

Consumer co-creation and the ecology of 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 ICT. We argue that customer integration into the development process as a whole is a key for enhanced innovation processes. Building on early experiences from two projects conducted with a living lab approach we ask how this approach can help organizations utilize important resources in an open innovation system and guide universities – as driving engines in R&D activity systems – to become key players in open innovation systems and 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 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. We coin the term ‘ecology of innovation’ to sum up the potentials related to innovation and value creation.

Introduction

Agile manufacturing, customer relationship management and mass customization 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 customer.

Open Innovation 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 licensing 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 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 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. The 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 programs, 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, responding to the opportunities identified through open innovation models but also proposing a way to move university research out in the wild. 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 processes of open innovation in the context of academy-society collaboration projects, and, as a part of this endeavor, suggest roads to new environments for academic research and education.

We argue that an approach focusing on the 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 organizations utilize 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?

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 customization 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 ‘democratization of innovation’ (von Hippel, 2005) 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 customization to increase switching costs for the customer, a firm builds stable relationships with its clients, allowing a better utilization 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, delievering 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. Maximization (including outbound licensing 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: 82)

These challenges outlined by West and Gallagher are tightly linked to 'the ecology of innovation' i.e. to the challenge of integrating social as well as technical resourses 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, 495).

To this end, 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.

The Living Lab Approach as a path to integration

The ideas behind the Living Lab approach is to put R&D activities into real-life and make it an integral part of larger innovation processes. A Living Lab should 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. 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.

Living Lab approaches also stands for a human-centric – as opposed to a technology centric – approach, trying to involve people in different stages of the innovation process. To this end individuals are seen as key sources of knowledge and information in R&D activities. While these individuals provides 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 Scandiavian tradition of user involvement in design processes (Ehn, 1989) but the Living Lab approach must be extended to include a broader innovation ecology.

For Living Lab approaches to make R&D activities an integral part of larger innovation systems it is of outmost 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, 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 characterized 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.

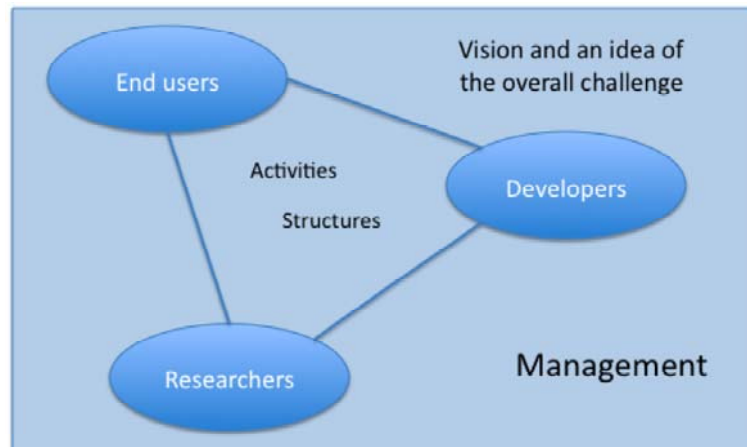


Figure 1. The model of integration guiding our Living Lab approach.

According to the model the innovation system is managed by a process management actor, focused on designing activities and structures that attracts 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 lies 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 that are keeping the innovation system together, and thus provide the basis for the whole system. Typical activities in such an environment 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 formalized 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 R&D 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 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 ecology) 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 organization or firm developing and delivering products and services to End-users, sometimes with the assistance of the Researchers.

The End-user is a stakeholder searching for better solutions to a specific need but also 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.

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, two cases will be presented in this section. The first one is ProcessIT Innovations which is a project specifically focused on the shift of technology in process and manufacturing industry driven by emerging ICT products and services. The second is Innovation Cultures, a project focused on the shift of people's everyday lives related to the ongoing societal digitalization, driven by new technologies and ICT-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.

The two cases are, from a methodological perspective, approached as action research cases. Both 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 outlets¹.

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

¹ For a comprehensive list of these publications see our web page: <http://www.informatik.umu.se/iit/>

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.

ProcessIT Innovations

ProcessIT Innovations² 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, ICT companies and the universities of Umeå and Luleå. In addition, the four coastal municipalities and the county administrative boards of Västerbotten and Norrbotten are involved. 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.³

ProcessIT Innovations is a project oriented towards ICT-based solutions, meeting the needs emerging in process and manufacturing industry. Its start was in 2004 when it was awarded "VinnväxtVinnare"⁴, 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, and (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.

² The homepage of the project is www.processitinnovations.se.

³ Since the 19th century the north of Sweden has been very successful in mining, forestry and energy. The regional ability to handle its minerals, its forests and its waters has made possible world leading positions in mining, forestry and energy, and in order to develop the machines and tools meeting the process industry needs to handle these natural resources a strong manufacturing industry has been established. The strategic idea guiding ProcessIT Innovations is to promote the birth of a highly competitive ICT-industry based on the needs emerging in both process and manufacturing industry. The aim is to reinforce existing primary industries and develop the region's ICT-industry to an internationally competitive position. This concept meets the challenges faced by today's knowledge-intensive, high-technology plant owners with the extensive knowledge developed by the region's ICT services.

⁴ VINNVÄXT is a programme that takes the form of a competition for regions. The aim is to promote sustainable growth by developing internationally competitive research and innovation environments in specific growth fields.

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.

Innovation Cultures

The project Innovation Cultures⁵ started in 2007 as an attempt to address the societal challenge of the digitalization⁶, 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 digitalization, 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, commercialization interests, and interests focusing on enhancing regional growth and attraction. The Researchers engaged in the project comes from various departments from the social sciences, the humanities and science of technology.

⁵ In the project the web page www.umealive.se works as a R&D platform, encouraging firms and citizens to engage in the innovation system.

⁶ Society today is focusing a digitalization of large proportions, changing almost any aspect of human life. That; including the places in which we are living our lives, the behaviors that we falls back to in order to conduct our everyday activities, and the structures that in intricate ways decides our spaces of actions. Nowadays no one gets surprised if you say that handle your bank services from your bedroom, or even that if you say that you haven't got a clue of how to by travels on other "places" than the internet.

The Developers are represented by companies and organization from a large variety of industries and societal sectors. Schools are engaged focusing on the digitalization 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.

Reflections on early findings:

- The Innovation Cultures project has been highly attractive to lot of people and organizations, 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 programs.

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

Discussion

This paper provides an integrated view of value creation in the development of new products and services related to ICT. More specifically, we argue that customer integration into the development process as a whole is a key for

enhanced innovation processes. Building on early experiences from two projects conducted with a Living Lab approach, we argue that customer integration is an important asset not only to increase efficiency and quality, but also for enhanced innovation. We coin the term 'ecology of innovation' to sum up the potentials related to innovation and value creation in the context of a heterogeneous set of actors. The results from the two cases suggest that the configuration of the innovation ecology 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. 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 emphasized it is critical to keep in mind – for both projects – that a well working project is characterized 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 & 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 a functional ecology established, where the functional ecology 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: 549). This functional ecology can be described as an 'ecology of innovation' where the key for success lies in

the successful integration of the involved actors and the associated goals, functions, and institutions contexts.

It seems as if universities can serve as a key actor in the Living Lab approach, offering arenas for Open Innovation to organizations and individuals in the form of the Living Lab approach. Looking at the interests shown to the Living Lab approach the Living Lab seems to be a promising approach not only for external parties to draw from university-based knowledge but also for universities to vitalize their research and education.

In ProcessIT Innovations the two universities involved have been very successful in designing an innovation system attracting the identified stakeholders to the 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. 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 ecology integrating the heterogeneous set of actors involved.

Conclusion

In this paper we asked how a Living Lab approach can help organizations utilize 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? We coined the term ‘ecology of innovation’ to provide a better understanding for the need to integrate a heterogeneous set of actors – and their associated goals and institutionalized contexts – in the open innovation processes.

From a managerial perspective, innovation ecologies managers must seek to conceptualize and implement strategy in new ways, embracing the role as a broker of the innovation ecologies. The brokering competence is critical for exploiting the networked nature of the innovation process (Hargadon & 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.

The emergent character of the innovation ecologies has been in focus for the brokers as functional ecologies are established in each sub-project. We describe these functional ecologies as an ‘ecology of innovation’ where the key for success lies in the successful integration of the involved actors and the associated goals, functions, and institutional contexts.

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