADIS Press.

Hajiamiri, M., & Korkut, F. 2015. Perceived Values of Web-Based Collective Design Platforms from the Perspective of Industrial Designers in Reference to Quirky and OpenIDEO. *ITU AZ,* 12(1): 147–159.

Hamari, J., Sjöklint, M., & Ukkonen, A. 2015. The Sharing Economy: Why People Participate in Collaborative Consumption. *Journal of the Association for Information Science and Technology.* Forthcoming. http://dx.doi.org/10.1002/asi.23552

Hart, C. 2003. *Doing a Literature Review – Releasing the Social Science Research Imagination.* London: Sage Publication Inc.

Howe, J. 2006a. Crowdsourcing: A Definition. *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business,* June 2, 2006. Accessed December 1, 2015: http://crowdsourcing.typepad.com/cs/2006/06/crowdsourcing_a.html

Howe, J. 2006b. The Rise of Crowdsourcing. *Wired,* 14(6), June 6, 2006. Accessed December 1, 2015: http://www.wired.com/2006/06/crowds/

Howe, J. 2009. *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business.* New York: Crown Business.

Huston, L., & Sakkab, N. 2006. Connect and Develop: Inside Procter & Gamble's New Model for Innovation. *Harvard Business Review,* 84(3): 58–66.

Kaufmann, N., Schulze, T., & Veit, D. 2011. More than Fun and Money. Worker Motivation in Crowdsourcing – A Study on Mechanical Turk. In *Proceedings of AMCIS2011,* Paper 340.

Krogstie, J. 2012. Bridging Research and Innovation by Applying Living Labs for Design Science Research. In C. Keller, M. Wiberg, P. Ågerfalk, & J. Z. Eriksson Lundström (Eds.), *Nordic Contributions in IS Research,* 124: 161–176. Berlin: Springer Berlin Heidelberg. http://dx.doi.org/10.1007/978-3-642-32270-9_10

Lakhani, K. R., & Wolf, G. 2005. Why Hackers Do What They Do: Understanding Motivaiton and Efforts in Free/Open Source Software Projects. In J. Feller, B. Fitzgerald, S. Hissam, & K. R. Lakhani (Eds.), *Perspectives on Free and Open Soruce Software.* Cambridge, MA: MIT Press.

Leminen, S., Westerlund, M., & Nyström, A.-G. 2012. Living Labs as Open-Innovation Networks. *Technology Innovation Management Review,* 2(9): 6–11. http://timreview.ca/article/602

Maher, M., L, Paulini, M., & Murty, P. 2011. Scaling Up: From Individual Design to Collaborative Design to Collective Design. *Design Computing and Cognition,* 10: 581–599. http://dx.doi.org/10.1007/978-94-007-0510-4_31

Massung, E., Coyle, D., Cater, K. F., Jay, M., & Preist, C. 2013. Using Crowdsourcing to Support Pro-Environmental Community Activism. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems:* 371–380. Paris: ACM. http://dx.doi.org/10.1145/2470654.2470708

Nov, O. 2007. What Motivates Wikipedians. *Communication of the ACM,* 50(11): 60–64. http://dx.doi.org/10.1145/1297797.1297798

Prpić, J., Shukla, P. P., Kietzmann, J. H., & McCarthy, I. P. 2015. How to Work a Crowd: Developing Crowd Capital through Crowdsourcing. ***Business Horizons,*** 58(1): 77–85. http://dx.doi.org/10.1016/j.bushor.2014.09.005

Rotman, D., Hammock, J., Preece, J., Hansen, D., Boston, C., Bowser, A., & He, Y. 2014. Motivations Affecting Initial and Long-Term Participation in Citizen Science Projects in Three Countries. In *iConference 2014 Proceedings:* 110–124. http://dx.doi.org/10.9776/14054

Schlagwein, D., & Andersen, N.-B. 2014. Organizational Learning with Crowdsourcing: The Revelatory Case of LEGO. *Journal of the Association for Information Systems,* 15(11): 754–778.

Ståhlbröst, A. 2012. A Set of Key Principles to Assess the Impact of Living Labs. *International Journal of Product Development,* 17(1-2): 60–75. http://dx.doi.org/10.1504/IJPD.2012.051154

Ståhlbröst, A. 2013. A Living Lab as a Service: Creating Value for Micro-enterprises through Collaboration and Innovation. *Technology Innovation Management Review,* 3(11): 37–42. http://timreview.ca/article/744

Ståhlbröst, A., & Bergvall-Kåreborn, B. 2008. FormIT – An Approach to User Involvement. In J. Schumacher, & V.-P. Niitamo (Eds.), *European Living Labs - A New Approach for Human Centric Regional Innovation:* 63–76. Berlin: Wissenschaftlicher Verlag.

Svensson, J., Esbjörnsson, E., & Eriksson, C. I. 2010. User Contribution in Innovation Processes – Reflections from a Living Lab Perspective. In *HICCS 2010, the 43rd Hawaii International Conference on System Sciences:* 1–10. Maui, Hawaii. New York: IEEE.

vom Brocke, J., Simons, A., Niehaves, B., Reimer, K., Plattfaut, R., & Cleven, A. 2009. Reconstructing the Giant: On the Importance of Rigour in Documenting the Literature Search Process. *ECIS 2009 Proceedings:* Paper 161. Verona, Italy.

Wendin, K., Åström, A., & Ståhlbröst, A. 2015. Exploring Differences between Central Located Test and Home Use Test in a Living Lab Context. *International Journal of Consumer Studies,* 39(3): 230–238. http://dx.doi.org/10.1111/ijcs.12171

Ye, H., & Kankanhalli, A. 2013. Leveraging Crowdsourcing for Organizational Value Co-Creation. *Communication of the AIS,* 33(1): Article 13.

Zhao, Y., & Zhu, Q. 2014. Evaluation on Crowdsourcing Research: Current Status and Future Directions. *Information Systems Frontier,* 16: 417–434. http://dx.doi.org/10.1007/s10796-012-9350-4

Zogaj, S., & Bretschneider, U. 2013. *Crowdtesting with Testcloud – Managing the Challenges of an Intermediary in a Crowdsourcing Business Model.* Paper presented at ECIS2013, Utrecht, Germany.

Citation: Ståhlbröst, A., & Lassinantti, J. 2015. Leveraging Living Lab Innovation Processes through Crowdsourcing. *Technology Innovation Management Review,* 5(12): 28–36. http://timreview.ca/article/950

Keywords: living Lab, crowdsourcing, innovation process, citizen, ICT, user

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

> *"Where things happen matters."*
>
> Stuart Shapiro
> Information Privacy
> and Security Engineer

In this article, we propose the concepts of places and spaces as conceptual tools to facilitate the organization of innovation activities within living labs. We have taken a pragmatic perspective on these concepts regarding how they are integrated in design situations, and how different types of places and spaces can facilitate or hinder innovation. We have found that, by applying openness, realism, and influence in the different spaces of our living lab milieus, they have transformed into many different places depending on the stakeholders involved, the methods chosen, and the facilitation of activities. Hence, by understanding this line of reasoning, living lab managers can make more informed decisions and plans for innovation activities.

Introduction

Within the emerging area of living labs, there is a call for better understanding of the concept and the context of living labs and the methodologies for co-creating innovation (Ballon, 2015; Westerlund & Leminen, 2014). In this article, we will focus on two key features of living labs, and innovation systems in general. The first is the intensified and matured use of Internet-based technologies aimed at facilitating development and innovation among individuals, organizations, and societies, and which create innovation milieus and processes characterized by a combination of physical and digital structures and activities (Almirall et al., 2012; Ballon, 2015). The second is the trend of extended and intensified globalization in combination with areas of localization. Both of these trends can be analyzed and discussed with the help of the concepts of place and space, where place is represented by a sense of being and contented belonging, and space is represented by "becoming" (versus "being") and a constant striving for newness (Schultze & Boland, 2000). Despite this increased importance of understanding different types of places and spaces in relation to innovation, little attention has so far been granted to the concept within the innovation community. Hence, we argue that it is time to reflect on the space of innovative opportunity linked to living labs and how they support diversities of action and behaviour in ways that open up possibilities for people to create a multitude of different places within these spaces.

In this article, we propose the concepts of places and spaces as conceptual tools to facilitate the organization of innovation activities within living labs. It is not our aim to clarify different philosophical standpoints related to the place and space; instead, we take a rather pragmatic perspective and focus on the concepts as tools for understanding present-day innovation milieus and processes, and how they are shaped. To manage this perspective, we need to understand the different dimensions of place and space, how they are integrated in design situations, and how different types of places and spaces can facilitate or hinder innovation. In the following sections, we briefly introduce living labs, discuss the concepts of place and space, and present our research methodology. Thereafter, we present empirical findings based on our experiences from a multitude of living lab projects related to place and space, and we discuss their influence on the innovation process. Finally, we end the article with our conclusions.

The Living Lab Concept

The concept of the living lab has been frequently studied by scholars in Europe during the last 10 years. There

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

exist different types of living labs (Leminen, 2013) and different aspects of living labs have been addressed, including methods for involving different stakeholders (Almirall et al., 2012; Ståhlbröst, 2008; Stålbröst & Bergvall-Kåreborn, 2008; Svensson et al., 2010); motivation for involvement (Ståhlbröst & Bergvall-Kåreborn, 2011); the "real life" aspect (Intille et al., 2006; Westerlund & Leminen, 2011); and categorizations of living labs (Følstad, 2008; Leminen et al., 2012; Schuurman et al., 2012). Given that the aspects differ, several definitions of "living lab" have been offered (e.g., Ballon et al., 2005; Dutilleul et al., 2010; Eriksson et al., 2005; Fulgencio et al., 2012; Westerlund & Leminen, 2011). In this article, we adopt the following definition:

"A living lab is a user-centric innovation milieu built on every-day practice and research, with an approach that facilitates user influence in open and distributed innovation processes engaging all relevant partners in real-life contexts, aiming to create sustainable values" (Bergvall-Kåreborn et al., 2009).

This definition states that a living lab is both an innovation milieu and an innovation approach. Related to this definition, *five key components* have been identified – ICT and infrastructure; management; partners and users; research; and approach – as well as *five key principles* – openness; realism; influence; value; and sustainability (Bergvall-Kåreborn et al., 2009). Given that the first three key principles (openness, realism, and influence) are connected to the innovation approach, whereas the last two (value and sustainability) are more related to the innovation itself, we will focus on the first three in our analysis of place and space in living labs.

Place and Space

The concepts of place and space have a long history and play a significant role in a number of different disciplines. Within living labs, the concepts are rarely discussed, with some exceptions (e.g., Femenias & Hagbert, 2013). However, because the concepts enjoy a wide, common-sense usage, we tend to assume that we know their meanings, which obstructs our understanding of the concept in a more theoretical way (Cresswell, 2004). It is therefore important to look at the concepts from a more theoretical perspective and to identify characteristics and features that can facilitate the design, development, and assessment of living labs. Because place is the more accessible of the two concepts (Sack, 1993), due to its relation to geographical location (Casey, 1996), we start describing place as a concept and use the images of place to later illustrate space.

Although the link between place and existing location is present in most literature, the concept of place in modern literature is more than frozen scenes or settings for human activity and social interaction. It includes the thoughts and actions of people that form and reform social and cultural life, and thereby transform space and nature (Pred, 1984). The extended view of place is largely influenced by scholars such as Bourdiue (1990) and Giddens (1990), and it infers that a place should be viewed as both an entity and a verb. This intertwinement between structure and process is the rationale behind concepts such as "place making" (Elmes et al., 2012) and is well described by Alexander (1979) when he says that the life and soul of a place is formed both by its physical environment and by the pattern of events that people experience there. Though Alexander talks of buildings and cities, his theories also apply to innovation environments. With this modern view of place, the concept has three necessary and sufficient features: geographical location, material form, and investment in value and meaning (Gieryn, 2000). Hence, when it comes to understanding and designing innovation environments of different types, we need to focus equally on their location, the structure of the environments, and on the innovation activities that takes place there.

There are also scholars who primarily focus on place as networks of people sharing common interests, beliefs, or identities (McNamee & Hosking, 2012). Due to Internet technologies, these networks are increasingly dispersed over wide geographical areas, giving the local geographical dimension of a place a broader meaning. Following this perspective, the interactions within a network by which norms, patterns of behaviour, and practices are established creates a sense of place, not necessarily tied to a specific geographical location (Massey, 1994). According to Massey (1994), meeting places integrates the global and the local world together. Taking into account the physical and digital, as well as the local and global, aspects of living labs and their aim to create innovative meeting places that transcend the limitations of the "here and now", we associate with this perspective of place.

In post-modern societies, place and space form a duality, and their meanings are mutually constituted and dialectically intertwined. Whereas place is associated with a sense of subjectivity, uniqueness, understood reality, practical knowledge, boundedness, belonging, tradition, stability, and security; space is characterized by objectivity, similarities, opportunity, scientific knowledge, expansiveness, being, newness, growth, and freedom (Schultze & Boland, 2000).

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

It is through our actions, behaviour, and the meaning attributed to a situation that a space transforms to a place (Harrison & Dourish, 1996). Locating these dimensions in an organizational setting space is represented by organizational flexibility, global presence, a mobile workforce, and endless opportunities for growth (Schultze & Boland, 2000). Technology is closely linked to the concept of space because it reinforces features such as universality, transferability, replicability, mobility, and continuous, progressive change. Place, on the other hand, represents the uniqueness of the organization, situated knowledge, and structures, processes, and culture that are difficult to transfer and replicate by other competing organizations.

Research Methodology

Drawing on more than ten years of experience from living lab activities in two different Swedish living labs, Botnia Living Lab located in the north of Sweden and Halmstad Living Lab located in the south, the authors have explored the concept of the living lab from many angles. In this article, we use our experience from 14 different cases to illustrate the importance of space and place in living labs (Table 1).

In all these cases, we have had a mix of stakeholders, including users/user groups, companies, and researchers. Also, the "real life" component has been a feature of all these projects. The cases represent a mix of national and international stakeholders and aspects of living labs. We have mostly used qualitative data collection methods in different combinations (e.g., Mingers, 2001), such as workshops, interviews, focus groups, etc. We have also worked in all stages of the innovation process, from need-finding to evaluations. When analyzing the data, we found patterns in the different projects related to the concepts of place and space. In the next section, we draw examples from some of the projects that could be seen as typical for the experiences in both the Botnia and Halmstad living labs.

Table 1. Descriptions of the living lab cases from which the findings are drawn

Living Lab	Project	Years	Aim	Reference
Halmstad	DigiNews	2004–2006	To explore research and development issues for an electronic newspaper of the future. The project aimed at combining the accessibility, simplicity, and mobility of printed newspapers, with the advantages of digital media, communication technologies, and portable consumer electronics	Åkesson & Ihlström (2006)
Botnia	Crocopil	2005–2007	To develop technologies and digital services that improve living and working conditions for people and organizations in remote areas with unstable Internet connectivity	Ståhlbröst & Holst (2006)
Botnia	SMART	2006–2007	To explore the concept of "reaction media", allowing individuals to easily and directly take active part in situations such as public dialogues and industrial quality processes	Bergvall-Kåreborn & Ståhlbröst (2009)
Halmstad	Safe at Home	2007–2008	Focus on methods for user involvement in the innovation process with the aim at supporting and empowering elderly people	Svensson, Ihlström Eriksson, & Ebbesson (2010)
Botnia	OLLSE	2007–2009	To initiate and administrate a Swedish collaborative network of pioneer living lab environments for user-driven innovation of ICT-based services and products	Ihlström Eriksson, Åkesson & Svensson (2009)

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

Table 1. (Continued) Descriptions of the living lab cases from which the findings are drawn

Living Lab	Project	Years	Aim	Reference
Botnia	MyHealth@Age	2008–2010	To improve the health and wellbeing of the ageing population in the northern periphery regions of Europe (Sweden, Norway and Northern Ireland) by co-creating ICT-products and services that make it possible for them to sustain autonomous living and take a more active role in their own wellbeing	Bergvall-Kåreborn et al. (2015)
Halmstad	Smart Locks	2008	To create an IT demonstrator that aims to mitigate the problems connected to safety and security for elderly people living alone at home and to enhance communication possibilities between, for example a caretaker, a caregiver, and next of kin to the elderly	Svensson & Ihlström Eriksson (2012)
Halmstad	LoCoMedia	2009–2010	To examine how to design an open media environment to leverage values of user-generated content (UGC) in media and news production	Ebbesson & Ihlström Eriksson (2013)
Halmstad	Express2Connect	2010–2012	To offer ways and occasions for communities among the elderly to be created, because it will intensify interaction, communication, and dialogue between the users and contribute to the feeling of wellbeing, self-esteem, and belonging	Wildevuur et al. (2013)
Botnia	SociaLL	2010–2012	To foster value-creating use of social software for co-creation in i) existing living lab infrastructures and ii) SMEs with little or no previous experience with living labs	Ståhlbröst et al. (2013)
Botnia	APOLLON	2010–2013	To facilitate networking and harmonizing of living lab approaches throughout Europe; real-world pilots were carried out on eParticipation, eHealth, energy efficiency, and eManufacturing	Lievens et al. (2011)
Botnia	CASSANDRA	2011–2014	To build a platform for the realistic modelling of the energy market stakeholders, also involving small-scale consumers; carried out real-world pilots together with users in a shopping centre and in a multi-residential building	Runardotter & Holst (2014)
Botnia	EAR-IT	2012–2014	To implement a smart city solution based on audio monitoring in a city context; to develop the solution with citizen needs related to privacy and smart city solutions in the centre	Ståhlbröst, Bergvall-Kåreborn & Ihlström Eriksson (2015)
Botnia	IoTLab	2013–2016	To develop crowdsourcing tools that support crowdsourced-driven research based on IoT and testbed services, featuring users as private persons who want to engage and contribute to research project.	Ståhlbröst et al. (2015)

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

Empirical Findings

As described above, we chose to centre our empirical findings on the first three key principles of living labs: openness, realism, and influence (Bergvall-Kåreborn et al., 2009). To illustrate the concepts of space and place and how they influence the innovation process, we created different vignettes related to these principles and included examples from projects in both the Botnia and Halmstad living labs.

Vignette 1: Openness
In our living lab projects, openness is strived for on different levels, many of which have been widely researched within the open innovation literature; for example: types of open innovation (Gassman & Enkel 2004), business models (Chesbrough, 2006a), and resource transfers (Chesbrough, 2006b). There is, however, one new dimension of openness that has emerged in some of our more recent living lab projects carried out within smart city contexts: openness related to data sharing of private persons, rather than organizations. To illustrate this dimension of openness and its relation to the concepts of place and space, we use the EAR-IT project, which implemented a smart city solution based on audio monitoring.

Implementing audio monitoring, as well as visual monitoring, in public spaces raises many interesting questions because individuals occupying these public spaces transform them into private places through their actions and behaviour, and the meaning they attribute to a situation. Hence, public spaces such as parks, streets, shopping centres, cafés, and restaurants quickly turn into private places when we place a blanket on the grass close to a large tree and have a family picnic, or when we meet for dinner with our friends or spouse at a restaurant. In addition, our study shows that, when people make conversations in these types of public spaces, these conversations are sometimes perceived as both safer and more confidential than meeting held in private spaces such as people's homes. One common argument for this perception was the presence of other people and the feeling that conversations became private due to surrounding sound and noise. This feeling was reinforced by a common assumption that people nearby did not observe them or listen in on their conversations. As stated by one of the interviewees "I have a feeling of being more private since my words are lost in the crowds".

Although monitoring in public spaces always needs to be clearly communicated, in relation with living lab studies, participants also need to explicitly consent to the monitoring. This is a challenging task when it comes to smart city installations because it is not possible to hand out consent forms to all potential citizens affected, and there is no overarching technology available through which this process can be managed. Once the technology was implemented, the attempt to gather citizens' consent shifted to an attempt to inform everybody entering public spaces with implemented audio monitoring technology. It is therefore an overarching risk that collecting data in public spaces will invade on the people and the private spaces they create in seemingly public environments. In the EAR-IT project, we therefore decided to make sure that no private conversations would be possible to identify. This was a guiding rule when determining the quality of the sensors used as well as the number of sensors implemented and their positions.

When it comes to openness in relation to cultural norms and traditions, the concepts of space and place have also proved very valuable due to their focus on the general and the individual. Understanding cultural aspects and how they influence both the innovation process and its outcomes is one of the main reasons for international and EU funded projects. This involves a broad spectrum from national and organizational aspects to age, gender, and user group aspects. Finding ways to understand, share, and illustrate these differences as well as develop innovations that are able to address them is a major challenge. What people are open and prepared to share with other people can vary considerable due to differences in culture, gender, and age. In the EAR-IT project, we could detect national and cultural differences in the willingness to share personal data. People from France and Spain, for example, were generally more cautious of sharing private data compared to people from Sweden. They also queried more about the purpose of the collected data and the specific purpose influenced their willingness to share to a greater extent compared to people from Sweden. This difference can be illustrated by the following two quotations:

"I do not care what type of data different systems collect about me: I have nothing to hide" (Swedish respondent) and, "I want to know who is behind the data collection and for what purpose they collect and use it" (Spanish respondent). These national differences can be interpreted in many different ways based on different levels of privacy maturity, scepticism, privacy, etc. Regardless of interpretation, the selected the examples point to the importance of understanding different perspectives and their consequences on openness.

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

Vignette 2: Realism

In living labs, realism often refers to the endeavour of carrying out innovation processes in the context in which the innovation should be implemented as soon as it is mature and stable enough to handle the complexity of real, unsupervised, and uncontrolled use (Ballon & Schuurman, 2015). This task is usually accomplished through user tests and evaluations in real-world contexts, as co-creation activities in the real world, or as real-world observational studies. But, realism is not only related to implementing innovations in a real-world context, it is also a human state of mind. To illustrate this dimension of realism and its relation to the concepts of place and space, we use the DigiNews project, which aimed to design and evaluate the future electronic newspaper.

In the DigiNews project, the importance of realism was stressed in many different situations. One example was during the evaluation where an e-newspaper was used in users´ everyday life. An e-newspaper is a digital version of a newspaper presented on an e-reading device based on eInk technology, aimed at replacing the printed newspaper. In other words, it is comparable to a newspaper's website. The vision was a bendable A4-sized e-paper in full color, but in this project we used iRex iLiads (an e-reading device in an A5 size with only greyscale) – iPads and other similar devices were not available on the market at that time. The e-newspaper evaluated was a Swedish newspaper with two editions each day. One of the aspects important to evaluate was whether the e-newspaper could replace the printed newspaper in normal daily situations. We therefore encouraged the users not to read their printed newspaper, but instead bring the e-newspaper to the place they normally read their news, for example, the breakfast table, the bathroom, during their commute to work, or in the bed in the evening. The reaction was that the e-newspaper could almost replace the calm reading experience provided by a printed newspaper, which is opposite to the more "lean-forward" reading of the news websites. Some of the comments were: “I liked this format, even if it initially seemed a little small, it was quite good… I had it with me on the airplane and on the bus, and then this size was perfect” and “this feels very trustworthy, same style and layout as the printed newspaper, same brand... and the calmness, you have succeeded to bring that”.

Another aspect of realism in the DigiNews project was that almost all the newspaper content (except for obituaries and comics) was reformatted each day into two editions especially for the e-reader device in order to create a realistic experience during the evaluations. This lead to considerable more work at the newspaper, but also made it possible for the users to experience some of the added values with an e-newspaper, such as one morning edition and one evening edition, which was essential for the experience.

The vision of the future e-newspaper was to keep the newspaper feeling but add more value for the readers, such as more pictures, graphics, video, and interactive features such as crosswords. Although the technology and available e-reading device did not support these features, three prototypes were designed together with newspapers, readers, and advertisers supporting this vision. These prototypes could only be tested on computers or tablets that did not support the actual newspaper feeling. Nevertheless, intensive evaluation provided indications to the design space of the future e-newspaper.

Given the limited time during the evaluation period and the limitations of the technology, it was not possible to state that the e-newspaper could replace the printed newspaper in the lives of users. However, given the realistic situation and the positive response from the users, there was a strong indication that it would be possible when the technology is there. At the same time, some users stated that a few features of the printed newspaper could never be replaced, such as the smell of print, the use of old newspapers for the cat litter box, etc. For them, it is not possible to transform the e-newspaper from space to place, because the printed newspaper had established a "taken for granted" position in their homes (places). There is an ongoing struggle among today’s newspapers to find new ways of transforming their digital products from people’s spaces into their places.

Vignette 3: Influence

Influence, as a key principle of living labs, highlight peoples’ right to impact innovations and changes that might affect them (Leminen & Westerlund, 2009) or the society in which they live. The rationale behind the principle is closely related to the main idea behind participatory design (Bergvall-Kåreborn et al., 2014), a Scandinavian approach to information systems development that originated in the 1960s (Bansler 1989; Björgvinsson et al. 2010).

Using the concepts of place and space to retrospectively analyze the theoretical and practical implications of influence in our living lab projects has highlighted the importance of innovation methods. The result of

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

the analyses reinforces earlier research by pointing to the significance role of methods in forming spaces and places that facilitate or hinder user participation and influence. By using methods that give users the power to effectively describe their everyday context, co-create design scenarios, and evaluate physical and digital constructs, the communication between designers and users creates insights that can be transferred to the innovation space and enhance the innovation.

In the MyHealth@Age project, user influence was strived for on different levels. Following contemporary trends within innovation (such as user-driven innovation), we decided to define the participating elderly people as partners rather than users. The main reasons for this were that partners have formal decision powers and they have access to all the generated data, reports, and other forms of documentation. Defining the elderly participants as partners also affected the management and research component; it gave them a role in the writing of the research application and gave them the chance to be informed about existing environmental constraints (e.g., aim and focus of the selected call, given budget boundaries, and partnership constellations) as well as the opportunity to influence the boundaries of the project. Hence, instead of entering a predefined project space, this gave the elderly people a chance to bring their own needs and experiences into the project application and thereby become part of their private places.

Defining users as partners also had an effect on the methodology we selected: we wanted a methodology that would enable different types of partners to take charge. We therefore used the Form-IT methodology and methods such as narratives, cultural probes, and elderly driven activities. In our discussion with the elderly partners, it became clear that they did not want to participate using Internet technology: they wanted to meet in physical locations close to their homes. For them, the physical meetings became a new and positive part of their daily lives. This can be illustrated by the following statement by one of the elderly persons: "I really look forward to our project meetings. I attend many meetings that I feel I have to attend, but these meeting I really look forward to". All of these decisions created a certain space for influence, and as the project progressed, this space was transformed into the MyHealth@Age project place.

Defining users as partners was not without complications, because they represented individual private persons and not formal juridical persons or organizations. Hence, in this respect, we were not able to fully transform the space for influence that we had created in the research application into an equally influential place for all the different stakeholder groups. Thus, it is important to consider whether all relevant stakeholders have the same opportunity to influence and how to give them a space in which their voice can be heard.

Conclusion

In this article, we have addressed the call to better understand the concept and the context of living labs and the methodologies for co-creating innovation (Ballon, 2015; Westerlund & Leminen, 2014). We have proposed the concepts of places and spaces (Schultze & Boland, 2000) as conceptual tools to facilitate the organization of innovation activities within living labs.

There is a large volume of literature on place and space, spanning extensive temporal space and diverse subjects such as geography, sociology, innovation and information systems, and philosophy. As is often the case in these situations, the concepts develops as their definitions and descriptions continuously adapt to different interpretations, cultural and philosophical trends, and the kernel of different subjects and challenges they presently face. To reduce the risk of getting caught up in philosophical discussions and standpoints related to the concepts, we have taken a rather pragmatic perspective and focused on the concepts as tools for understanding present-day innovation milieus and processes, and how they are shaped. Based on this pragmatic perspective, we have studied how the concepts of place and space are integrated in design situations and how different types of places and spaces can facilitate or hinder innovation.

The concepts of place and space are integrated in design situations in many different ways and on many different levels. For example, the concepts of space and place must be considered when selecting, mixing, and using innovation methods and tools in ways that generate general and scientific knowledge of the situation in focus, while at the same time assuring that the specific needs and requirements linked to certain user groups are not lost. On a more overall level, there are similar judgements to be made in relation to the vision of integrated and networked living labs throughout Europe with the specific national and cultural characteristics inherent in ideation, development, test, and implementation activities at different sites participating in a project.

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

Revisiting the concept of openness, including the concepts of place and space, we can conclude that a person's willingness and possibility to contribute with data is highly influenced by the technology surrounding them. Currently, technologies are become increasingly ubiquitous and pervasive; they weave themselves into the fabric of our everyday spaces in ways that were not possible a few years ago. This integration with technology has an impact on how open people want to be, and can be. Sometimes, people are open and share data about themselves because they are naïve and at other times people do not know that they share data openly; thus, their personal space can be invaded due to the technical implementation in their space.

When is comes to realism, we can conclude that implementing and testing innovations in different places and spaces is of vital importance to fully understand the impact and the suitability of the innovation in its real context. This study reveals that places are important carriers of local knowledge and insights from which can be used to further the development of the innovation. In addition, real places contribute with insights that make it possible for users to include the innovation in their personal space and the landscape of technologies. How different types of places and spaces facilitate or hinder innovation is also a multifaceted question. Here, it is important to understand that different real-world contexts and places offer different spaces for innovation.

The same is also true for influence, where a place for influence can be instantiated in the different methods that are used to support user influence in living lab processes while the different methods used also support different spaces for innovation. Some methods support a narrow focus and put emphasis on, for instance, requirement engineering, whereas other methods have a broader scope and emphasize understanding of the context in which users act and use innovations. Hence, by using different methods, the users' space for innovation alters and can move from a small space, such as checking requirements, to a large space, such as influencing what innovation is to be developed through need-finding studies and co-design. Hence, by understanding the differing spaces the methods supports, living lab managers can make more informed decisions and plans for innovation activities.

To conclude, we have found that, by applying openness, realism, and influence in the different spaces of our living lab milieus, they have transformed into many different places depending on the stakeholders involved, the methods chosen, and the facilitation provided by researchers or managers. Therefore, the managers of living labs need to consciously design their physical and digital spaces and places in accordance with the purpose of the activity carried out. Further research is needed to understand how digital technologies affect innovation milieus and processes, not just in relation to digital and physical locations, but also in relation to local and global, as well as private and public, spaces and places.

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

About the Authors

Birgitta Bergvall-Kåreborn is Pro-Vice Chancellor and Professor in Information Systems at Luleå University of Technology, Sweden. Birgitta's research interests concern design-oriented research focused on participatory design in distributed and open environments; human-centric and appreciative methodologies for design and learning; value-based information systems development; the increasing overlap between stakeholder participation and labour sourcing, and its consequences for value creation and value capture. She has published over 60 articles within these areas, and she has participated in a large number of national and international research projects.

Carina Ihlström Eriksson is Associate Professor in Informatics at Halmstad University in Sweden, where she is also the manager of Halmstad Living Lab (halmstadlivinglab.se). Carina's research interests concerns digital innovation services, user and stakeholder involvement in innovation processes, living labs, value networks, and business models within the application areas of media and health innovation. She has published more than 50 articles within these areas and has managed and participated in numerous research projects. For more information, visit ihlstrom-eriksson.se.

Anna Ståhlbröst is an Associate Professor in Information Systems at Luleå University of Technology, Sweden. Her research is focused on the phenomena of living labs and open, user-driven innovation processes, with special interest in end-user needs and motivations. Anna's research is related to different application areas such as energy, domestic-IT use, and smart cities. She has participated in several international and national innovation and research projects, and she is currently involved in the IoT Lab project financed by the European Commission.

Acknowledgements

An earlier version of this paper was presented at the XXVI International Society for Professional Innovation Management (ISPIM) Conference – Shaping the Frontiers of Innovation Management, Budapest, Hungary, 14–17 June, 2015.

References

Åkesson, M., & Ihlström, C. 2006. Designing and Evaluating the Calm e-Newspaper. In *Proceedings of European Conference on Information Systems (ECIS 2006),* Göteborg, Sweden, May 12–14.

Alexander, C. 1979. *The Timeless Way of Building.* New York: Oxford University Press.

Almirall, E., Lee, M., & Wareham, J. 2012. Mapping Living Labs in the Landscape of Innovation Methodologies. *Technology Innovation Management Review,* 2(9): 12–18. http://timreview.ca/article/603

Ballon, P. 2015. Living Labs. In R. Mansell et al. (Eds.), *The International Encyclopedia of Digital Communication and Society.* New York: Wiley & Sons.

Ballon, P., Pierson, J., & Delaere, S. 2005. Open Innovation Platforms for Broadband Services: Benchmarking European Practices. In *Proceedings of the 16th European Regional Conference,* Porto, Portugal, September 4–6.

Ballon, P., & Schuurman, D. 2015. Living Labs: Concept, Tools and Cases. *info,* 17(4). http://dx.doi.org/10.1108/info-04-2015-0024

Bansler, J. 1989. Systems Development Research in Scandinavia: Three Theoretical Schools. *Scandinavian Journal of Information Systems,* 1(1): 3–20.

Bergvall-Kåreborn, B., & Ståhlbröst, A. 2009. Living Lab: An Open and Citizen-Centric Approach for Innovation. *International Journal of Innovation and Regional Development,* 1(4): 356–370. http://dx.doi.org/10.1504/IJIRD.2009.022727

Bergvall-Kåreborn, B., Ihlström Eriksson, C., Ståhlbröst, A., & Svensson, J. 2009. *A Milieu for Innovation - Defining Living Lab.* Presented at the 2nd ISPIM Innovation Symposium, New York City, New York, United States, December 6–9.

Bergvall-Kåreborn, B., Howcroft, D., & Ståhlbröst, A. 2014. Disregarding History: Contemporary IS Contexts and Participatory Design. *Communications of the Association for Information Systems,* 34(1): 1319–1332.

Bergvall-Kåreborn, B., Ihlström Eriksson, C., Melander-Wikman, A., & Ståhlbröst, A. 2015. A Model for Reflective Participatory Design – The Role of Participation, Voice and Space. In *Proceedings of the Americas Conference on Information Systems (AMCIS),* Puerto Rico, USA, August 13–15.

Björgvinsson, E., Ehn, P., & Hillgren, P. A. 2010. Participatory Design and "Democratizing Innovation". In *Proceedings of the Participatory Design Conference (PDC10),* Sydney, Australia, Nov 29–Dec 3.

Bourdiue, P. 1990. *The Logic of Practice.* Stanford, CA: Stanford University Press.

Casey, E. S. 1997. *The Fate of Place: A Philosophical History.* Berkeley, CA: University of California Press.

Chesbrough, H. W. 2006a. *Open Business Models: How to Thrive in the New Innovation Landscape.* Boston: Harvard Business School Press.

Chesbrough, H. W. 2006b. *Open Innovation – The New Imperative for Creating and Profiting from Technology.* Harvard: Harvard Business School Press.

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

Cresswell, T. 2004. *Place: A Short Introduction.* Malden, MA: Blackwell Publishing.

Dutilleul, B., Birrer, F. A. J., & Mensink, W. 2010. Unpacking European Living Labs: Analyzing Innovation's Social Dimensions. *Central European Journal of Public Policy,* 4(1): 60–85.

Ebbesson, E., & Ihlström Eriksson, C. 2013. Co-creating UGC Services with the Media Industry. In *Proceedings of HICSS'46,* Maui, Hawaii, United States, January 7–10.

Elmes, M. B., Jiusto, S., Whiteman, G., Hersh, R., & Guthey, G. T. 2012. Teaching Social Entrepreneurship and Innovation from the Perspective of Place and Place Making. *Academy of Management Learning & Education,* 11: 533–554. http://dx.doi.org/10.5465/amle.2011.0029

Eriksson, M., Niitamo, V.-P., & Kulkki, S. 2005. *State-of-the-Art in Utilizing Living Labs Approach to User-Centric ICT Innovation – A European Approach.* A Working Paper. Luleå University of Technology, Sweden. http://www.vinnova.se/upload/dokument/verksamhet/tita/stateoftheart_livinglabs_eriksson2005.pdf

Femenias, P., & Hagbert, P. 2013. The Habitation Lab: Using a Design Approach to Foster Innovation for Sustainable Living. *Technology Innovation Management Review,* 3(11): 15–21. http://timreview.ca/article/741

Friedland, R., & Boden, D. 1994. *NowHere: Space, Time and Modernity.* Berkeley: University of California Press.

Fulgencio, H., Le Fever, H., & Katzy, B. 2012. Living Lab: Innovation through Pastiche (A Research Linking Disparate and Discorded Ontology). In *Proceedings of eChallenges e-2012,* Lisbon, Portugal, October 17–19.

Følstad, A. 2008. Living Labs for Innovation and Development of Communication Technology: A Literature Review. *The Electronic Journal for Virtual Organizations and Networks,* 10: 99–131.

Gassman, O., & Enkel, E. 2004. *Towards a Theory of Open Innovation – Three Core Process Archetypes.* Paper presented at the R&D Management Conference, Lisbon, Portugal, July 6–9.

Giddens, A. 1990. *The Consequences of Modernity.* Stanford, CA: Stanford University Press.

Gieryn, T. F. 2000. A Space for Place in Sociology. *Annual Review of Sociology,* 26: 463–496. http://dx.doi.org/10.1146/annurev.soc.26.1.463

Harrison, S., & Dourish, P. 1996. Re-place-ing Space: The Roles of Place and Space in Collaborative Systems. In *Proceedings of ACM Conference Computer-Supported Cooperative Work, CSCW´96,* Boston, Massachusetts, USA, November 16–20.

Ihlström Eriksson, C., Åkesson, M., & Svensson, J. 2009. Setting up a Living Lab – A Researcher View. In *Proceedings of eChallenges e-2009,* Istanbul, Turkey, October 21–23.

Intille, S. S., Larson, K., Munguia Tapia, K., Beaudin, J. S., Kaushik, P., Nawyn, J., & Rockinson, R. 2006. Using a Live-In Laboratory for Ubiquitous Computing Research. In *Proceedings of Pervasive 2006,* Dublin, Ireland, May 7–10.

Leminen, S. 2013. Coordination and Participation in Living Lab Networks. *Technology Innovation Management Review,* 3(11): 5–14. http://timreview.ca/article/740

Leminen, S., & Westerlund, M. 2009. *From Innovation Networks to Open Innovation Communities: Co-Creating Value with Customers and Users.* Paper presented at the 25th IMP Conference, Marseilles, France, September 3–5.

Leminen, S., Westerlund, M., & Nyström A.-G. 2012. Living Labs as Open Innovation Networks. *Technology Innovation Management Review,* 2(9): 6–11. http://timreview.ca/article/602

Lievens, B., Schaffers, H., Turkama, P., Ståhlbröst, A., & Ballon, P. 2011. Cross Border Living Labs Network to Support SMEs Accessing New Markets. In *Proceedings of eChallenges e-2011,* Florence, Italy, October 26–28.

Massey, D. 1994. *Space, Place and Gender.* Minneapolis, MN: University of Minnesota Press.

McNamee, S., & Hosking, D. M. 2012. *Research and Social Change: A Relational Constructionist Approach.* New York, NY: Routledge.

Mingers, J. 2001. Combining IS Research Methods: Towards a Pluralist Methodology. *Information Systems Research,* 12(3): 240–259. http://dx.doi.org/10.1287/isre.12.3.240.9709

Pred, A. 1984. Place as Historically Contingent Process: Structuration and the Time-Geography of Becoming Places. *Annuals of the Association of American Geographers,* 74(2): 279–297. http://dx.doi.org/10.1111/j.1467-8306.1984.tb01453.x

Runardotter, M., & Holst, M. 2014. Views on Energy Efficiency: Findings from the CASSANDRA Project. In *Proceedings of 20th International ICE Conference on Engineering, Technology and Innovation (ICE 2014),* Bergamo, Italy, June 23–25.

Sack, R. D. 1993. The Power of Place and Space. *American Geographical Society of New York,* 83(3): 326–329. http://dx.doi.org/10.2307/215735

Schultze, U., & Boland, R. J. 2000. Place, Space, and Knowledge Work: A Study of Outsourced Computer Systems Administrators. *Accounting, Management and Information Technologies,* 10(3): 187–219. http://dx.doi.org/10.1016/S0959-8022(00)00006-0

Schuurman, D., De Marez, L., & Ballon, P. 2013. Open Innovation Processes in Living Lab Innovation Systems: Insights from the LeYLab. *Technology Innovation Management Review,* 3(11): 28–36. http://timreview.ca/article/743

Shuurman, D., Lievens, B., De Marez, L., & Ballon, P. 2012. Towards Optimal User Involvement in Innovation Processes: A Panel-Centered Living Lab Approach. In *Proceedings of PICMET '12,* Vancouver, BC, July 29–Aug 2.

Shapiro, S. 1998. Places and Spaces: The Historical Interaction of Technology, Home, and Privacy. *The Information Society,* 14(4): 275–284.

Ståhlbröst, A. 2008. *Forming Future IT: The Living Lab Way of User Involvement.* Doctoral Thesis, Luleå University of Technology, Department of Business Administration and Social Sciences, Division of Informatics.

Ståhlbröst, A., Angelopoulos, C. M., Evangelatos, O., Krco, S., Nikoletseas, S., Raptis, T., & Ziegler, S. 2015. *Understanding Modes of Crowdsourcing and Related Crowd Motivators.* Paper Presented at the XXVI ISPIM conference, Budapest, Hungary, June 14–17.

Places and Spaces within Living Labs

Birgitta Bergvall-Kåreborn, Carina Ihlström Eriksson, and Anna Ståhlbröst

Ståhlbröst, A., & Bergvall-Kåreborn. B. 2008. FormIT – An Approach to User Involvement. In J. Schumacher and V.P Niitamo (Eds.), *European Living Labs – A New Approach for Human-Centric Regional Innovation:* 63–76. Berlin: Wissenschaftlicher Verlag Berlin.

Ståhlbröst, A., & Bergvall-Kåreborn, B. 2011. Exploring Users Motivation in Innovation Communities. *International Journal of Entrepreneurship and Innovation Management,* 14(4): 298–314. http://dx.doi.org/10.1504/IJEIM.2011.043051

Ståhlbröst, A., & Bergvall-Kåreborn, B. 2013. Voluntary Contributors in Open Innovation Processes. In J. Eriksson Lundström, M. Wiberg, S. Hrastinski, S., M. Edenius, & P. Ågerfalk (Eds.), *Managing Open Innovation Technologies:* 133–149. Heidelberg: Springer.

Ståhlbröst, A., Bergvall-Kåreborn, B., & Ihlström Eriksson, C. 2015. *Stakeholders in Smart City Living Lab Processes.* American Conference on Information Systems (AMCIS), Puerto Rico, USA, August 13–15.

Ståhlbröst, A., Bertoni, M., Følstad, A., Ebbesson, E., & Lund, J. 2013. Social Media for User Innovation in Living Labs: A Framework to Support User Recruitment and Commitment. In *Proceedings of the XXIV ISPIM Conference,* Helsinki, Finland, June 16–19.

Ståhlbröst, A., & Holst, M. 2006. Appreciating Needs for Innovative IT Design. *International Journal of Knowledge, Culture and Change Management,* 6(4): 37–46.

Svensson, J., & Ihlström Eriksson, C. 2012. Exploring Social Aspects Influence on Change in Network Relationships – a Case Study of Digital Innovation. *International Journal of Social and Organizational Dynamics in IT,* 2(4): 14–33. http://dx.doi.org/10.4018/ijsodit.2012100102

Svensson, J., Ihlström, C., & Ebbesson, E. 2010. User Contribution in Innovation Processes – Reflections from a Living Lab Perspective. In *Proceedings of HICSS'43,* Kauai, Hawaii, January 5–8.

Westerlund, M., & Leminen, S. 2011. Managing the Challenges of Becoming an Open Innovation Company: Experiences from Living Labs. *Technology Innovation Management Review,* 1(1): 19–25. http://timreview.ca/article/489

Wildevuur, S., Van Dijk, D., Hammer-Jakobsen, T., Bjerre, M., Äyväri, A., & Lund, J. 2013. *Connect: Design for an Empathic Society.* Amsterdam: BIS Publishers.

Citation: Bergvall-Kåreborn, B., Ihlström Eriksson, C., & Ståhlbröst, A. 2015. Places and Spaces within Living Labs. *Technology Innovation Management Review,* 5(12): 37–47. http://timreview.ca/article/951

Keywords: living lab, space, place, openness, realism, influence

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison of Living Lab Concepts in Urban Research

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

> *"My greatest challenge has been to change the mindset of people. Mindsets play strange tricks on us. We see things the way our minds have instructed our eyes to see."*
>
> Muhammad Yunus
> Social entrepreneur and Nobel Laureate

Innovation development is key to transforming a product-based economy into an innovative service economy by integrating users as co-creators in real-life environments. User co-creation and user involvement are key elements in living labs. Urban living labs add not only the urban component to the conceptual design, but also societal, political, and technological questions. Fields of analysis in urban research relate to socio-spatial environment, living together, and urban policies. The leading question of this article is: to what extent can urban living labs be used as an instrument to support these fields of investigation? Comparing three different approaches for urban living labs, ranging from socially-centred to more technology-centred, we offer a more nuanced understanding of urban living lab design in diverging research contexts. All three case studies manage to go beyond testing and improving new products, which is normally the aim of existing living labs, by embedding innovation in appropriate social, structural, and institutional frameworks, and targeting civil society involvement. The community benefits from this case study comparison because it contextualizes living labs as research methodology to be applied in future urban research projects.

Introduction

Living labs have become an established tool for testing and developing new products or services with users in real-life environments (see Leminen et al., 2012; Veeckman et al., 2013). They were also introduced into urban research agendas by the Finnish European Union Presidency in 2006. Since then, research programmes have been using living labs as a methodological tool to connect research to public and private stakeholders with citizens in order to co-create and co-design products and services to improve the quality of life in cities (Edwards-Schachter et al., 2012; Pascu & Van Lieshout, 2009). Although projects and approaches to urban living labs differ widely, the benefits lie in user integration and the use of results to develop need-based products and services that can be implemented into the living environments of citizens. As Schuurman (2015) points out, the key components of living labs are user involvement and user co-creation. Contrary to the predominately technology-centred living lab concepts, urban living labs add not only the urban component to the conceptual design, but also a range of topics including societal, political, and technological questions. As a result, a more nuanced understanding of living lab design in diverging research contexts is necessary to provide adequate frameworks in diverging fields of research.

This article extends the existing knowledge on living lab approaches by considering living labs as a tool to create a contextualized methodology within urban research. We introduce and use a typology to compare three different types and concepts of urban living labs from ongoing research projects by descriptive dimensions

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

operating at different levels. This qualitative case study comparison offers new and context-dependent insights into urban living lab approaches and the complexity of the term. Based on the research questions and disciplines of selected case studies, the objective of this article is to further contextualize them as a tool within research methodology. Finally, this article reflects on the question of how cities can trigger social innovation and redistribute and share the outcomes of successful co-creation in the wider urban society.

Background

The living lab concept originally emerged almost ten years ago during the European repositioning aimed at (again) becoming a competitive, innovation-based economy (Pascu & Van Lieshout, 2009). According to the European Commission, four "P's" became the focus of collaboration: public–private–people–partnership (Schuurman, 2015). The starting point for living lab approaches is rooted in product-testing and has developed through the implementation of popular showcases at the Massachusetts Institute of Technology (MIT) in Boston or with the Urban Labs at the University of Chicago (Markopoulos & Rauterberg, 2000; Schumacher & Feurstein, 2007). The Philips Homelab or Fraunhofer InHaus are European examples, largely focusing on product-based technology laboratories (Schuurman, 2015), whereas examples from universities have the advantage of involving university staff and students as both active researchers and testers (Franz, 2015).

For a comprehensive literature overview on mostly technological living lab publications, see Følstad (2008) or Schuurman (2015). Both authors demonstrate the evolution of the living lab debate from a technologically-centred approach that focuses on innovation research. Emphasis lies in the innovation-based economy, where co-creation processes with users are implemented in real-life test environments (Pascu & Van Lieshout, 2009; Mulder, 2012; Schumacher & Feurstein, 2007). As Franz (2015) points out, "innovation" mainly refers to open innovation processes, including testing and validating a reactive integration of citizens, and developing and co-creating processes for an active integration of citizens (Pascu & Van Lieshout, 2009). Although the starting point of co-creation can be traced back to precise scopes in architecture or participatory design projects (see Sanders & Stappers, 2008), the definition of co-creation became fuzzy over time (see Schuurman, 2015; Winthereik et al., 2009; Ståhlbröst & Bergvall-Kåreborn, 2008; Veeckman, 2013). Reasons can be found in diverging outcomes that largely depend on the general methodological setup or actors and their diverging role of interest in being involved (see Juujärvi & Pesso, 2013). In this article, we take co-creation to mean a collaborative new outcome between two or more groups of actors that include residents as a prerequisite. Co-creation is based on an explorative environment. Therefore, it is not possible to foresee whether a phase of co-creation can be achieved, as shown by many projects in urban research. Instead, we argue that living labs can be designed as an accompaniment to co-creation.

Existing literature suggests many definitions or approaches for living labs, and there are different cases in different countries. However, they mostly do not contextualize the methodology by taking into consideration discipline and research question and, hence, actors and adequate methods. This article offers an overview of innovation hubs and living labs currently being put into practice as part of Austrian urban research projects. The examples range from socially-centred to more technology-centred approaches, addressing how and why civil society actors should be involved in these approaches. We focus on the comparison of three approaches, all of which investigate the potential of civil society involvement, taking into account its social, political, economic, and cultural heterogeneity. The first case deals with the involvement of residents in an impact analysis of local integration policies, whereas the second case implements and evaluates pervasive citizen participation. Both did not include co-creation as a mandatory element in the research design. The most advanced approach to co-creation can be found in the third case, which involves co-creators for urban mobility solutions, combining social and economic (technological) innovation. All three cases share the requirement to design context-depending living lab approaches. This need results in the main research question for this article, asking: What types and concepts have to be considered to design contextualized living lab approaches dealing with co-creation in the framework of urban research?

Research Methodology

Research project partners are often faced with a lack of continuity when it comes to the further development of research questions based on their findings after a project ends. The key question is how to foster innovation with more than a project-oriented approach, i.e. going “beyond projects” by cooperating in a living lab, building sustainable structures for cooperation with a long-

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

term perspective, and building confidence between all the involved stakeholders, which are essential for translating research results into action. We explore how this "going beyond" can be achieved by applying the living lab methodology. In order to both make our three cases studies comparable and provide a framework for future analysis, we developed a typology based on central factors of the living labs. Due to their complexity and the various contexts in which living labs can be applied, we argue that a case study analysis is the most appropriate method to provide a better understanding of living labs as a tool within research methodology. The unit of analysis here are the individual research projects. Data is gained through project documents as well as qualitative interviews with the project leaders and field notes by researchers participating in the selected living labs. The dimensions of the typology result from an iterative analysis process using document and content analyses. Table 1 summarizes the dimensions used in the typology.

As detailed in the previous section, the aims of technology and social-centered living labs differ widely, while the initial idea of co-creation persists (Franz, 2014). These aspects concern more the long-term objectives in a living methodology, but there are also short-term goals. Although they might be linked in some cases, both are relevant because they can greatly influence the methodology and course of a living lab. These differences in the aims of a living lab are the first dimension in our typology.

Stakeholders involved in living labs can be companies, non-profit organizations, special interest groups, universities, and municipalities. They all have their own motivations and agendas for becoming involved. Their level of involvement and motivation is also closely linked to the point at which they enter the living lab or project. Some stakeholders needed for the successful execution of the project (e.g., municipalities as official or legal entities) are relatively passive during the living lab, whereas other stakeholders take on an active role and pursue their own goals. This symbiotic coexistence allows the latter to be considered partners of researchers in the living lab.

With the emergence of socially-oriented approaches, the role of stakeholders and participants has shifted from an indirect to a direct factor in co-creation processes. In that context, the question arises of how co-creation is understood. Some scholars argue that co-creation has to have a novel outcome (e.g., a service or process), and it remains uncertain which stakeholders need to be involved – and to what extent – to enable that co-creation. Based on these considerations, the type and level of involvement by stakeholders form another dimension in our typology for comparing living lab models.

Technology-centred living labs are not typically designed to gain external approval; instead, they aim for efficiency. However, when embedded in a research context, the insights resulting from living labs need to be

Table 1. Typology used to compare selected living labs

Dimension	Levels	Description
Objective	• Short-term • Long-term	What are the project's objectives during the living lab?
Stakeholders	• Interest & motivation • Aims	Which stakeholders are involved and what is their motivation to take part?
Involvement	• Stakeholders • Citizens	How is co-creation understood?
Transferability	—	To what extent can the results be generalized?

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

transferable. No one living lab is the same, nor are the cities in which they take place. Each lab has different living environments and different settings to be considered as contextual factors. Although the goal of a living lab is to make use of real-life complexities (Schuhmacher & Feurstein, nd.), the transferability of the results needs to be ensured in order to be of value to the broader research community.

Given these dimensions and their various characteristics, it becomes apparent that there cannot be a "one size fits all" living lab concept, applied to every setting. Although living labs may be alike in one dimension, the projects in which they are carried out could have very diverse objectives and approaches. As a result, there is a clear need for contextualization.

Case Studies: Living Labs in Practice

In this section, a description of three research projects within the fields of urban research is offered. These portraits serve to provide concrete examples for different urban living lab concepts considering the context of wider framework conditions located in cities. Special attention is paid to the identified classifiers (see Table 1).

Interethnic Coexistence in European Cities (ICEC)
Within the JPI Urban Europe programme, the ICEC project focuses on interethnic coexistence in Amsterdam, Stockholm and Vienna. The main aim lies in the identification of effects on neighbourhood identity and co-responsibility through participation in local integration policies. These might include bottom-up initiatives or top-down policy measures, for instance, free preschool. Due to a lack of existing living lab concepts that focus on socio-spatial research questions, ICEC designed a socially-centred approach to implementing living labs by applying the concept of a “space of encounter”. This means that the researcher accesses places where local residents already meet and interact with each other, for instance, community centres or public spaces. The “space of encounter” depends on the local conditions in each city, such as access to migrant groups and collaboration with local stakeholders that serve as "door-openers" to residents (Franz, 2015). As for the objectives, the ICEC urban living lab aims to gain knowledge at two levels: i) in methodological design as a short-term objective and ii) in policy analysis as a long-term objective, given that these results have the capacity to be considered and developed by politicians and the public sector after the project ends. As for the level of involvement, the ICEC urban living lab as a space of encounter is able to collaborate with stakeholders and engage with affected residents over a longer period, based on trust-building activities. As a result, openness to informal conversations and formalized semi-structured interviews with ethnically diverse residents seems likely compared to similar research designs that do not allow the long-term interaction between researchers and (non-)participants. This outcome is different to technologically-centred approaches that may also apply user-centric approaches in the users’ social environment. However, the ICEC urban living lab clearly benefits from its localized character, ranging in form from a community room to a marketplace or neighbourhood garden. The methodological design did not include co-creation as a mandatory element. However, it allows the co-creation of more needs-based policies between researchers, local residents, and local stakeholders as a collaborative initiative beyond the initial project duration.

As a result, contextualization of the ICEC living lab refers to a spatial component, the space of encounter, as well as to a defined set of actors that require practice-based methods such as participatory observation resulting in qualitative interviews. As for interim results in the ICEC project, the analysis has identified a tendency across all social groups towards a low interdependency between participation in local activities and neighbourhood identity. With regard to co-creation, the ICEC living lab is recognizing a beneficial outcome of long-term interaction between local residents, stakeholders, and researchers. Over time, the understanding of local needs and adjusted policies has become more detailed and is currently being transferred into co-created measures supported by co-responsible residents, local (public) stakeholders, and the research institution.

Building Pervasive Participation (b-Part)
b-Part is another project embedded in the JPI Urban Europe funding stream. Its living lab is currently being implemented in the city of Turku, Finland, over a period of five months. In close cooperation with local authorities, the project explores the requirements, opportunities, and impacts of implementing pervasive citizen participation concepts in urban governance. In this context, a purpose-built mobile application serves as a vehicle for the research. Together with in-depth interviews with users, its data will serve to answer the project’s research questions. The development of the prototype followed an iterative user-centred design process.

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

Gathering quantitative as well as qualitative data is essential for the project's success, making the short-term goal recruiting enough users for the platform and encourage sustainable participation. The evaluation and iterative improvement of the prototype form both the short and long-term goals of the b-Part living lab. Viewed from the technology approach for living labs, the mobile prototype is the product to be evaluated in an actual living environment and improved through resident-driven development.

The consortium of the b-Part project brings together three different research disciplines, which approach the research questions from various perspectives: human–computer interaction and research regarding social and political aspects. Through the involvement of these diverse disciplines, the approach used in the b-Part living lab can be considered both technology and efficiency-centred, as well as a socially-centred.

Encouraging civic involvement is difficult for a variety of reasons, some of which are connected to trust. In order to show people that their input is valued, city officials have been involved in the project from early on. With them responding to input and also implementing suggestions, we hope to increase the public trust in authorities for both sustainable participation and future partnerships between these two stakeholders.

Rooted in the basic principles of democracy, the motivation of the municipality to be an active part in the b-Part living lab can be explained by the necessity of citizens' involvement. By being actively involved, urban planners hope to get valuable feedback on existing ideas, but also novel suggestions from citizens. For both the overarching goal is to improve communication between citizens and governance.

The involvement of both citizens and governance is central to the b-Part living lab. By actively using the mobile application and providing feedback, both stakeholders are contributing to the co-creation process, which helps identify the requirements for civic engagement tools. While city officials are also partners on an operational level (i.e. by co-organising structures for the living lab), both stakeholders are not only users of a product (i.e. the prototype), but also directly (city officials and urban planners) and indirectly shaping (citizens) concepts for enhanced participation.

Urban Mobility Labs (UML) – Research environments for future mobility

The transport system is largely shaped and determined by users. A precondition for innovation in urban mobility is therefore socio-economic and exploratory research and the creation of socially innovative nodes and quarters. On the supply side, future mobility is no longer a carrier-only topic; numerous different industry sectors are involved, new players need new business and cooperation models, and public authorities need new models to achieve the transport policy goals. Urban mobility living labs show great potential in tackling the challenge of how future urban mobility can be organized, with the user at the centre. Starting at the beginning of 2015, eight project consortia throughout Austria began developing feasibility studies for living labs on specific topics, ranging from C-ITS (cooperative systems), influencing mobility behaviour, and the sharing economy, to cognitive and digital mapping. The objective is to overcome the pure technological focus through the cooperation of different actors and the involvement of citizens as co-creators, defining organizational structures and new alliances across the entire innovation chain. A prerequisite for breaking down institutional boundaries towards cross-solutions and close coordination is a long-term living lab framework enabling cooperation beyond single projects, with a planning perspective of four to seven years, not only to enable the incorporation of the findings made in the living lab into further research, but also into the implementation of solutions and future strategies. All of the feasibility studies will involve different kinds of actors to get them on board for the implementation of the living labs, though it differs depending on the specific topic:

- Cities benefit from involvement in projects at a very early stage by customized social and technological innovation, and they gain more value from strategic investments.
- Industry gains access to test users and data and can take into account the needs of cities and users at an early stage, developing new business models in cooperation with the partners of the living lab.
- Researchers/academics gain access to test users and test data, can demonstrate and test in real-life conditions, and can pursue long-term research with the partners in the living lab.
- Citizens change from consumers to valuable co-creators, not only for new services and products, but also for coordination processes as local experts for their mobility needs in the city.

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

Urban mobility labs are based on a common approach, but will differ in the specific organizational arrangements and methods of involving citizens. While appreciating that the labs will not offer a "one size fits all" solution, findings and insight concerning user involvement and the creation of cooperation structures will be transferable to other cities with similar challenges. Special attention is given to the redefinition of the public authorities' role: to reach transport policy goals, it is essential that they be a strong partner in the implementation rather than just the funder. This approach needs an appropriate mix of interventions along the whole innovation chain. Conclusions on an appropriate living lab structure for cooperation and testing in real-life environments deliver better feedback on the impact of funded projects aiming at establishing an innovation climate and reaching national and European goals for innovation in specific sectors. The implementation of two to three labs will be funded in 2016/2017.

Conclusion

The comparison of the three projects shows the scope of divergent approaches for urban living labs, covering such diverse questions as integration, participation, and mobility. This article contributes to a more nuanced understanding of "co-creation" that can be considered both a mandatory or a co-evolving element within living lab designs. Accompanying that, we emphasize the ability for long-term interaction between public and private actors, including citizens and researchers, as a core benefit in living labs, allowing co-creation beyond the initial research project.

As for the main research question on the creation of contextualized living lab approaches that allow co-creation in urban research, the comparative case study analysis in this article shows the dominant influence of the core interest of research. The research question is the main driver when it comes to selecting the actors involved in the process and determining their motivations, interests, and needs. The crucial element for contextualization is then to decide on the spatial setup of the actual living lab as well as to select more practice-based and engaging methods. Living labs have the capacity to support co-creation within urban research as long as openness to changes can be provided in the long term. In this respect, all three cases show a deficit in a truly co-created methodology, because the design, space, and actors involved in the living lab were chosen by the project teams. Co-created outcomes are expected to be achieved as long as interaction between researchers and living lab participants can be ensured. However, as long as the co-creation process is dependent on the duration of a research project, collaboration will be constrained to a set timeframe.

Moving beyond co-created outcomes – such as social innovation – requires a long-term commitment to the living lab remaining in place and to allowing enhanced collaboration between residents, public and private stakeholders, as well as researchers. In that respect, we conclude with a critical statement to not overestimate the potential of co-creation and social innovation while underestimating contextualizing factors such as space and time in living lab designs.

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

About the Authors

Yvonne Franz is a post-doctoral researcher at the Institute for Urban and Regional Research within the Austrian Academy of Sciences. She studied Economics and Geography at the Ludwig-Maximilians-Universität in Munich, the University of Cologne, and the University of Vienna, and she received her PhD on gentrification processes in New York City, Berlin, and Vienna in 2013. She is now involved in two JPI Urban Europe projects dealing with gentrification processes (Practices and Policies for Neighbourhood Improvement: Towards Gentrification 2.0) and interethnic coexistence (ICEC - Interethnic Coexistence in European Cities) that includes the urban living lab approach. She is a lecturer at University of Vienna and co-organizer of the Vienna Summer School in Urban Studies.

Karin Tausz is Head of Innovation & E-Mobility at AustriaTech. She received a Master's degree in economics from the University of Vienna, Austria. Her experience includes policy consulting and innovation management for urban mobility, ITS and e-mobility, addressing public authorities, and companies. She was previously research coordinator at the Mobility Department of the applied science organisation AIT. She has been active for over 20 years in regional and urban development as a project manager, evaluator, and consultant with an emphasis on public participation, transport, and governance.

Sarah-Kristin Thiel is a Project Manager at the Telecommunications Research Centre Wien and is pursuing a PhD from the University of Salzburg. In her thesis, she investigates the influence of game-inspired elements in civic engagement platforms. She received a Master's degree in Media Informatics from Ludwig-Maximilians University in Munich, Germany. During her studies, she has gained experience in the automotive industry, human–machine interaction, and mobile development. Her research interests include (mobile) human–computer interaction, interaction design, and technology in society.

Acknowledgements

An earlier version of this paper was presented at the XXVI International Society for Professional Innovation Management (ISPIM) Conference – Shaping the Frontiers of Innovation Management, Budapest, Hungary, 14–17 June, 2015.

References

Allen, S., Bailetti, T., & Tanev, S. 2009. Components of Co-creation. *Open Source Business Resource,* November 2009: 11–18. http://timreview.ca/article/301

Almirall, E., & Wareham, J. 2011. Living Labs: Arbiters of Mid- and Ground-Level Innovation. *Technology Analysis & Strategic Management,* 23(1): 87–102.

Bergvall-Kåreborn, B., & Ståhlbröst, A. 2009. Living Lab: An Open and Citizen-Centric Approach for Innovation. *International Journal of Innovation and Regional Development,* 1(4): 356–370. http://dx.doi.org/10.1504/IJIRD.2009.022727

Edwards-Schachter, M. E., Matti, C. E., & Alcántara, E. 2012. Fostering Quality of Life through Social Innovation: A Living Lab Methodology Study Case. *Review of Policy Research,* 29(6): 672–692. http://dx.doi.org/10.1111/j.1541-1338.2012.00588.x

Følstad, A. 2008. Towards a Living Lab for the Development of Online Community Services. *The Electronic Journal for Virtual Organizations and Networks,* 10: 47–58.

Følstad, A. 2008. Living Labs for Innovation and Development of Information and Communication Technology: A Literature Review. *Electronic Journal of Virtual Organisations, 1*0: 99–131.

Franz, Y. 2014. Chances and Challenges for Social Urban Living Labs in Urban Research. In *Conference Proceedings of Open Living Lab Days 2014:* 105–114. Brussels: European Network of Living Labs (ENoLL).

Franz, Y. 2015. Designing Social Living Labs in Urban Research. *info,* 17(4): 53–66. http://dx.doi.org/10.1108/info-01-2015-0008

Juujärvi, S., & Pesso, K. 2013. Actor Roles in an Urban Living Lab: What Can We Learn from Suurpelto, Finland? *Technology Innovation Management Review,* 3(11): 22–27. http://timreview.ca/article/742

Leminen, S., Westerlund, M., & Nyström, A.- G. 2012. Living Labs as Open-Innovation Networks. *Technology Innovation Management Review,* 2(9): 6–11. http://timreview.ca/article/602

Markopoulos, P., & Rauterberg, G. W. M. 2000. Living Lab: A White Paper. In *IPO Annual Progress Report,* 35: 53–65.

Mulder, I. 2012. Living Labbing the Rotterdam Way: Co-Creation as an Enabler for Urban Innovation. *Technology Innovation Management Review,* 2(9): 39–43. http://timreview.ca/article/607

Pascu, C. & Van Lieshout, M. 2009. User-Led, Citizen Innovation at the Interface of Services. *info,* 11(6): 82–96. http://dx.doi.org/10.1108/14636690910996731

Sanders, E. B.-N., & Stappers, P. J. 2008. Co-Creation and the New Landscapes of Design. *CoDesign,* 4(1): 5–18.

Schumacher, J., & Feurstein, K. 2007. *Living Labs – The User as Co-Creator. Results from Corelabs: Co-Creative Living Labs.* 13th International Conference on Concurrent Enterprising (ICE). Sophia Antipolis, France.

Schuurman, D. 2015. *Bridging the Gap between Open and User Innovation? Exploring the Value of Living Labs as a Means to Structure User Contribution and Manage Distributed Innovation.* Dissertation at Ghent University and Vrije Universiteit Brussel VUB.

Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison

Yvonne Franz, Karin Tausz, and Sarah-Kristin Thiel

Tanev, S., Knudsen, M. P., Bisgaard, T., & Thomsen, M. S. 2011. Innovation Policy Development and the Emergence of New Innovation Paradigms. *Technology Innovation Management Review,* 1(2): 14–19. http://timreview.ca/article/496

Veeckman, C., Schuurman, D., Leminen, S., & Westerlund, M. 2013. Linking Living Lab Characteristics and Their Outcomes: Towards a Conceptual Framework. *Technology Innovation Management Review,* 3(12): 6–15. http://timreview.ca/article/748

Citation: Franz, Y., Tausz, K., & Thiel, S.-K. 2015. Contextuality and Co-Creation Matter: A Qualitative Case Study Comparison of Living Labs Concepts in Urban Research. *Technology Innovation Management Review*, 5(12): 48–55. http://timreview.ca/article/952

Keywords: urban living labs, co-creation, participation, social innovation, innovation ecosystem

TIM Lecture Series
When Are Software Systems Safe Enough?

Chris Hobbs

> *"We have an ethical duty to come out of our mathematical sandboxes and take more social responsibility for the systems we build – even if this means career threatening conflict with a powerful boss. Knowledge is the traditional currency of engineering, but we must also deal in belief. The techniques of persuasion must become part of the engineering toolbox. If the safety integrity of a system is compromised by a bad management decision, it is our duty to speak truth to power and change belief systems. The alternative is to risk enduring regret for the shortened lives of the people who put their faith in our skills."*
>
> Les Chambers
> Systems engineer and author

Overview

The TIM Lecture Series is hosted by the Technology Innovation Management (TIM; timprogram.ca) program at Carleton University in Ottawa, Canada. The lectures provide a forum to promote the transfer of knowledge between university research to technology company executives and entrepreneurs as well as research and development personnel. Readers are encouraged to share related insights or provide feedback on the presentation or the TIM Lecture Series, including recommendations of future speakers.

The seventh TIM lecture of 2015 was held at Carleton University on October 29th and was presented by Chris Hobbs, a Software Safety Consultant at QNX Software Systems (qnx.com). The lecture covered the changing nature of safety-critical software over the last 20 years, including a brief discussion of the standards that are directing development in the medical, industrial, and automotive fields. Hobbs also demonstrated some of the tools recommended in the safety standards and which are used during design verification.

Summary

By an enormous margin, most of the computers active today are embedded into devices and are invisible to users. Increasingly these embedded devices are being deployed in applications where injury to human life or the environment can occur if a failure occurs. Examples include embedded systems in cars, aircraft, nuclear power station controllers, railway signals, railway braking systems, and medical devices.

In this TIM Lecture, Chris Hobbs described his recent work with railway signalling systems, robots performing hip surgery, industrial robots working alongside humans, medical analyzers, undersea drill-heads, and autonomous and semi-autonomous cars. The development of these types of system places great stress on the validation and verification not only of the product, but, more importantly, its architecture and design.

Hobbs cautioned that, "A system cannot be safe. It is a matter of whether it is safe enough." And, determining whether a system is "safe enough" requires an understanding of both risk and safety, and the context in which a particular system will be used. The International Organization for Standardization (ISO, 2011) defines risk as a "combination of the probability of occurrence of harm and the severity of harm", whereas unreasonable risk is "risk judged to be unacceptable in a certain context". In contrast, safety is described as the "absence of unreasonable risk according to valid societal moral concepts".

So, how can we test whether a particular system is safe enough? The International Software Testing Standard–ISO/IEC/IEEE 29119 (2013) – states that, due to the complexity of systems and software, it is impossible to test a system exhaustively; testing becomes a sampling activity. Even dynamic testing is "not sufficient to provide reasonable assurance that software will perform as intended".

In part, the goal of software testing is to assess the availability and reliability of a system. Availability asks, "Does the system give an answer?", whereas reliability

TIM Lecture Series – When Are Software Systems Safe Enough?

Chris Hobbs

asks, "Is the answer correct?" Although both of these aspects are important, depending on the system and its functional context, either availability or reliability might be more important for safety. For example, it is safer for some systems to determine that, if a reliable answer cannot be given, then no answer should be given. However, in other contexts, even some degree of unreliable information may be safer than no information at all. Unfortunately, when it comes to testing, there are many more techniques for assessing availability than reliability. Developers must carefully consider this balance and determine which aspect is more important for the safety of their system – and make design decisions accordingly.

Given that we cannot design completely safe systems, we must somehow decide what is safe enough. Hobbs described three methods commonly used to assess risk and decide whether a given system is safe enough:

1. *As low as reasonably practical (ALARP):* society determines what levels of risk are unacceptable and broadly acceptable, and in between there is an area where financial decisions (often based on the value of a human life) will influence risk-mitigation efforts.

2. *Globalement au moins aussi bon (GAMAB):* a new system must offer a global level of risk no worse than that offered by an existing equivalent system.

3. *Minimum endogenous mortality (MEM):* risk is assessed based on the underlying likelihood of death by accident, and new systems must not add more than a particular level of risk to that baseline amount, which is country/market-dependent.

In any case, developing a software system to an acceptable of safety does require careful attention to risk and some additional work. Hobbs estimates that development to a safety-critical standard requires only 10% additional effort above a "professional development" standard, but he notes that many companies are actually developing software to a much lower standard, which makes the additional costs associated with developing safe software seem high. For companies already used to developing commercial-grade software, developing safety-critical software does not require that much extra effort.

However, aside from the additional costs in time and development effort, there is also the certification process, which is not easy. Lloyd and Reeve (2009) reported on the certification attempts of 16 companies and found that, at the time of sampling, only 25% of those attempts that had reached an outcome resulted in successful certification: more than half of the companies failed simply by not completing the certification process.

A key element of design for safety – and one that is required by safety standards – is the development of a safety culture within development organizations. A safety culture includes aspects such as accountability for decisions related to functional safety, highest prioritization given to safety, a proactive attitude towards safety, processes that include checks and balances, deliberate allocation of required skilled resources, and fostering and valuing intellectual diversity (ISO, 2011).

Hobbs highlighted that developers are currently facing significant challenges in designing and implementing these types of systems. In the remainder of the lecture, he demonstrated development and testing tools, gave an overview of some example standards from the automobile industry and how they are structured, and he identified major areas where research is required, such as tool integration, standards and tools for security, and tools to help developers manage the competing demands for performance, availability, reliability, security, and safety.

In summary, the lecture focused on the following key messages:

• Almost all of today's computers are embedded devices.

• An increasing number of those devices are performing safety-critical roles.

• The software for those devices needs to be dependable.

• We can no longer test software to ensure that it is working properly.

• There are many problems with embedded devices: ephemeral and difficult-to-diagnose bugs, hardware susceptibility, and a lack of tools. And, these problems are getting worse.

• Security is now an integral part of safety.

• There are international standards on the development of safety-critical software.

TIM Lecture Series – When Are Software Systems Safe Enough?

Chris Hobbs

References

ISO. 2011. *ISO 26262: Road Vehicles — Functional Safety.* Geneva: International Organization for Standardization (ISO). https://www.iso.org/obp/ui/#iso:std:iso:26262:-1:ed-1:v1:en

ISO/IEC/IEEE. 2013. *The International Software Testing Standard.* Geneva: International Organization for Standardization (ISO) / International Electrotechnical Commission (IEC) / Institute of Electrical and Electronics Engineers (IEEE). http://www.softwaretestingstandard.org

Lloyd, M. H., & Reeve, P. J. 2009. *IEC 61508 and IEC 61511 Assessments – Some Lessons Learned.* Paper presented at the 4th IET International Conference on Systems Safety. London: The Institute of Engineering and Technology (IET). http://dx.doi.org/10.1049/cp.2009.1540

About the Speaker

Chris Hobbs is a Software Safety Consultant at QNX Software Systems in Ottawa, Canada. He was educated as a mathematical philosopher, but finding few jobs available for mathematical philosophers, fell enthusiastically into computer programming where he has spent the last 40 years avoiding management positions and remaining at the leading edge of software development. At QNX Software Systems, he is part of a team focussed on deploying QNX's operating system into safety-critical systems. He works on the safety certification of QNX's products and spends a lot of time with QNX's customers, helping them to design systems to meet specific safety requirements. He is the author of *Embedded Software Development for Safety-Critical Systems* and *The Largest Number Smaller Than Five.*

This report was written by Chris Hobbs and Chris McPhee.

Citation: Hobbs, C. 2015. TIM Lecture Series – When Are Software Systems Safe Enough? *Technology Innovation Management Review*, 5(12): 56–58. http://timreview.ca/article/953

Keywords: safety, risk, security, software systems, safety-critical systems, standards, testing

Author Guidelines

These guidelines should assist in the process of translating your expertise into a focused article that adds to the knowledge resources available through the *Technology Innovation Management Review*. Prior to writing an article, we recommend that you contact the Editor to discuss your article topic, the author guidelines, upcoming editorial themes, and the submission process: timreview.ca/contact

Topic

Start by asking yourself:

- Does my research or experience provide any new insights or perspectives?
- Do I often find myself having to explain this topic when I meet people as they are unaware of its relevance?
- Do I believe that I could have saved myself time, money, and frustration if someone had explained to me the issues surrounding this topic?
- Am I constantly correcting misconceptions regarding this topic?
- Am I considered to be an expert in this field? For example, do I present my research or experience at conferences?

If your answer is "yes" to any of these questions, your topic is likely of interest to readers of the TIM Review.

When writing your article, keep the following points in mind:

- Emphasize the practical application of your insights or research.
- Thoroughly examine the topic; don't leave the reader wishing for more.
- Know your central theme and stick to it.
- Demonstrate your depth of understanding for the topic, and that you have considered its benefits, possible outcomes, and applicability.
- Write in a formal, analytical style. Third-person voice is recommended; first-person voice may also be acceptable depending on the perspective of your article.

Format

1. Use an article template: .doc .odt
2. Indicate if your submission has been previously published elsewhere. This is to ensure that we don't infringe upon another publisher's copyright policy.
3. Do not send articles shorter than 1500 words or longer than 3000 words.
4. Begin with a thought-provoking quotation that matches the spirit of the article. Research the source of your quotation in order to provide proper attribution.
5. Include a 2-3 paragraph abstract that provides the key messages you will be presenting in the article.
6. Provide a 2-3 paragraph conclusion that summarizes the article's main points and leaves the reader with the most important messages.
7. Include a 75-150 word biography.
8. List the references at the end of the article.
9. If there are any texts that would be of particular interest to readers, include their full title and URL in a "Recommended Reading" section.
10. Include 5 keywords for the article's metadata to assist search engines in finding your article.
11. Include any figures at the appropriate locations in the article, but also send separate graphic files at maximum resolution available for each figure.

Issue Sponsor