
Regional IT innovation: a living lab approach

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Abstract: The paper provides an integrated view of value creation in the development of new products and services related to IT. We argue that customer and end-user integration into the development process as a whole is a key for enhanced innovation processes. Building on experiences from two regional IT innovation projects conducted with a living lab approach, we ask how this approach can help organisations utilise important resources in an open innovation system and guide universities – as driving engines in regional innovation systems – to improve their environments for research and education. Exploring the outcome from the projects and how customers are integrated into value creation processes during the course of IT design and use, we argue that innovation systems management and customer integration are important assets not only to increased efficiency and quality, but also for enhanced innovation.

Keywords: regional innovation systems; living lab approaches; customer integration.

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1 Introduction

Agile manufacturing, customer relationship management and mass customisation are strategies that have enjoyed increasing attention in the literature during the last decade (e.g., [Sahin, 2000](#); [Piller, 2003](#)). Despite different foci, these new concepts related to value creation share in common the ambition to provide ways of enabling companies to increase cost efficiency along the value chain while simultaneously increasing the company's ability to react to changing customer needs. They are approaches to innovation designed to improve and strengthen the value creation process related to the end customer.

The open innovation approach can be seen as a response to the necessity of constant innovation and the decline of the so-called closed innovation model [for a discussion, see [Chesbrough \(2003, 2006\)](#)]. Several factors have led to the erosion of the closed innovation model during the past few years. Critical sources of knowledge exist outside the research laboratories of large companies; this is a fact that has to be acknowledged and addressed by large companies as well as by small firms collaborating with large companies. In addition, as employees change job positions they also effectively take their knowledge with them, resulting in knowledge flows between competing firms. We can also see how possibilities to further develop ideas and technologies outside the firm (in the form of spin-offs or through licencing agreements) are growing rapidly. And, arguably most importantly, other actors in the value chain, for instance customers and suppliers, play increasingly important roles in today's innovation processes. Closed innovation – innovation within the firm's boundaries – is just not working anymore.

To this end growing attention has been devoted to the concept of open innovation, both in academia as well as in practice. [Chesbrough \(2003\)](#) describes how many companies have shifted from closed innovation models towards a more open way of innovating during the past few years. Open innovation is focused on how to combine internal and external ideas as well as internal and external paths to market to advance the development of new technologies.

There is a potential for universities to play a key role in open innovation processes, striking partnerships with firms seeking ideas and knowledge originating outside the firm boundaries. During the last decade universities both in Europe and in the US have struggled to be competitive in terms of research and education quality. The role of the

university in contemporary society has radically changed during the past few decades and the 'ivory tower' type of university does not exist anymore. This change has been described by Gibbons as a change towards a role more sensitive towards societal needs where university research and education cater for external societal needs (Gibbons et al., 1994). While universities are reported to struggle in making this transition, some good examples exist where innovation systems – involving research units, educational programmes, and external commercial parties – co-exist in a way that makes each innovation system component better off (Saxenian, 2006).

Living labs can be seen as new arenas for innovation (Almirall, 2008; Almirall and Wareham, 2011; Schuurman et al., 2011), responding to the opportunities identified through open innovation models but also proposing a way to move university research out in the wild (Bergvall-Kåreborn and Ståhlbröst, 2009). Originating from Professor William Mitchell at MIT Media Lab and School of Architecture and city planning, Boston, the concept of living lab has been described as “a user-centric research methodology for sensing, prototyping, validating and refining complex solutions in multiple and evolving real life contexts” [Eriksson et al., (2005), p.4]. In this paper, the living lab approach is investigated as an approach to support and implement new service-oriented value creation processes (Normann, 2001; Vargo and Lusch, 2004; Vargo et al., 2008), based on principles of open innovation (Chesbrough, 2003) in the context of academy-society collaboration projects, and, as a part of this endeavour, suggest roads to new environments for academic research and education.

We argue that an approach focusing on IT design and use in value creation processes – using and developing further the open innovation model – is the only way to go for individual firms and at the same time offers a unique opportunity to universities to develop. However, we need to move the discussion related to why we need to innovate, or what the innovation goals should be, to practical questions related to how we should go about this innovation process. The research questions for this paper is: How can a living lab approach help organisations utilise important resources in open innovation systems and guide universities – as driving engines in R&D activity systems – to become key players in open innovation systems and improve their environments for research and education?

2 Open innovation and the need for customer integration

As today's consumer markets are seemingly changing faster by the day, and modern-day consumers are more demanding than ever (Pine et al., 1995), mass customisation has emerged as a solution for addressing these new market demands (Tseng and Jiao, 2001; Piller, 2003). However, contemporary flexible manufacturing systems provide us with necessary but not sufficient conditions to offer customers variety without compromising on a firm's profitability (Forza and Salvador, 2002). To this end, recent ideas related to the 'democratisation of innovation' (von Hippel, 2001) is focusing on the interaction with the customer to obtain specific information in order to define and translate the customers' needs and desires into a product or service (Vandermerwe, 2000; von Hippel, 1998) or even more radical customer-centric solutions.

By tightly integrating the customer into value creation in this way, a firm gets access to so-called 'sticky information' (von Hippel, 1994, 1998). The aggregation of this

customer information to more precise market knowledge increases the efficiency of market research and product development activities. In addition, by building on customisation to increase switching costs for the customer, a firm builds stable relationships with its clients, allowing a better utilisation of its customer base. Thus, costs for marketing activities and customer acquisition can decrease.

Customer integration can be much more than merely access to the right information. It can be defined as a form of value creation where the consumers take part in activities and processes which used to be seen as the domain of the companies ([Wikström, 1996](#)). The customer becomes a 'co-producer' and from a producer perspective the customer is seen as tasks in a production system ([Ramirez, 1999](#)). As such, customer integration represents an important shift of paradigm. The company becomes a co-producer in the customer's own value creation process, delivering opportunities to value creation rather than values of its own. The co-producing of the organisation can only produce value as part of the customers own value creation process. If the in-sourcing of one company should be valuable to the outsourcing part company (as such, a customer to the first company), the latter has to be able to integrate this outsourced process into the own overall value creation process. Even if the first part takes the responsibility to the whole process being outsourced.

West and Gallagher (2006) define open innovation as systematically encouraging and exploring a range of internal and external sources for innovation, consciously integrating that exploration with firm capabilities and resources, and broadly exploiting those opportunities through multiple channels. In their view, firms practicing open innovation face three inherent management challenges, which are:

- 1 maximisation [including outbound licencing of intellectual property (IP), patent pooling and even giving away technology to stimulate demand for other products]
- 2 incorporation (firms need to identify relevant knowledge through scanning, recognitions, absorption and political willingness to incorporate external innovation)
- 3 motivation (firms must cultivate ways to assure continued supply of relevant external technologies and IP) [West and Gallagher, (2006), p.82].

These challenges outlined by West and Gallagher are tightly linked to the challenge of integrating social as well as technical resources in an innovation system. In a similar vein, [Hargadon and Bechky \(2006\)](#) underscore the need of integration of heterogeneous knowledge bases, and define characteristics that are required from brokers facilitating such integration:

“Because collective creativity takes place in moments when any one individual does not hold all of the necessary knowledge to construct a creative solution, the potential for a creative solution requires the domain-relevant skills of multiple participants.” [[Hargadon and Bechky, \(2006\), p.495](#)]

The need for a broker to create a collaborative culture within innovation systems is of critical importance, where the key for success lies in whether or not integration of heterogeneous innovation system components are achieved or not. Almirall (2008) discusses this as the intermediary role played by living labs as brokers, connectors and coordinators.

3 The living lab approach as a path to integration

The living lab approach is a way to organise and structure user participation in real life situations, and as such it is an approach to take care of aspects mentioned but not yet properly handled within open innovation literature [Almirall, (2008), p.37]. The ideas behind the living lab approach are to put R&D activities into real-life and make it an integral part of larger innovation processes. A living lab should ideally constitute a competitive environment with a great ability to attract a heterogeneous set of actors with a heterogeneous set of needs and deliver results of interest to all actors involved (Almirall, 2008; Almirall and Wareham, 2011). A living lab should thus be an environment that attracts organisations, researchers, students, cases, fundings, and innovations, and is efficient in delivering new knowledge and innovations relevant to the actors involved (Bergvall-Kåreborn et al., 2009). Often, living labs origins from university technology transfer organisations (Almirall, 2008). In this paper, we will further investigate how living lab approaches can support more ambitious university ventures, including how universities at large can open up to external partners and to encourage researchers to engage in real world activities.

Living lab approaches stands for a human-centric – as opposed to a technology centric – approach, trying to involve people in different stages of the innovation process (Almirall and Wareham, 2011). To this end individuals are seen as key sources of knowledge and information in R&D activities. While these individuals provide gateways to knowledge of fundamental importance to the firms both developing and using emerging technologies, this knowledge is not easily put into action/production. This makes the management and design of living labs of critical importance and thus models of integration critical for living lab management.

In living labs customer integration, or more often described as user involvement, is related to the design, development and validation of new products and services. In early living lab initiatives, for example those focusing smart/future homes, people could be involved as inhabitants in such houses, observed in their usage of new technologies in real home settings often staying in these homes for several days or weeks (Eriksson et al., 2005). These efforts echoed the Scandinavian tradition of user involvement in design processes (Ehn, 1989) but the living lab approach must be extended to include a broader innovation perspective.

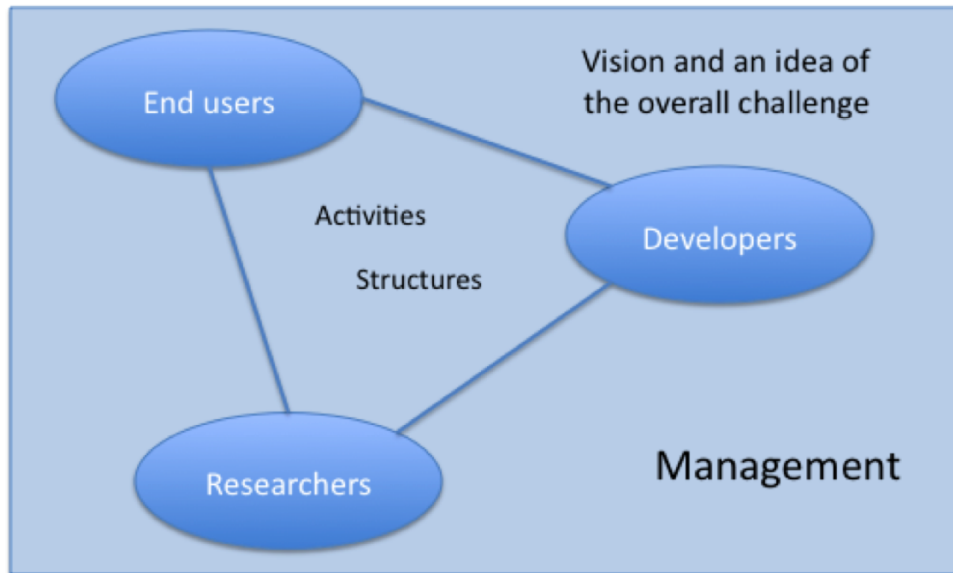
According to Bergvall-Kåreborn et al. (2009), the living lab approach is built on five key principles: openness, influence, realism, value and sustainability. Openness relates to attitudes and mindsets concerning collaboration; influence relates to the possibilities of the end-users to have their say; realism relates to the context of the activities that should be a realistic, natural real life setting; value is concerned with the necessity of the produced values to be properly shared; and sustainability relates to the responsibility to the wider community in which the living lab operates. From a university perspective the living lab approach can thus be seen as a possible approach to open up and give opportunities to influence to external partners (openness and influence), to offer real life situations to researcher and students (realism), to offer sustainable value co-creation opportunities to all kinds of living lab stakeholders (value), and to better integrate into the wider community (sustainability).

For living lab approaches to make R&D activities an integral part of larger innovation systems it is of utmost importance to understand how different stakeholders can interact

and become co-producers of each other's value creation processes, and how the overall innovation process can be managed. For this reason we have developed a model of integration (Figure 1), helping us describe and analyse innovation systems.

This model of integration includes the key parts of our model of innovation systems, and describes the integration on a systems level. It is designed in order to help in the continuous development of innovation systems characterised by strong attraction, viable commitment, and efficient production. The key challenge lies in how to mindfully design and manage the activities and structures that constitute the offerings to the systems stakeholders and enables each one of them to become co-producers in each other's value creation processes.

Figure 1 The model of integration guiding our living lab approach (see online version for colours)



According to the model, the innovation system is managed by a process management actor, focused on designing activities and structures that attract stakeholders and important resources to the system and delivers outcomes that can contribute to the value creation of each stakeholder.

The stakeholders are the actors committed to the common overall challenge and vision constituting the innovation system, typically joining forces with the other stakeholders to solve a very practical problem.

The offerings for a stakeholder joining a living lab environment lie in the services offered by the innovation system, ideally making the engagement in the system worthwhile to each stakeholder. Typical offerings can be relations to new customers, knowledge only covered by other stakeholders, etc. The offerings represent the links, and incentives, that are keeping the innovation system together, and thus provide the basis for the whole system. Openness, influence, realism and value are key offerings according to our model of integration. Typical activities in such an environment according to the model can be R&D projects, pre-studies, end-user events, workshops, need finding

activities and different kinds of product/service or market evaluations. Typical structures enabling these activities are formalised meetings, special interest groups, counselling groups, R&D clusters, etc.

The model includes three different stakeholders; the researchers, the end-users and the developers. Described from a university perspective the researcher is the natural part to start with. The researcher is a stakeholder primarily focused on the production of new knowledge, but also willing to take part in innovation processes at least when the process carries with it 'knowledge possibilities'. In an open innovation process the researcher can contribute through specific studies or by knowledge of something at hand, for example a technology or methodology relevant to the actual process. In exchange the researcher will gain a lot in terms of realism, real world cases, and information available through the cooperation with the other actors.

The developer is a stakeholder developing products or services aimed at fulfilling the end-user needs or just improving the situation of the end-user. The developer is searching for information and knowledge about the needs and opportunities important to the end-user, but also in constant search for own market and business opportunities. The developer could contribute to the other stakeholders (e.g., the whole innovation environment) with new products, services and solutions, but also with important and competent management in the innovation process as a whole. A developer is typically an organisation or firm developing and delivering products and services to end-users, sometimes with the assistance of the researchers. To the developers, the openness and opportunity to co-create value together with end-users means opportunities to integrate internal development activities with exploration and exploitation activities of potential customers.

The end-user is a stakeholder searching for better solutions to a specific need but also for knowledge that could give guidance to better ways to handle their present situation. The end-user can contribute to the other stakeholders expressions of needs, use experience, situation expertise and as end-user of the primary services produced by the innovation system. An end-user can be an individual such as a consumer or citizen, but can also be a group of people such as a workplace team or a whole organisation like a production plant producing cars. To end-users, the openness, opportunity to influence activities of developers, and to co-create values together with both researchers and developers means opportunities to add competence to their own development processes.

4 Research design – the case studies

The two cases are, from a methodological perspective, approached as action research cases. Both cases, ProcessIT Innovation and Innovation Cultures, are based on the action research paradigm, as they are aimed at establishing particular types of innovation systems. The first author has served as process manager for both projects, and the second author has served as researcher and research manager for both projects. The paper is based on their experiences to date. These experiences are building on a large number of individual projects, building primarily on qualitative data and published widely in various scholarly outlets ([Jonsson et al., 2008, 2009](#); [Westergren and Holmström, 2008](#); [Holmström et al., 2010](#)).

The research project was organised as collaborative practice research ([Mathiassen, 2002](#)) allowing the first author to engage fully in practical problem-solving as a strategic support to the management of ProcessIT and Innovation Cultures while at the same time researching their innovation approaches in collaboration with the other author ([McKay and Marshall, 2001](#)). The research started in 2004 when ProcessIT, a R&D programme focused on emerging IT solutions for process and manufacturing industries in Northern Sweden, received substantial financial support from the national agency Vinnova. Our research has focused on the innovation approach in the projects and how this has contributed to improved co-creation of value between involved stakeholders. We have been particularly interested in how the approach have influenced each project concerning collaboration and experienced value appropriation.

We decided to adopt the case study method based on a number of considerations. First, multiple data sources and theory driven data analysis are key characteristics of case study research ([Yin, 2003](#)), and we had access to very rich data about the projects. Second, the case study method has a distinct advantage in situations when ‘how’ or ‘why’ questions are being asked about events over which the investigator has little or no control ([Yin, 2003](#)). Our investigation was driven by such a question based on retrospective analysis of events that had shaped ProcessIT and Innovation Cultures. We ensured credibility by making our research project an explicit part of the ongoing innovation efforts in each project and by having project managers’ critique as relevant parts of our analysis. To facilitate transferability of results, we related our findings to current theory on living lab approaches ([Almirall, 2008](#); [Bergvall-Kåreborn et al., 2009](#)) and described the context of each project to enable judgment of the impacts of the contextual factors that shaped each project.

5 The living lab approach illustrated: two cases

To illustrate the living lab approach, and how it can contribute to the establishment of more open innovation processes, the two cases will be presented in this section. The first one, ProcessIT Innovations, is a project specifically focused on the shift of technology in process and manufacturing industry driven by emerging IT products and services. The second, Innovation Cultures, is a project focused on the shift of people’s everyday lives related to the ongoing societal digitalisation, driven by new technologies and IT-related services improving and/or deteriorating people’s everyday lives in ways that are difficult to understand and predict. As an innovation system, Innovation Cultures is also focused at guiding product and service developers, aiming at delivering as good products and services to their customers as possible.

Both cases described in this section will be described in terms of integration, and in order to do this the model of integration will be used. In addition each case will be briefly discussed in terms of innovation systems outcomes, i.e., what can be said about what has been achieved during the course of action.

5.1 ProcessIT Innovations

ProcessIT Innovations was started as an initiative from industry and universities in the northern region of Sweden, and today its activities involve plant owners from the process and manufacturing industries as end-users, IT companies as developers, and researchers

and students from the universities of Umeå and Luleå as researchers. In addition, the four coastal municipalities and the county administrative boards of Västerbotten and Norrbotten are involved, primarily though as part of the high-level management. The strength of ProcessIT Innovations' strategic concept lies in the interest and power that these players have in the innovation system, and on the long-term level this is what constitutes the integration in ProcessIT Innovations.

ProcessIT Innovations is a project oriented towards IT-based solutions, meeting the needs emerging in process and manufacturing industry. Its start was in 2004 when it was awarded 'VinnväxtVinnare', and thereby got substantial financial support over a period of ten years. The award also gave a tremendous boost to the cooperation that already was underway between the universities and process and manufacturing industry in the region, and made possible an integration of a number of new actors as well as the development of new forms of collaborations between the different actors on both short-term and long-term level.

The innovation systems integration is designed to support:

- a the continued competitiveness of plant owners demands concerning new, effective ways to measure, control, and regulate production processes such as the development of communications, infrastructure, user interfaces, and business proposals
- b the ICT companies ability to meet the demands and challenges from plant owners
- c the universities' ability to conduct world class research and strengthen the research environment through the means of leading cases and long-term finances.

The system is built to allow for the actors to engage and work together without sacrificing too much of their own main interests.

A lot could be said about the results from this project. After the first establishment year 2005, followed a very good year 2006 with accelerating activities. Many researchers, many process industries and suppliers were involved in R&D projects and on an innovation systems level the project was able to establish collaboration with industries outside the primary region, i.e., north Finland and the Örnsköldsvik area. ProcessIT Innovations also had domestic activities and on a pan-European level with several successful activities mainly focusing on embedded systems.

During the first three years about 80 R&D projects and pre-studies have been carried out, 60 companies have engaged in different activities, the yearly monetary commitment from industry have gone from 1.5 MSEK to 3.9 MSEK, the number of researchers involved in R&D projects are now more than 80, and the project turnover has radically increased from 10.1 MSEK in 2005 to 17.7 MSEK in 2007.

During the same period three new companies have been formed, five new products have been developed and put into action in process and manufacturing plants, and more than ten more promising product prototypes are on their way.

Concerning openness it was a constant increase of firms, willing and able to take part in the project. Concerning influence the project received a strong support from the process industry, to a great extent because of the project focus on process industry needs. Each group of stakeholder expressed strong appreciation of their ability to influence directions and activities of the project. Regarding realism, the university researchers expressed very positive opinions about the real world character of the activities, and related to value, there was a growing interest and comprehension in the motives and

interests of each other, followed by an increase in experienced value appropriation from each group of stakeholder.

5.2 *Innovation Cultures*

The project Innovation Cultures started in 2007 as an attempt to address the societal challenge of the digitalisation, mainly by meeting the challenge with a living lab approach. The starting point was that people today, aware of it or not, are pilots trying to understand and make purposeful use of emerging opportunities and situations related to the ongoing digitalisation, and that integrated into more structured exploration activities at universities, this continuously ongoing public exploration could be exploited as a living lab offering developers an effective environment for innovation processes. The overall challenge of the project though, was to incorporate this everyday exploring of situations and opportunities continuously made by humans into larger R&D and innovation processes.

The management of Innovation Cultures is composed of representatives from university, from media companies, from the Municipality of Umeå, and thus represents a mix of interests from research, commercialisation interests, and interests focusing on enhancing regional growth and attraction. The researchers engaged in the project come from various departments from the social sciences, the humanities and science of technology.

The developers are represented by companies and organisation from a large variety of industries and societal sectors. Schools are engaged focusing on the digitalisation of school, and churches are engaged focusing on new ways of performing their services. Media companies are engaged focusing on how ‘super local news’ and new ways of involving local readers can contribute to better media and improved cultures in the geographic areas where the news are produced. Financial institutes are engaged studying how new services can replace the use of cash.

The end-users are represented by ‘everyday people’ in common. Often though, the project works with people in small groups that are focused on a specific interest (for example mobile gaming), more innovatively engaged in exploring situations and activities that are common to people on an everyday basis.

5.3 *Reflections on early findings*

- The Innovation Cultures project has been highly attractive to lot of people and organisations, and the project management is approached by a large number of firms interested in participating in the project.
- While it is far too early to comment upon the outcomes of the comments, it seems as if the underlying model is right on track as the heterogeneous set of actors involved in each project ensure that every actor will bring something unique to the table.
- The project is primarily focusing on the explorations of opportunities that innovative individuals and groups continuously are engaged in, but the issue of how this process can be integrated into research and educational processes at universities presupposes an openness to change in the academic setting that is interesting. It remains to be seen how far this openness can be stretched but academic departments involved with

Innovation Cultures from a research perspective is currently working on integrating project activities with their educational programmes.

Just as in the case of ProcessIT, it was a constant increase of firms willing and able to take part in Innovation Cultures, and thus a strong appreciation of the project openness. The project also received an increased interest from the public and from the individuals involved in the project, to a great extent because of its focus on challenges emerging in peoples' everyday lives, and their chance of influencing the activities. The university researchers were also positive about the real world character of the project, but concerning experienced value appropriation from the stakeholders, the firms developing the identified solutions were uncertain as the path from well-developed solutions to business was complex.

While the actual settings for the projects differ significantly – IT innovations in the traditional industry versus IT innovations in everyday life settings – the similarities are more striking than the differences. Common for both projects, however, is the openness of the projects and the commitment to integrating a heterogeneous set of actors in the innovation process.

6 Discussion

This paper provides an integrated view of value creation in the development of new products and services related to IT. More specifically, we argue that customer and end-user integration into the development process as a whole is a key for enhanced innovation processes, and that the living lab approach and four of the key principles – openness, influence, realism and value – can be a guide to universities trying to open up to external partners. Building on early experiences from two projects conducted with a living lab approach, we argue that customer and end-user integration is an important asset not only to increase efficiency and quality, but also for enhanced innovation and increased collaboration. Related to [Gibbons et al. \(1994\)](#), the living lab approach applied in the two projects was supportive to the involved universities in moving towards a more sensitive role concerning societal needs. Concepts of national and regional innovation systems ([Lundvall, 1992](#); [Cooke et al., 2004](#)) are important to sum up the potentials related to innovation and value creation in the context of a heterogeneous set of actors, and also to indicate a line of development, promising to universities interested in open up to and engage in collaborations with external partners. The results from the two cases suggest that the configuration of the innovation systems has had a strong effect on the balance between exploration and exploitation, but the system's performance also depends on the speed with which potential products of these innovation systems (new products or services) diffuse. More generally, these results highlight a trade-off between maintaining the diversity necessary for obtaining high performance in the innovation system and the rapid dissemination of products. Diversity has been found to be beneficial to system performance in a variety of systems such as democratic deliberation systems ([Sunstein, 2003](#)), project systems ([Mähring et al., 2004](#)) and entrepreneurial systems ([Florida, 2002](#)). It is clear that such diversity is more profoundly stressed in the Innovation Cultures project, whereas the rapid dissemination of products and services has become a key rationale in the ProcessIT project [for a discussion, see [Holmström et al. \(2010\)](#)]. In other words, while the balance between exploration and exploitation is tilted towards

exploitation in the ProcessIT project, exploration has been underscored in the Innovation Cultures project to date. This is a reasonable situation as the Innovation Cultures project is at an early stage and thus in need for a more exploratory mode early on. While it is likely that the exploitation mode will be more emphasised it is critical to keep in mind – for both projects – that a well working project is characterised by the ability to strike a balance between exploration and exploitation.

The results from the two projects also underscore the need for innovation system management. Hargadon and Sutton (1997, 2000) focus on innovation brokering in companies. These brokering companies build up a strategy for exploiting the networked nature of the innovation process and new communities around innovative re-combinations ([Hargadon and Sutton, 1997](#)). Looking at our two projects from a brokering perspective it is safe to say the process management has taken on a very active role in both project. In ProcessIT Innovations the process management has taken on a very active role from the very start of the project, being very proactive in making researchers understand that the project is different from any project they may have been involved in before, and stressed to each actor group that the essence in the project is the co-evolution of the network of actors, and not the effect with any of the individual actors. There has been an innovation system established, where the system can be defined as “a set of processes and interactions between goals and functions, actors and institutional contexts that give rise to the functions that the system is expected to fulfill” [[Bergman et al., \(2007\), p.549](#)]. This innovation system can be described as a system of innovation where the key for success lies in the successful integration of the involved actors and the associated goals, functions, and institutions contexts.

While living labs has been described as new arenas for innovation ([Almirall, 2008](#); [Almirall and Wareham, 2011](#); [Schuurman et al., 2011](#)), little attention has been paid to the ways in which universities can play a key role in innovation networks consisting of heterogeneous actors. Our results illustrate how universities can play a key role in offering arenas for open innovation to organisations and individuals based on the living lab approach. Concerning openness the approach taken in the projects did open up university activities to external partners, and concerning influence the approach also was appreciated because of its focus on the needs and situations of potential customers and end-users. Concerning realism, it was clear that the university researchers were positive about the real world character of the activities, and concerning value, the approach seems to encourage interest and comprehension in the motives and interests of each other, followed by an increase in experienced value appropriation within each group of stakeholder. Against this backdrop our results show how the living lab approach is a promising approach not only for external parties to draw from university-based knowledge but also for universities to vitalise their research and education.

In ProcessIT Innovations, the two universities involved have been very successful in designing an innovation system attracting the identified stakeholders in the innovation system to their value creation processes. In addition, both universities have embraced the project and made the project an integral part of the research profiles at both universities. Innovation Cultures also shows promising signs regarding early reactions from researchers and the public. The broker role in the Innovation Cultures project has been an emergent feature of the project, albeit not as apparent as in ProcessIT just yet. A key for the coming year lies in making the transition from exploration to exploitation successfully, thus, addressing the needs of the actors prepared to develop and use the forthcoming innovations. This transition is arguably more difficult to make in the

Innovation Cultures project compared to the ProcessIT project as the exploratory character in research conducted by researchers from the social sciences and humanities is arguably more profound than it is in the ProcessIT project. Having said this, the greater the gap between these two modes, the greater the potential is for radical innovation. A key for achieving this is to be successful in creating an innovation system integrating the heterogeneous set of actors involved.

7 Conclusions

In this paper we asked how a living lab approach can help organisations utilise important resources in open innovation systems and guide universities – as driving engines in R&D activity systems – to become key players in open innovation systems and improve their environments for research and education. The concept of innovation systems is important to provide a better understanding for the need to integrate heterogeneous sets of actors – and their associated goals and institutionalised contexts – in the open innovation processes, especially from a university perspective.

From a managerial perspective, innovation systems managers must seek to conceptualise and implement strategy in new ways, embracing the role as a broker of the innovation systems. The brokering competence is critical for exploiting the networked nature of the innovation process (Hargadon and Sutton, 1997). The process management has taken on a very active role in both projects, embracing the broker role stressing to each actor group that the essence in the project is the co-evolution of the network of actors and not the interest of any single actor.

References

- Almirall, E. (2008) 'Living labs and open innovation: roles and applicability', *The Electronic Journal for Virtual Organizations and Networks*, Vol. 10, No. 3, pp.21–46.
- Almirall, E. and Wareham, J. (2011) 'Living labs: arbiters of mid-and ground-level innovation', *Technology Analysis & Strategic Management*, Vol. 23, No. 1, pp.87–102.
- Bergman, M., Lyytinen, K. and Mark, G. (2007) 'Boundary objects in design: an ecological view of design artifacts', *Journal of the AIS*, Vol. 8, No. 1, pp.546–568.
- Bergvall-Kåreborn, B. and Ståhlbröst, A. (2009) 'Living lab: an open and citizen-centric approach for innovation', *International Journal of Innovation and Regional Development*, Vol. 1, No. 4, pp.356–370.
- Bergvall-Kåreborn, B., Ihlström Eriksson, C., Ståhlbröst, A. and Svensson, J. (2009) 'A milieu for innovation – defining living labs', *The 2nd ISPIM Innovation Symposium – Stimulating Recovery – The Role of Innovation Management*, New York City, USA.
- Chesbrough, H.W. (2003) *Open Innovation. The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston, MA.
- Chesbrough, H.W. (2006) *Open Business Models. How to Thrive in the New Innovation Landscape*, Harvard Business School Press, Boston, MA.
- Cooke, P., Heidenreich, M. and Braczyk, H. (2004) *Regional Innovation Systems: The Role of Governance in a Globalized World*, 2nd ed., Psychology Press, Routledge, London, New York.
- Ehn, P. (1989) *Work-Oriented Design of Computer Artifacts*, Lawrence Erlbaum Associates, Hillsdale, NJ.

- Eriksson, M., Niitamo, V. and Kulki, S. (2005) 'State-of-the-art in utilizing living labs approach to user-centric ICT innovation – a European approach', Centre for Distance-Spanning Technology, Luleå University of Technology.
- Florida, R. (2002) *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*, Basic Books, New York.
- Forza, C. and Salvador, F. (2002) 'Managing for variety in the order acquisition and fulfilment process', *International Journal of Production Economics*, Vol. 76, No. 1, pp.87–98.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994) *The New Production of Knowledge*, Sage, London.
- Hargadon, A. and Bechky, B.A. (2006) 'When collections of creatives become creative collectives: a field study of problem solving at work', *Organization Science*, Vol. 17, No. 4, pp.484–500.
- Hargadon, A. and Sutton, R. (1997) 'Technology brokering and innovation in a product development firm', *Administrative Science Quarterly*, Vol. 42, No. 4, pp.716–749.
- Hargadon, A. and Sutton, R. (2000) 'Building an innovation factory', *Harvard Business Review*, Vol. 78, No. 3, pp.157–166.
- Holmström, J., Wiberg, M. and Lund, A. (Eds.) (2010) *Industrial Informatics Design Use and Innovation*, IGI Global, Hershey, PA.
- Jonsson, K., Holmström, J. and Lyytinen, K. (2009) 'Turn to the material: remote diagnostics and new forms of boundary-spanning', *Information and Organization*, Vol. 19, No. 4, pp.233–252.
- Jonsson, K., Westergren, U.H. and Holmström, J. (2008) 'Technologies for value creation: an exploration of remote diagnostics systems in the manufacturing industry', *Information Systems Journal*, Vol. 18, No. 3, pp.227–245.
- Lundvall, B. (Ed.) (1992) *National Systems of Innovation: Towards a Theorem of Innovation and Interactive Learning*, Pinter Publications, London.
- Mähring, M., Holmström, J., Keil, M. and Montealegre, R. (2004) 'Trojan actor-networks and swift translation: bringing actor-network theory to project escalation studies', *Information Technology & People*, Vol. 17, No. 2, pp.210–238.
- Mathiassen, L. (2002) 'Collaborative practice research', *Information, Technology & People*, Vol. 15, No. 4, pp.321–345.
- McKay, J. and Marshall, P. (2001) 'The dual imperatives of action research', *Information Technology & People*, Vol. 14, No. 1, pp.46–59.
- Normann, R. (2001) *Reframing Business: When the Map Changes the Landscape*, Wiley, Chichester.
- Piller, F.T. (2003) *Mass Customization*, 3rd ed., Gabler, Wiesbaden.
- Pine, B.J., Peppers, D. and Rogers, M. (1995) 'Do you want to keep your customers forever?', *Harvard Business Review*, Vol. 73, No. 2, pp.103–104.
- Ramirez, R. (1999) 'Value co-production: intellectual origins and implications for practice and research', *Strategic Management Journal*, Vol. 20, No. 1, pp.49–67.
- Sahin, F. (2000) 'Manufacturing competitiveness: different systems to achieve the same results', *Production and Inventory Management Journal*, Vol. 41, No. 1, pp.56–65.
- Saxenian, A. (2006) *The New Agronauts: Regional Advantages in a Global Economy*, Harvard University Press, Boston.
- Schuurman, D., De Moor, K., De Marez, L. and Evens, T. (2011) 'A living lab research approach for mobile TV', *Telematics and Informatics*, November, Vol. 28, No. 4, pp.271–282.
- Sunstein, C. (2003) *Why Societies Need Dissent*, Harvard University Press, Cambridge, MA.
- Tseng, M. and Jiao, J. (2001) 'Mass customization', in G. Salvendy (Ed.): *Handbook of Industrial Engineering*, 3rd ed., pp.684–709, Wiley, Chichester.
- Vandermerwe, S. (2000) 'How increasing value to customers improve business results', *Sloan Management Review*, Fall, Vol. 42, No. 1, pp.27–37.

- [Vargo, S., Maglio, P. and Akaka, M. \(2008\) 'On value and value co-creation: a service systems and service logic perspective', *European Management Journal*, Vol. 26, No. 3, pp.145–152.](#)
- [Vargo, S.L. and Lusch, R.F. \(2004\) 'Evolving to a new dominant logic for marketing', *The Journal of Marketing*, Vol. 68, No. 1, pp.1–17.](#)
- von Hippel, E. (1994) 'Sticky information and the locus of problem solving', *Management Science*, Vol. 40, No. 4, pp.429–439.
- von Hippel, E. (1998) 'Economics of product development by users', *Management Science*, Vol. 44, No. 5, pp.629–644.
- [von Hippel, E. \(2001\) 'Perspective: user toolkits for innovation', *Journal of Product Innovation Management*, Vol. 18, No. 4, pp.247–257.](#)
- [West, J. and Gallagher, S. \(2006\) 'Open innovation in open source software', in Chesbrough, H., Vanhaverbeke, W. and West, J. \(Eds.\): *Open Innovation: Researching a New Paradigm*, pp.82–106, Oxford University Press, Oxford, UK.](#)
- [Westergren, U. and Holmström, J. \(2008\) 'Outsourcing as open innovation: exploring preconditions for the open innovation model in the process industry', *Proceedings of ICIS 2008*, Paris, France.](#)
- [Wikström, S. \(1996\) 'Value creation by company-consumer interaction', *Journal of Marketing Management*, Vol. 12, No. 5, pp.359–374.](#)
- [Yin, R. \(2003\) *Case Study Research: Design and Methods*, SAGE Publications, California.](#)