Barriers and outcomes of the collaboration between industry and academia in a new approach: the Living Labs

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Introduction

In the last two decades, many studies have been made upon university-industry collaborations (UIC). Indeed, advantages such as cost reduction, technology acquisition or reputation give both parties an interest in such collaboration. Arvanitis et al. (2008) argue that the interaction and collaboration between the two parties has become a central concern in applied economics. They also argue that it has during the last years closely influenced the recent economic policies. According to Zahra and George (2002) a critical factor in regard to market success is the firms’ ability to identify, acquire and utilize external ideas in the operations. Companies tend to acquire their knowledge, R&D and innovation processes from specialized players in or connected to the industry instead of developing it on their own (Sherwood and Covin, 2008). More and more companies are therefore dropping the concept of creating knowledge “in-house” because of a lack of time and/or resources and prefer to acquire it from external sources (e.g. from academia). A technology source firm or organization provides a technology recipient firm or organization with viable ideas, knowledge and development that the recipient does not have the will or possibility to achieve on its own (ibid). Such transfer is also often called “open-innovation”. According to Chesbrough (2006) the companies aiming for the use of external resources would gain a better ability to innovate along with a transcending of their boundaries in the creation of customer value. The ability to make use of these partnerships...
aiming development and introduction of innovations is according to Sherwood and Covin (2008) one of the factors crucial for the success of companies in technology-intensive businesses. One should not limit the idea of research partnerships to only a supply chain with a distinct direction from supplier to receiver, it is also worth to take into consideration how two organizations can take advantage of a symmetric research partnership. There are according to Caloghirou, Hondroyiannis and Vonortas (2003) a large number of reasons to why a company would enter a research partnership, and among the most important one is the reduction of risk and uncertainty that is connected to the R&D process.

In order to help the industry in its collaboration with the academic world, the “Living Lab” approach is a concept for innovation which has been launched by the European Union. Eriksson and Svensson (2009) describe the Living Labs as an entity embracing the concept of external help and development as resource for innovation by placing the user in the center. This approach of using external help is primarily aimed at supporting innovation processes leading to usable products or services in a “real-world” environment. The difference with classic UIC is held in the fact that the entire firm’s stakeholders such as researchers, users, public partners and more are collaborating in a real-world setting (ibid). Indeed, in a Living Lab environment all the relevant parties when it comes to innovation creation process such as technical researchers, company itself and users are involved. Thus, Living Labs are working with companies in order to develop knowledge, understand it but also understand the surrounding market by working also with the user/consumer. In a classical UIC little attention is given to the market by the industry and the development of innovations is mainly done with particular interest on the technology development and less on the market orientation of the product. Therefore, by including the consumer in the process, the Living Lab concept is avoiding this tendency of classical UIC and provide solutions with a higher degree of market orientation. Eriksson and Svensson (2009) define the Living Labs concept as a user-centric research methodology allowing researchers to sense, prototype and validate their information and transform it into valuable and understood knowledge. Therefore, the Living Labs are a facilitator when it comes to open innovation. Hence, the Living Labs is a radically new way to organize UIC, designed differently than the classic UIC, having intermediary proposition management support meanwhile UIC process and also including new valuable actors such as the user, which sets the Living Labs apart from other UIC settings.

Numerous studies have been conducted upon the barriers that could occur in a typical UIC. As Sherwood and Covin (2008), Philbin (2008) and Arvanitis, Sydow and Woerter (2008) point out there is a significant gain to a company's performance when incorporating a knowledge acquisition or exchange routine with other companies, independent research facilities and most importantly academia, but there has also been noted a discrepancy between the knowledge and insights that are transferred and the practices that are taking place in the companies (Rynes, Bartunek and Daft, 2001). Causes can be the separate environments that the two are operating within – executives not looking into academia for theoretical but applicable knowledge and academics not enough inspired by and proving their research with real-world practitioners. Many researchers are worrying that a collaboration with the industry means that research and its outcome will be short-term and only opted towards presenting commercially profitable projects instead of a broader knowledge and a greater good. At the same time, researchers are worried that the degree of freedom will be restricted to the company's choice of collection and interpretation of data. Many researchers also feel that the research that is the foundation of the knowledge transfer to the industry is consisting of
insignificant studies with less important research questions (ibid). Sherwood and Covin (2008) investigate what specific abilities or features that are related to the success in the knowledge transfer in a UIC relationship.

Although considerable amount of research has been done on UIC, the problem is that, according to the authors’ notice none are focusing on the barriers which could occur during the collaboration under a supervising entity and propose solutions to overcome those barriers. Some influential factors must be taken in consideration from what has been studied in a typical UIC. Although platforms as the Living Labs have been created by EU for taking the role of facilitators between UIC and stakeholders of a firm, some barriers of innovation still occur and therefore this setting does not fully satisfy the expectations of the industry and academia. In order to succeed in its ambition to be a working link- and leverage in this multi-stakeholder setting, the potential threats and barriers to this certain type of collaboration has to be recognized and the discrepancies between potential or expected practices and actual outcomes be examined.

The discussion above leads the authors to the research question motivating this article and formulated as follows: what barriers exist in UIC implemented in a Living Lab setting?

The purpose of this article is to identify potential barriers of collaboration between industry and academia in a new interaction setting. The authors will apply existing theories regarding barriers occurring in the collaboration between the industry and the academia to this particular setting. The authors have the ambition to gain understanding on occurring phenomenon and firms’ stakeholders interests/expectations which could lead to potential collaboration failure in this new context. Also, the authors’ interest is to, after having performed this, help companies but also Living Labs entities themselves to have a better understanding and use of the platform.

**Literature review**

**Innovation**

Innovations and innovativeness have replaced many traditional competitive advantages, encouraging policies on the subject (such as the Bayh-Dole act described below) to be initiated (Swan and Scarbrough, 2001), and are according to Motohashi (2005) often an outcome of UIC as the capacity for innovation along with the overall productivity of SMEs and new technology based firms are increased significantly by a research collaboration. In a UIC is a large number of different types of UICs possible – according to Inzelt (2004) there are eighteen typical cases of interaction between companies and universities, ranging from low-level interaction (as a lecture of firm employees at a university) to high-level institutional integration, such as joint research facilities and projects. The ambition and motivation for these types of collaborations are according to Rohrbeck and Arnold (2006) two-sided, with both academia and industry sharing risks, funding, information/knowledge exchange and gains, and is specifically attractive to companies in technology-intense businesses. Significant for all of these collaborations is the integration of these two helixes to a certain, but as stated by Inzelt (2004) varying, degree with the intent to gain advantage by teaming up (Rohrbeck
According to Santoro and Chakrabarti (2002) industry and academia can be connected in four major inter-related components: research support, cooperative research, knowledge transfer, and technology transfer, decided by the size of the participating units and the type of industry involved. In all innovation collaborations, effective solutions have to be organized to avoid the most common types of sources of failure that according to O'Sullivan (2002) are poor leadership, organization, empowerment, communication and knowledge management.

The technology transfer between academia and industry has since the 1980s received a high level of attention and support from governments both in Europe and the US (Bozeman, 2000; Siepmann, 2004), especially since university knowledge spillover benefits the private sector (Shane, 2004). This complies with Etzkowitz's (2003) statement that universities have transformed from only teaching to research and economic development enterprises as described in the concept “triple helix”; a connection and collaboration between government, industry and academia (Etzkowitz, 2008) interacting in order to achieve innovation (Etzkowitz and Zhou, 2006). The US early introduced UIC policies in order to encourage commercialization of university research with the Bayh-Dole Act of 1980 (Jelinek, 2005; Mowery and Ziedonis, 2002), that made innovation far more valuable to universities due to the possibility to claim title to discoveries and developments instead of making it public domain. This is especially important due to the change in economy from matter- and natural resource-based described by Contractor and Lorange (2002) to a knowledge-based where the main source of technology research is academia (Niosi, 2000).

This type of policy and legislation is not effective worldwide – although similarly developed and with a very high capacity of research the countries of the European Union do not have the same level of UIC legislations (Siepmann, 2004), making the EU fall behind the US in terms of UIC innovation commercialization (Etzkowitz, 2002), a problem that is called “the European Paradox” (Andreasen (1995), Tijssen and Van Wijk (1999), Kogan et al. (2006), Olsen and Maassen (2007)). To solve this many European countries consider creating initiatives and policies similar to the Bayh-Dole Act (Mowery and Sampat, 2004) - one of these is the Living Labs.

The Living Labs

“In Europe, various Directorate Generals of the European Commission have implemented policies aimed at promoting broadband innovation and competitiveness.” (Ballon, Pierson and Delaere, 2005, p. 4). The Living Labs are one of the initiatives launched by the EU to enhance innovation. According to Ballon et al. (2005) the EU policy interest for innovation started in the mid-90’s and since this date, a succession of measures to foster innovation at a European level have been introduced. Cohen and Levinthal (1990) emphasized that firms must develop the ability to recognize to what extent new and external information is important as we can see in the UIC development of the past years. Completely in-house development is not effective anymore and outside sources of knowledge are critical to innovation processes. Further on, they put an emphasis on the fact that firms must also develop the skill to both assimilate and apply it, it is according to them critical to its innovative capacities. (ibid) Unfortunately, for reasons such as financial resources, lack of experience or effective focus, firms are giving away opportunities. The Living Labs have been created to help firms all
along this process from external possibilities recognition through development to the access to market.

Ballon et al. (2005) argue that adequate environment of innovation system must be set in order to facilitate the interactions between the different stakeholders. Therefore the Living Labs are playing the role of facilitators by managing the different stakeholders involved into the process. Eriksson and Svensson (2009) describe the Living Labs as a new manner for the industry to use external ideas as a resource for innovation. Indeed, since the open innovation paradigm, governments and organizations tried to elaborate new innovation systems. The first aim is to define a new approach in which all the stakeholders, researchers, firms, users, public partners are gathered in a common collaboration project in real-world setting. Eriksson and Svensson (2009) describe the aim of Living Labs as a support for the creation of usable ICT products and services gathering the three fundamental elements necessary for launching successful innovation: the technology, the market but also the “society”. It is assumed that the Living Labs are always proceeding according to a pre-defined plan in three steps. Firstly by discovering who the users are by identifying their needs and preference. Then as a second step ensuring that the innovation will be set to be successful once reaching the market. Finally the third step is about the incorporation of the knowledge previously gained (ibid). Living Labs are mainly working with new technology related industries and help enterprises to create innovations closely related to these new innovative possibilities.

Living Labs could be seen as a platform set in order to enhance the performance of UIC. Mariussen and Asheim (2003) argue that every innovation systems have been created in the aim of setting relations between different elements contributing to innovation as institutions of research and education, firms and customers. According to Niitamo (2005) taken from Ballon et al. (2005) Living Labs is a regional development program of testing, developing and validating new products.

According to Mariussen and Asheim (2003) scholars have been investigating for years on the advantages of “clustered” milieus for innovation (creating innovation on a micro level), providing proximity between all stakeholders, enabling face-to-face interactions which are themselves creating interactive learning which is important in order to properly acquire knowledge. They also argue having a milieu for innovation considered as a cluster to enforce the UIC and helps driving the new knowledge resulting from such collaboration especially in industries driven by analytic innovation systems such as biotechnology or ICT (Living Labs like). Thus, it also enforces the interactive learning process (ibid).

The triple helix (Etzkowitz, 2008) of industry-government-academia described earlier is a system where the three included entities are not clearly divided, nor limited to a double-helix system (as previously existing in the form of industry-academia) but an integration of all three for a greater good and an optimal output of efforts. This model differs from both the totalitarian view of the government or state as controller of industry and/or academia (such as in the Soviet Union) that technically puts the double-helix in an third helix of power/ownership, or the view of the three as completely independent actors in a laissez-faire setting (Etzkowitz, 2008). The triple helix model is built on the thought that all of the three helixes are integrated in order to both contribute and gain from a collaboration, involving all three parts in the strive for innovation development. What makes the Living Labs setting novel and unique is the implementation and connection of a fourth sphere consisting of the users, creating a quattro helix. By including the customer/user in the knowledge creation
process and “co-creating” this one, it ensures innovation setting for commercialization, making the diffusion easier. Ballon et al. (2005) assume that the Living Labs are helping to increase the level of technology readiness by serving as a platform where original in-house companies' ideas will, via collaboration with innovation end-users under Living Lab management, be cast into innovation prototypes corresponding to customer needs. According to Veugelers and Cassiman (p.81 taken from Arvanitis et al., 2005) it has been proven that “there is a financial benefit for companies through time-saving in R&D but also into reduction of technological risk.” The Living Lab concept could be considered as a platform regrouping many of the stakeholders of a company, taking the role of facilitators by having a central position between the technical researchers (academia), the companies (industry) and the new social helix (customers) for the sake of common understanding. According to Ballon et al. (2005, p. 7) “In an emerging broadband world characterized by high uncertainty, large up-front investments in new technology and complex interdependencies between infrastructure provision and service development, it may be expected that joint test and experimentation platforms will reduce systemic failures in broadband application domains such as information, health, mobility, education and entertainment.”

The Living Labs are following a pattern in matter of innovation as the one explained by Reichwald et al. (2004) and developed in the working paper of Svensson, Ihlström Eriksson and Ebbesson (2010). The first step is the idea phase, in which the Living Lab is working in workshops as a foundation for generating ideas using techniques such as brainstorming, scenario building and mock-ups. The interesting point is that in comparison with classical UIC is that the Living Lab are already connected to the “social stakeholders” and are trying to generate ideas via a selected group of people representing the targeted customer groups. According to Fahy et al. (2007) what makes a living labs environment special is the fact that the end-users are involved on a direct manner into the conception of new innovations. This changes the role of the end-users transforming them from “research objects” into a pro-active role into the innovation process considering them as “co-creators”. By definition, an UIC usually incorporates only 2 parties as known as University and Companies, in the “living labs” concept an emphasis is put on the user role all along the process. According to Eriksson and Svensson (2009) living labs could therefore be considered as user driven innovation which implies that the involvement of the end user into the innovation process is of importance and vital. They justify this statement according to the fact that user involvement is critical in order to increase creativity and create new ideas that will be merged and converted in the end into innovation and therefore bring “value creating use” (ibid). Indeed, according to Thomke and von Hippel (2002) users are often the source of innovation. According to Svensson and Eriksson (2010, p.2) “Living Labs contributes to the challenges of mass-deployment of ICT solutions as a mean to further develop the society by involving the citizens. It brings the users/consumers/citizens into the system of innovation. In a Living Lab, ICT innovations are created and validated in collaborative multi-contextual empirical real-world environments. The individual is in focus in the role of a citizen, user, consumer, or worker and is seen as a valuable source of innovation.”

The second step is the concept phase in which information collected in the previous phase is assembled in order to generate something concrete which could be conceptualized aiming further development. The next step is called the prototype phased, in which the concept created earlier has been transformed into something concrete and tested through the last phase: the market phase.
In the last phase, the Living Labs are connecting back to the users (or social stakeholder) what has been developed previously thanks to their ideas originally collected. According to Rice and Matthews (1995, taken from Etzkowitz, Carvalho de Mello and Almeida, 2005) incubation has become a worldwide phenomenon, part of regional and national policies of both OECD and non-OECD countries in which innovation are tested and becoming ready to reach the market. However, the Living Labs are providing a value-add to a classic UIC by not only providing the role of connector between the stakeholder but also by managing the innovative process and playing the role of innovation incubator closely related to “end-user representatives” feedback.

Nowadays, the Living Lab concept (which has emerged following the 80’s growing interest for user-centered designs) is more and more spread and developed. Nevertheless it is only in the last years that one has seen the emergence of that new trend of including user involvement as a strategy to strengthen innovation and development processes. (Eriksson and Svensson, 2009) This new trend has exponentially spread throughout Europe in four “waves” along the two last decades to finally nowadays commence to expend worldwide [1]. Although the development of such innovative strategies has been enhanced by public EU incentives, the concept appealed numerous of “private companies” which have been keen on adapting the method into their own innovation processes. The user centered milieu for innovation including all the stakeholders of the company interacting in a managed environment such as the one proposed by living labs has seduced numerous innovative firms and made them rethink the way they innovate [2]. Now, there are 212 Living Labs connected to the European Network of Living Labs, which 34 representatives in the Scandinavian countries [1].

Nonetheless the growing and expanding success of the living labs, researchers such as Mulder et al. (2007) emphasized that more researches must be conducted upon living labs entities, notably upon the organizational and managerial issues that could be encountered in a living lab setting according to the level of difficulties to gather so many stakeholders into a productive environment, especially the end-users. Eriksson and Svensson (2009) raise few points regarding the Living Labs that must be carefully taken into account when implemented such as finding the right end users to involve in, organizing the user involvement and collaboration between practitioners and academicals or finally providing motivation to the users. The authors agree on the fact that a strong managing entity must be implemented in order to find the right stakeholders and lead them all along the innovation development process they are involved in (ibid).

In order to conclude and to match the purpose of this paper a comparison is presented below of classical UIC and the Living Labs based upon descriptive literature. These differences are drawn vis-à-vis a company which would collaborate with academia and therefore acquire knowledge from this external partner.
Traditional UIC | Living Labs
---|---
Exclusive collaboration between two parties (company and university/academic institution) | User involvement within the collaboration, as well as other interested parties (Eriksson and Svensson, 2009)
Knowledge researches among universities are up to the industry | Supervising entity helping industry from the research of valuable knowledge, validating, prototyping, testing and quality check (Ballon et al., 2005)
Two-sided set of expectation, motivation and commitment | Full commitment of all the parties in an innovation-oriented environment (Eriksson and Svensson, 2009)
No real platform set, communication biased, unsupervised progress | “Clustered” milieu, enabling contact, face-to-face interactions in between all the stakeholders (Mariussen and Asheim, 2003)
At companies'/universities' own initiative | Incepted by governmetal initiative (Ballon et al., 2005)
Double-helix involvement | Triple-/quattro-helix involvement (Etzkowitz, 2008)

Table 1: Comparison between traditional UIC and Living Labs

**Collaboration in and barriers to innovation**

Many factors influence and affect the possibility for different entities to perform in collaborations, but a number of abilities and capabilities are according to literature of greater importance. Knowledge acquisition, transfer and creation are mentioned as some of the core features of many technology-intensive industries, and one of the most commonly cited phenomena is absorptive capacity, which is “a set of firm abilities to manage knowledge” (Zahra and George, 2002, p. 186) or more elaborated “a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability” (ibid).

Other views assembled by the same authors is concluding into the thought of the ability of taking knowledge into an organization and apply it to gain advantages – “the capacity to learn and solve problems” (ibid) or the degree of integration and utilization of knowledge (Van den Bosch, Volberda and de Boer, 1999). Knowledge conversion may be seen as transformation of knowledge into new forms, i.e. from scientific knowledge created in a laboratory – into industrial knowledge, where laboratory results are used to make money. (Mariussen and Asheim, 2003) A problem with the absorptive capacity of a company is that, as well as any other intangible theme with indirect benefits, it can be hard to motivate investments and involvement in order to improve the absorptive capacity of an organization (Cohen and Levinthal, 1990). The problem with investments in absorptive capacities is also that it, according to Cohen and Levinthal (1990), sometimes can occur as by-product to a company's routine activities in the case that the area if interest is close to what the company is normally
involved in, while the same does not occur when there is a discrepancy between the present and desired information or knowledge area – in that case, the process to come to an enhanced capability must spring out of a determined effort to do so. Normally, absorptive capacity is a subject that according to van den Bosch et al. (1999) is concerning the firm or organization as a whole, and specifically its ability to acquire and absorb external knowledge (knowledge that is coming from outside the organization, for example inter-organizational knowledge). According to van den Bosch et al. (1999), two organizational traits play a significant role in a companies’ ability to absorb knowledge – the organizational form and the combinative capabilities.

Knowledge has to be divided into two categories: tacit and explicit knowledge. Tacit knowledge is personal in nature, context-specific, and therefore hard to formalize and communicate (Nonaka and Takeuchi (1995, cited in Holden (2002), Sanchez (2005)), and is truly transferable only by bringing the right individuals together under the right circumstances (Sanchez, 2005). Explicit knowledge is what can be articulated in formal language including mathematical expressions, specifications, manuals and so forth and thus can be transferred between individuals easily (Holden, 2002).

In the process of acquiring knowledge, not only the companies' own capacities play a part – in addition to these, transfer-specific problems and barriers that only occur when inter-organizational communication and cooperation is present are a threat to the success of the process. One could view acquisition as a process that only includes one party, but a transfer has as implied several parties involved with the corresponding complications of collaboration. In this kind of collaboration, barriers to the creation and transfer of innovations can appear. A barrier is something that slows down, constrains, hinders or in another way negatively influences a process, in this case innovation – and the opposite is a facilitator, something that influences the process in a positive manner (Shavinina, 2003). Shavinina (2003) claims that the two above (barriers/facilitators) are tightly connected – so tightly connected that a lack of facilitators itself leads to barriers. Barriers in UIC can be categorized as external (i.e. market or government related) or internal (i.e. structure and people related) as by Shavinina (2003) or as Bruneel, D’Este and Salter (2010) categorizes it; orientation (with the emphasis on how industry and academia differ in its views) or transaction (emphasizing the process itself) related barriers.

Sherwood and Covin (2008) mention three factors that are strongly influencing the process of collaboration, and these are independent variables influencing the success of such a transaction. The first is trust, not only on an individual but also on an organizational level, between parties – a factor that is needed to avoid barriers in the transfer, consisting of a resistance to both to initiation of change and the practices connected to it. The second of the three influential factors is familiarity, in the meaning that the entity acquiring knowledge will perform better in that aspect if it has knowledge and experience of the knowledge supplier, the technology involved and the transfer process. The third factor involved is interaction. Is this case, Sherwood and Covin (2008) propose that the success in knowledge transfer is depending on the amount of interaction between the two entities. This is specified as the amount of people involved in the transfer, how formally they are assigned not only to the project but also to co-operate with the other parties' representatives and the amount and frequency of contact between these. This combined is, according to Sherwood and Covin (2008), related to the success in knowledge transfer.
Cantoni, Bello and Frigerio (2001) are also concerning the area of barriers of collaboration and present two major barriers to collaboration: localization and culture. Localization represents the physical barriers to transfer, most noticeably distance that can disrupt the flow of information between two parties. Culture on the other hand represents the psychical disruptions that appear, based on the difference in understanding, norms and practices in the respective organization. Solutions to bridge these gaps are according to Cantoni et al. (2001) training (of developing, judging and adopting ideas and knowledge), incentives (in order to even the small resistance and initiate a common movement), technology (primarily communication and computer technology to speed up transfer processes) and structures (formalized procedures, routines and facilities to enhance knowledge transfer and absorption). Carlile (2002) supports the barrier presented by Cantoni et al. (2001) by explaining how the transfer of knowledge is facilitated by two factors – homogeneity and co-location both contribute to the success of knowledge transfer in an innovation process. Overall, one view that is to a large extent dominating is the idea of networking and collaboration as the source of many innovations. Swan, Newell, Scarbrough and Hislop (1999) point out the importance of partnership and networking in an innovation process as a requirement for success, and how constant dialogue and interaction might foster innovation processes.

Keanevey (2008) points out another possible barrier in knowledge transfer between research and commercialization, namely the clash between marketing and engineering, or applicable onto the potential difference between academia and industry. Keanevey (2008) shows in a study around experiences and attitudes how marketers and engineers have a set of attitudes and prejudices against each other, maybe founded in a lack of understanding, communication and experience. What is most apparent is the conviction that the own area (technical development or marketing) is the sole importance, proven first of all incorrect by Keanevey and secondly also the need for several views and traits in a company to absorb all knowledge that the company – both engineers (for the technical development and research) and marketers (for commercialization and market knowledge). Having different sets of backgrounds, references or areas of expertise is not necessarily something negative, quite contrary state for example Leonard and Sensiper (1998) claiming that heterogeneous groups are more susceptible to foster innovation, under the condition that one manages to create a communication, networking and common set of preferences in order to coordinate work, a view that is shared by Hertel, Geister and Konradt (2005) who primarily focus on the possibilities of interacting over distance with the shared context intact by the use of technology. This is also supported by Fahey and Prusak (1998), who among ten other potential mishaps emphasize the importance of creating a shared context for all parties involved is a necessity in knowledge transfer processes, as the lack thereof means that individuals involved in the process will have different sets of expectations and perspectives upon the collaboration, leading to failure (which is one their reasons for a collaboration to fail). The context, especially the shared and need thereof, is also a theme by Augier, Shariq and Vendelø (2001) stating that it is necessary in a knowledge acquisition situation as a facilitator to interacting, based on the thought that a better knowledge of each others’ abilities and a higher degree of contact and communication will reduce barriers in knowledge transfer, most noticeable when considering tacit knowledge as described below.
Analytical model

The authors have developed an analytical framework for the setting of Living Lab collaboration in general and with companies in particular, in order to enhance the performance and reduce or even remove barriers in the collaboration. The model is based on theories and views presented in the literature review, and is compiled by the authors in order to present a view of the, according to theories, optimal pattern of collaboration for a Living Lab setting, taking into consideration not only the formal structure of the collaboration but also the according to theory beneficial or need facilitators and capabilities. The model puts the stakeholders and the interested parties in a context, providing an easy-to-grasp overview of the conditions and relations present combined with potential facilitators. As the collaboration with the intent to create, transfer and convert knowledge and innovations between the parties is largely a web of processes, the model itself has a strong focus on the interactions.

The model takes into consideration previously mentioned and well-known entities such as the company, the Living Labs, researchers/academia and users – what is new is the sphere called “company gatekeepers”. These are the representatives from the industry/company side in collaboration, and based on the literature review's focus on facilitating collaboration the authors are proposing a closer focus on the interaction group above. In the model, three representatives for not necessarily individuals but abilities that according to theories must be present in an interaction is featured.

Figure 1: Analytical model

The first, A, is a market focused and knowledgeable representative (Keanevey, 2008) that has an understanding about the collaboration's possibilities of commercialization and user value in addition to market attraction. This is put in contrast to Keanevey's (2008) diametric opposite, representing the engineering/technical knowledge. In the model, this is presented as B. This
ability gives the collaborating company a technical expertise, needed to verify the potential level and usage of the company's resources regarding its technological abilities. The last gatekeeper that has to be implemented (C) is the knowledge and competence regarding organizational matters and culture (Cantoni et al., 2001). This ability represents the interaction not only between the different entities but also within the company. The importance of this ability is high since it assesses the knowledge about decision structures, information flow and routines within the company.

The necessity for these abilities is not simply for the company side – the same applies to the opposite, the researchers. In order to make a proper collaboration, the Living Labs management might not only have to propose certain abilities from the inter-actors from the company side, but also from involved researchers. A trait or focus with an understanding of the necessity for commercial focus also promotes the interaction by a shared mindset or context (Fahey and Prusak, 1998).

The shared context is not only a theme for the mindset, but also a requirement for the tacit interaction. Cantoni et al. (2001) and Mariussen and Asheim (2003) point out the importance of closeness and face-to-face in a favorable environment (Sherwood and Covin, 2008), providing the safest way of achieving the needed trust, interaction and familiarity that is needed for a successful collaboration and process (Sherwood and Covin, 2008).

The management skills of the Living Lab representatives are of importance as they act not only as the linkage, but the catalyst of such a setting. What is needed is to offer not only a context for interaction (Cantoni et al., 2001; Mariussen and Asheim, 2003; Sherwood and Covin, 2008) but also the needed skills to put together the right “gatekeepers” and representatives to avoid clashes between persons with shared mindsets, abilities and focus (Hertel et al., 2005; Leonard and Sensiper, 1998) but also foster the needed partnership, common understanding and networking (Swan et al., 1999; Carlile, 2002) between the stakeholders that removes barriers and facilitate collaboration. All of the above are as the model implies coming together as a responsibility for the Living Lab management, needed to be both independent and dedicated to the task of enhancing interaction which in the extension makes for successful commercialization of academicals knowledge and innovations.

**Methodology**

**Research design**

In this article the authors choose to do a qualitative case study with a deductive approach. These choices were made in order to focus on one type of entity and several companies, to gain an understanding and drawing conclusions from their specific behavior, and see if their experience could prove valuable to others. According to Bryman and Bell (2007) a case study could be defined by an intensive and detailed analysis of a case, this case can be single or multiple. According to Yin (2003) there is a strong correlation between the choice of a case study and the will of the authors to distinguish a problem from its context. This argument further taken by Saunders, Lewis and Thornhil (2003) stating that using multiple sources of evidence, is the best strategy when it comes to involve empirical investigation of a particular recognized contemporary phenomenon within its real-life context.
According to Yin (2003) the selection of relevant theoretical concepts in order to have guidance when it comes to design and data collection of a case study is of importance. Indeed, two purposes are stated such as placing the case study in appropriate research literature (in order to give the reader a better understanding of the topic) and the second is to help to define the unit of analysis, candidates’ selection criteria and suggest the relevant variable of data collected into the case study. (ibid)

According to Yin (2003) the choice of a multiple case study takes its relevance in the fact that thanks to this method, the authors are able to see some patterns among the different data collected from different entities and this referring to the common theory selected before. Recurrent data are gathered by the authors and analyze in order to find out if patterns can be elaborated around. Also, the coverage of different contexts and conditions is emphasized by opting for a multiple case study.

Case selection
The five cases were chosen as three of the 34 Scandinavian entities implementing the Living Labs setting and companies involved in Living Labs projects on the industry side of the UIC and all belong to an area that is relatively unexplored (in comparison with the traditional UIC context) and thereby both offers the possibility to gain knowledge, aids potential theory building and gives good conditions to generate several proposals for future research. With a similar theme but individual preferences, the slight difference of the three entity cases and the two companies give a spread and variety. According to Bryman and Bell (2007) sampling could be considered as a crucial step in a research process. When it comes to sampling two approaches can be considered: the random and the systematic. The authors have based this article upon a systematic sampling by choosing themselves the entities but also the individuals regarding the relevance of information vis-à-vis the theories chosen and the paper orientation. According to Bryman and Bell (2007) the weak point of this sampling technique is that the authors might have less of a chance to recognize patterns and to come up with generalized assumptions than when using random sampling. All of the respondents are individuals with good insight in the entities' or the companies' strategic work for collaboration and everything it implies, but are as the names of the companies kept anonymous in order to not only avoiding exposure of certain entities and individuals, but also to put emphasis on the phenomena and processes in general and not on certain cases, companies and individuals. The authors decided to use semi structured interviews. Some advantages could be seen when it comes to data collection into the use of a case study such as described by Knights and McCabe (1997): the observation and semi-structured interview which can be according to them used combine to reach highly valuable outcomes. Interviews were performed face-to-face, per Skype or telephone during approximately one hour each, and the data collected was completely transcribed in order to ensure validity and reliability.

The data for this article was assembled by the authors in April and May 2010 by interviewing representatives for three Scandinavian Living Labs entities and two representatives for companies in an ongoing or finished collaboration with the above entities. Due to practicalities, the number of companies responding was limited to two instead of the initial three, something that limits the extent of testimonials but according to the authors acceptable.
Case descriptions
From the first Living Labs, entity A, the authors interviewed two representatives. Both are PhD students but also performing research, lecturing and conducting work at the Living Lab entity. The organization of entity A is generally quite informal and acts as much as connector of formal units within the university. The two representatives of entity A are not the formal research leader at the entity, but participating in approximately fifty percent of the work. The formal research leader of the entity is the one “signing the contracts” and involved in the strategic decisions. The largest areas of research for entity A is healthcare, and information and communication technology, especially newspapers and media.

From entity B, two representatives were interviewed by the authors. One is the leader for all Living Labs activities at the university with formal responsibilities and duties including preparation and setup of new projects, communication with interested/involved parties and development. The second is one the researchers at the Living Lab, combined with researcher education at the university. Approximately eighty percent of the above researchers' efforts go into Living Labs projects. Entity B is a standalone unit at its university, have its own board and is rather well-staffed with around a dozen positions in management and administration on the side of the research team. The entity has existed and implemented Living Labs style research before EU introduced the Living Labs theme.

Entity C was represented by one individual, the head of lab. Entity C differs from the other two in the in the sense that it is a truly independent unit, established and driven as a company or commercial entity. The entity also differentiates with its lower connection to universities and greater emphasis towards business life and value creation. The interviewee contrasts to the ones from the other entities as well by having a business/MBA background instead of the engineering focus that is apparent in the other two cases.

Company 1 is a small and young, technically focused company with approximately 30 employees within the healthcare industry, the respondent being Chief Technology Officer, responsible for the technical development and products in the company and in charge of the contact with the Living Lab entity. The company has been active for six years, and is market leading in its field; a form of elderly healthcare and security technology, combining mechanics and IT.

Company 2 is a large company in a technology-intensive business, where the authors have focused on its research branch, and interviewed one of the research engineers involved in the contact with a Living Lab entity for a decade. The company employs several thousand persons worldwide with headquarters in Sweden, where the research branch is relatively independent and the about 600 researchers are employed in order to develop and test both consumer and business technology and solutions, mainly in the communications and IT field.

Reliability and validity
According to Kvale (1997) the reliability and validity ensure that the purpose of the paper is fulfilled by the authors in the way they are constructing this one. For a question of validity, the authors constructed their theoretical framework as the most relevant possible in a logical way starting from a general level including concepts and policies explanation (origins and reasons of creation of Living Labs) through a more in depth analysis of the activities of the Living Labs as a first part. Thereby, the authors browsed research on UIC barriers in order to
apply it on a new context as the chosen Living Labs. The authors have chosen a data analysis method best described as narrative (Bryman and Bell, 2007) where the interviewees experiences and insights in a larger context and time frame are given in order to discover and identify patterns and meanings, telling the story of the collaboration, the entity and the events experienced in the process. By the number of entities studied, confirming and supporting each others' statements, the validity is increased and secured. The validity of the interview guide was assured by pre-interview contact and trial with the researchers of one the entities. By performing the interviews from a semi-structured guide, with recording and full transcription the reliability of the data collection was also taken into consideration.

**Empirical findings**

Both entity A and B are research units without a commercial focus, meaning that they rely heavily on funding by authorities, government and the European Union. Entity C contrasts this with its company structure and the business idea and model of creating value for several parties in the collaboration. Entity A are 100% project funded, and since they want to get sustainability in both work and funding, they are working primarily with regional/local partners in order to improve business life in the surrounding area. Sources of funding are a blend of regions/municipalities, foundations and the university but no financial input from the European Union. To a large extent, entity A relies of funding for individual projects and according to the respondents one of the major tasks at the entity is the more or less constant fundraising. Entity B is also funded from a multitude of sources, including European Union framework programs and structural funds together with governmental support and fees together with in-kind contributions from participating partners. The lion's part of the funding comes from research foundations and besides the mentioned a small part comes from the university.

The influence from the European Union is noticeable in both Entity A and B, as they are both involved in the European Living Labs network, and share the methods and practices of these. Company 2 is very well aware of this connection – by being one of the inceptors of their corresponding Living Labs entity, the company has a long-going interaction and also to an extent funding it. The above might change with time, though, as when in bad financial situations the funding is to a larger extent angled towards and dependent on regional, governmental and EU support.

The work in a Living Lab is to a large extent consist of managing the various parties involved, and handling, as one of the entities mention, power balances between these and the stakes of all. According to entity A, several cases have become failures because of a disagreement already early in the process regarding rights, shares and formal requirements. The importance of the Living Labs is to a large extent to involve, motivate and use the abilities of all parties, a view that company 1 seconds – it claims that the matter of power balance and managing both workload and responsibilities, as well as fortune and fame, in the projects. This has to be monitored and managed constantly. The companies view the Living Labs entity as the facilitators and managers, and not as researchers. In order to have such a tight collaboration, company 2 realizes the need for strong legal documents and agreement regarding the from a business perspective more sensitive parts of the collaboration – the formal order of working procedures, confidentiality and non disclosure is an essential part of such a large corporation's agenda for a research partnership. Entity C proposes a view on power balance management as
something that that is not possible, instead it promotes the idea of involving the companies in an environment where leadership, management and strategy from the Living Labs side forms a framework and opportunity for companies to involve and share, but one cannot force them to.

The idea of user-centered or -influenced research is applicable all of the Living Lab entities, having an emphasis on the interaction of users in the process. Entity A strives for the use of an “advanced” user in the form of experienced, demand or lead users and state that being able to find the key users is an essential part of the research process. Also user organizations are preferred in the cases it is applicable for certain interest groups, or advocacy groups for certain user segments such as elderly. One problem is presented – the need for involvement from the users although not on the payroll makes relation-making and motivation very important to keep users involved. By that, the concept of lead users is applicable according to the respondents from entity A as they have knowledge, ideas and needs that forego the regular user groups. Entity B supports this, as emphasizes how the user is involved in the whole process, having a very important role. The problem with a user-centered design is mostly emphasized by the companies – both company 1 and 2 witness that user involvement and feedback is of importance to the company when testing or evaluating products, technology and services, but both share the view of complications. These include the fact that the representatives for the user side tend be user organizations, focus groups or voluntary testers, bringing a biased view to the collaboration. In the case with health technology, the user side of the collaboration tend to, according to company 1, have a very strong personal involvement and a high need for the product, meaning that their approximation of the market demand and especially the willingness to pay was far from reality – the product that was developed in this collaboration was far too expensive for the mass market. Entity C confirms and supports the importance of the right users or representatives for the users in the process. Many parties do, according to entity C, take the role as end user representatives with too much of a bias and/or own interests. One example presented is how municipalities and user groups with a sometimes political agenda diffuses the input from the user helix to one that (also unintentionally) fits their schedule and supports their cause.

The industry is primarily represented by ICT and development companies, and the persons involved are primarily top management, executives and development managers, according to entity A. In some cases, several companies are involved (5 or more, according to entity A), and depending on size the number and qualifications of the companies' representatives vary greatly. In the case with micro companies, the CEO is often the representative in the project setting. In smaller companies collaboration with entity A, normally both the representative(s) and the rest of the employees are technically angled / engineers although in different positions, forming a rather homogeneous unit. There are some attempts from the Living Labs to put up a profile for who should be representing the company but in the case with micro companies, one is often restricted to what is practically available. The homogeneity is confirmed by both companies 1 and 2, proving that the personnel in both firms are practically 100% technology/engineers, and that it of course brings a certain focus to the process of technological expertise. Company 2 although presents an idea of a varied set of abilities (although with an engineering theme), using both very technology-driven and more market oriented personnel in the transfer. Company 2 also presents groups of between one and five persons (with the mixed abilities mentioned above) for each project, enhancing the project in
two ways; dedicating personnel to the project in a larger numeral and liberating CEO/CTO from this in order to let him or her perform other tasks.

The amount of time spent (or the possibility thereof) in a collaboration, both in a long- and short-term perspective is a major problem. Company 1 stated that it was about three hours every second week that the sole representative (CTO) was spending in the setting, making it common with repetition and rehearsal to remember what was achieved in the last setting. Also, the pace of development proved a problem by taking too long. Company 1 stated that the development pace of the Living Lab collaboration was much slower than the company is used to (not necessarily a bad thing – knowledge and findings had time to “sink in”), which made the rapid technological development in the business overtake it and render a large part of the findings obsolete. The reason for this was according to company 1 the users focus that to a large extent slowed down the pace. The slow pace and many hours of interaction also makes it hard for smaller companies to add further personnel (as it costs too much time and money), locking up one person with the task to interact, coordinate, learn and transfer knowledge back to the company. It also proved a problem to company 1 by rendering a chain of demands within the organization that could not be fulfilled – salespersons wanting products from engineers wanting access to research findings from CTO involved in Living Lab collaboration, ending up in only a demonstrator. Company 2 have a more long-term relation with their Living Labs entity, having a structured collaboration with meetings on a regular basis and with a casual or informal setting in order to on a non-project basis discuss and open up not only for continuous information sharing but also familiarity between the two parties.

Companies often come into the process with an idea, concept or product, according to entity A, that they want to test in the real-life setting that the Living Labs offer with their “internal” triple helix, with a degree of contact with end users that they cannot acquire on their own, a view that is shared by company 1. Entity C calls this a view on the Living Labs setting as simply a product or service testbed. In other cases, the companies enter a Living Labs collaboration with a product or concept that more or less is finished and are more eager to get the reactions from the users and researchers, also partly shared by company 1. Additionally, and quite surprising, many companies enter a collaboration with more or less intent of developing products or services but to gain access to the network offered by the Living Labs entities regarding companies, authorities, user organizations and other interested parties, and specifically the market knowledge available. The latter is according to entity A especially applicable when companies are planning to expand to unknown markets or segments, where the Living Labs can offer relation and contacts with established representatives for the specific group. Company 2 states that this is sometimes their intent, especially to gain access and contact to small, regional companies. It is the experience and opinion of some the Living Lab representatives that it is the industry’s representative that has the final word in many of the negotiations regarding the project settings. With more than only one company attending and sharing interest in the findings, the importance for clear management and control of the setting increases. With more companies involved, entity C claims that the need for openness increases but the will might be opposite, with companies afraid of losing control of both the collaboration and vital information. This is a factor that greatly reduces the possibility to create value in this setting according to entity C.

According to the experience of entity A, it takes approximately six months of interaction to build a trust level enough to do good collaboration, and this time period to a large extent for
the parties to get to know each other in order to build trust to a satisfying level. In collaborations where the parties are acquainted from before (from for example working in the same business), this stage in the process is much shorter. Entity B supports the idea of trust as an essential factor for success, and that it is achieved with openness, a good research environment and close collaboration. A high degree of transparency leads according to entity B to both trust and familiarity from the other stakeholders, something that entity C supports by claiming that it is a necessity to get full transparency about the parties intents and core competences to understand each-other, and by that creating a common vision for the outcome of the project.

It is hard even for the Living Labs entities to make sure who is researcher and who is manager in these processes, as they have several tasks within the same project. The idea of non-profit Living Lab entities that do not charge companies for their services brings a possibility for the entities to apply research ideas to the context. The representatives for the entities consider themselves as researchers in first place and not consultants or managers. Entity A considers it a strength to act this way in order to keep its neutrality that would otherwise potentially get lost by entering the collaboration as a paid business environment, selling services. Overall, the Living Labs are very heavy on the research side of the triple helix. Company 1 support the view that it is sometimes a blend of management, facilitators and researchers that one as a company representative is meeting, but company 2 notice that researches that are external or independent to the Living Labs entity are regularly used in the collaboration. Entity C is the exception in this case, founded and driven from a business point of view with a much smaller researcher influence than the other two, with the motivation that researchers are a resource or part as any other in the quattro helix and that the researcher should remain an un-integrated part of a Living Lab management.

**Analysis**

The authors have found and pointed out a number of themes in the theoretical and empirical parts that will here be discussed and developed. Based on theoretical knowledge, with the empirical findings applied in order to identify and to further understand them, the themes will regard UIC in a new setting, and the potential barriers it faces.

UIC in a new setting brings opportunities but also certain constraints. In accordance with the article purpose, a certain number of areas of interest and potential barriers have been identified and considered by the authors. Below, the theoretical framework and the authors’ empirical findings are contrasted and combined in order to highlight this new setting’s specific features and its influence on UIC.

**Gatekeepers**

In the analytical framework, the authors put a large emphasis on the correct forming of the so-called gatekeepers from the industry side of the industry-academia collaboration, initiated for the sake of border-crossing innovation networking (Swan et al., 1999) resulting in a long-term advantage (Ulrich, 2002) in markets especially focusing on technology. The request was to put three abilities in the group of representatives;
• A is the first ability, the market knowledgeable and minded representatives (Keanevey, 2008)
• B is the second ability, the technical and engineering expertise (Keanevey, 2008)
• C is the third ability, the cultural and organizational representatives (Cantoni et al., 2001; Carlile, 2002)

What came out of the interviews is that it is primarily small-size and even micro companies involved with the Living Labs entities that the authors observed (with the exception of company 2, chosen with the intent to describe the contrast with established and larger stakeholders in this type of collaboration). In addition to this, the numeral of interacting individuals was correspondingly low and was often limited to for example only the CEO (or another member of top management, as the CTO in the case of company 1) of the respective company. With the companies having a mainly technological focus and a staffing that often is exclusively technological or engineering educated and focused, one can easily see that it is first of all too few involved and with a too narrow frame of knowledge, abilities and positions. Both the small amount of interaction (as CEOs and other top management personnel as stated tend to have limited time to spend) and the homogeneity makes the collaboration less effective and the potential barriers and failures increase dramatically. In the case with company 2 that has been in (and actually incepted) a Living Labs environment more than a decade ago, the group of gatekeepers is still consisting of all engineers but with specific abilities and focus (technical, business et cetera). In contrast to company 1, company 2 has the resources and abilities in the company to build a group of one to five representatives that are included in the Living Labs collaboration. According to presented theory and the experience of the companies the heterogeneity of a company side collaboration group, that the authors call gatekeepers, is positively influencing the collaboration by offering diversified expertise and heterogeneity.

**Intentions and expectations**

In the framework, it is assumed that companies approach the Living Labs entities with ideas to develop or test supported by Living Lab theory (Eriksson and Svensson, 2009), all in order to gain competitive advantage by a knowledge acquisition or exchange routine with external sources (Sherwood and Covin, 2008; Philbin, 2008; Arvanitis et al., 2008). The data collection showed that the assumption was incorrect – both entities and companies initiate the process on their side by proposing either knowledge or a need, and that the process also changes with time, according to the three factors trust, interaction and familiarity (Sherwood and Covin, 2008). With a higher degree of the above, not only the company assesses a greater knowledge about the abilities of the entity, but with the routine of the collaboration also the entity has the possibility to propose solutions and innovations to the companies based on previous experiences.

A source of failure or potential barrier that is both supported in theory and practice is the definition of the collaboration's output. Just as theory suggests, there is a significant delta of the time period, the level of theoretical/practical applicability and tacit/explicit knowledge between the parties involved in the collaboration. The authors recognize the need for clarity from all parties regarding the process, its format and most of all aligning the expectations of the outcome.
One major part of the work of a Living Lab entity is to manage not only the collaboration and interaction but also the relation between the interested parties, and especially from a power balance point of view. Both the entities and the companies state the importance of clear-cut properties and positions in the collaborations, as well as the formal or legislative documents and agreements needed to put at clarity to the share of power, workload and returns. A potential unclarity of the relationship between the involved parties is by all interviewees considered a great danger, and should be of prime importance to avoid.

**Management**

The framework also suggests and assumes that the Living Lab entities are operating independently, primarily promoting interaction between and managing the different stakeholders involved in the process (Hertel et al., 2005; Leonard and Sensiper, 1998). As observed, many cases feature for example researchers doing more than one part of the process like both performing the Living Lab setting management and coordination and taking the role of researchers in the quattro helix. As entity states, there should be a clear definition of the roles in this setting, and also leaving researchers to do research and managers to manage.

One major part of the work of a Living Lab entity is to manage not only the collaboration and interaction but also the relation between the interested parties, and especially from a power balance point of view. Both the entities and the companies state the importance of clear-cut properties and positions in the collaborations, as well as the formal or legislative documents and agreements needed to put at clarity to the share of power, workload and returns. A potential un-clarity of the relationship between the involved parties is by all interviewees considered a great danger, and should be of prime importance to avoid.

The Living Labs management is because of not only their physical location but also the background of the involved closely tied to academia in general and the researchers in the analytical model in particular. The collected data shows that the distance assumed and expected in the model is not present in real life – the authors' observations is that the Living Labs executives, supposed to facilitate and emphasize the collaboration between all interested parties in the quattro helix. What is in reality happening is that the Living Labs executives are themselves the researchers in the analytical framework (and more – as stated in the methodology the Living Labs executives the authors have spoken to also share their time with studies and/or lecturing) in addition to the duties of coordinating collaboration in a new, maybe more demanding, context. Upon the testimony of both companies 1 and 2, the authors recognized that the clear position between researchers and manager of the platform is of importance and in the empirics collected unfortunately almost inexistent. Indeed, the tasks of the Living Lab employees regarding management of the platform and of the stakeholders are numerous. The authors can see a need for a larger degree of separation and distinction – as proposed the selection of researchers involved is of the same importance as the selection of what users or industry representatives. In order for everyone to do their best and to get as much out of the collaboration, not only should the most suitable be in place but also do what they are best at. In case with the Living Labs executives that according to the framework are managing the other parties, they are according to observation ending up in a role that is compromising between management, administration, funding and researching among others. In addition to this, Living Labs' personnel are also to a large extent sharing their time with other tasks in the university environment.
Interaction

The Living Labs might be primarily considered a shared context, a facilitator or a network for interaction (Cantoni et al., 2001; Asheim and Magnusson, 2003; Sherwood and Covin, 2008; Fahey and Prusak, 1998). What is offered is the face to face interaction needed for the transfer or tacit knowledge (Holden, 2002) that in contrast to the explicit is very hard to just bring along back to the company, but needs to be absorbed in place. The time and possibility to attend this type of meeting is for small business managers or executives a scarce commodity, but as theory confirms, an increased amount of attendance to this type of interaction improves the ability to absorb the tacit knowledge. In this shared context, with its possibilities to interact intensively, the possibility to enhance the process by gaining trust, interaction and familiarity (Sherwood and Covin, 2008) with other parties in the setting. This assumes that there is a level of dedication high enough from the company's representatives or gatekeepers in order to take part in the shared context, especially in a physical dimension (Cantoni et al., 2001), something that naturally turns out as a matter of logistics as if the situation is as the Living Labs executives and company representatives describe, for example a CEO cannot get involved enough to gain full advantage of what the collaboration can bring. The interaction is the key to success in this setting, and requires presence both in time and number of persons. With the tacit knowledge being hard to transfer and create but in direct interaction (Holden, 2002), it is of utter importance to be able to take part and show presence, something that the both split nature of management roles in company brings and is amplified by the limited time. Combined with the troubles of relaying tacit knowledge (and the value of interaction in the collaboration), it might be a weakness in the process that so few and busy representatives from the industry side is sharing the context offered by the Living Labs.

User-centrism

A stakeholder unmentioned this far is the users and the way that they are incorporated in the Living Labs quattro helix. By being a user-centered research design, the users are an integral part of the theme. What is an interesting detail mentioned by the Living Labs entities is the problems with motivating users that are not on payroll, as many Living Labs entities are non-profit the demand for projects and subjects with a higher-than-average personal involvement is obvious. The problem as shown in the data is that various organizations, entities and by some means biased users prove the point that the Living Labs management has to be as careful in the selection of user representatives in the quattro helix as any of the other shareholders.

Also, what has been highly emphasized by the company 1 and followed on some extent by the company 2 is that unrealistic expectations could be formulated by the group of users. Indeed, according to the companies, requests to the user groups are usually on a large extent basis in order to galvanize and overcome the boundaries of their creativity. This method could be considered as dangerous if the Living Lab management team does not keep the idea development within the framework of feasibility regarding companies’ resources.

The largest value addition of the Living Labs context compared to the classical UIC might be in the company's context, gaining access to the market with the setting's inherent incorporation of end-user input which correctly sorted to avoid biased information provides great value for understanding the market.
Conclusion

In this article, the authors investigated the barriers of UIC in a new kind of setting, the so-called Living Lab. During this process, the authors examined what and why barriers appeared in this new configuration. By taking “classic” occurring UIC barriers from the literature reviewing the subject, the authors recognized numerous recurrent factors. Therefore, a selection has been applied upon those in order to select the ones which seem the most relevant and interesting to take a closer look on. Thereby, the authors recognized some major streams of thoughts among barriers in UIC researches. Highlighted concepts are enhancement of trust, familiarity, interaction (shared context) but also divergence between set of expectations (depending individuals and entities backgrounds, positions or situation into collaboration) and gradual nuances within knowledge management concepts. Therefore, the authors elaborated an analytical framework gathering the previous cited classic barriers in UIC but also knowledge they gained from theoretical views describing the setting and implementation of a Living Lab milieu. This way, the analytical framework is representative of a UIC included into a Living Labs setting but designed regarding the will of the authors to overcome the usual barriers occurring into classic UIC. This framework is therefore emphasizing key points such as the creation of the so-called gatekeepers group gathering different mandatory skills but also the importance of a Living Lab team exclusively focused on the managerial purpose along with the creation of a shared context aiming to enhance tacit interaction. Keeping on sight their deductive approach, the authors elaborated two questionnaires including the previous mentioned concepts and designated to be used into interviews gathering several Living Labs entities and companies closely related to the above. These interviews confirmed some of the majors points thought by the authors while thinking upon the problem but also brought new views about the setting and the final outcome of a UIC in a Living Lab milieu. Interviewees from both companies and Living Lab entities confirmed several insights of the authors, found below.

High importance should be given to the stakeholders in the “quattro helix”. Indeed, having an “end-user” external point of view is crucial into an innovation process and is one the main element brought by a having it into a Living Lab setting. Of great importance also understands the relevance of the creation of a gatekeepers’ group gathering fundamental set of skills such as technological, market and organizational orientations. The set of expectation of the companies confronted to the one from the university part and the type of outcomes the collaboration is developing. Between researchers more likely technology oriented and driven technological development confronted to companies more likely further commercialization of innovation oriented.

Also, some new elements have been brought to the attention of the authors after having collected the empirical data - the fact that a long-term perspective approach of the Living Lab has to be conceived. There is a need for a creation of networking between the different stakeholders for further collaboration or exchange and help of ideas/information/knowledge/know-how as well as the possibilities for companies to network with the other stakeholders but also be helped by other companies themselves in a common project.

Therefore the authors identified new barriers regarding the complete overview of how the UIC in a Living Lab setting is organized such as the clear cut which has to be made between the researchers’ stakeholder and the Living Lab management team regarding the numerous
problems which need full management attention and full objectivity vis-à-vis technological or market orientation. In addition to this, there is also an apparent need of sorting out the market orientation of the user groups in order to gain relevant and useful outcomes. On one hand informing the user group about the constraint and possibilities of the project (on a company resource based view) could restrain their creativity but on the other hand leaving the user group without boundaries could end up to an innovation with low market relevance. Hence, this is important not to “spoil” the users but a quality check regarding feasibility has to be established. The power balance between all the stakeholders, especially if several companies are involved in a project, is of managerial importance. Interests, constrain, set of expectations along with orientation must be taken with the highest consideration by the Living Lab management team and must be considered as the central point of the project enhancing control among stakeholders in order to smoothen the collaboration process. Needed is also the creation of a physical shared context with face-to-face interaction where all the stakeholders are gathering on a regular basis is important in order to ensure the setting of trust, familiarity and interaction but also for the general understanding of what is freshly and newly brought by each party. Barriers such as ambiguity, misunderstandings, conflict of interest between the different stakeholders composing this milieu for innovation could therefore be overcome by an efficient management from the Living Lab.

On a policy level, Living Labs created from the initiative of EU might have the involuntary tendency to reduce costs by lowering means employed (e.g. shortcutting the role of researchers). Also, those might have an approach more based on a passive understanding of problems due to the fact that no financial imperatives are coming into play and do not end-up to creation of concrete solutions (which can be conflicting with the companies set of expectation or reduce the pace of a project).

Finally, the authors have recognized numerous limitations leading to areas if interest while developing this article according to a knowledge gap regarding this particular setting. Despite the fact that numerous researches have been done by scholars upon the UIC, the authors have approached the barriers occurring in UIC with a new approach. The recent EU elaboration of the platform for innovation was a suitable match for this purpose. Therefore, by choosing the EU initiative labeled as Living Labs the authors have been confined into an exclusive setting. It would be interesting to enlarge the scope of research to different sets of milieus for innovations, such as ones independent to EU policies. Also, the authors have chosen to look exclusively on a policy level by concentrating their efforts of analysis to the setting of the collaboration (on a managerial point of view) among the stakeholders within a Living Lab project rather than having an interest in the companies’ managerial abilities. Indeed, although the authors are aiming by this identification of barriers to help further transfer of knowledge back to companies, they are having an interest in having a deeper look into the intrinsic absorptive capacities of companies and further more how companies are managing the conversion of the previously transferred knowledge into commercialization. Therefore, instead of focusing upon a managerial problem on a policy level in the UIC within a Living Lab project, researches would be led upon a managerial problem on a company level once knowledge created within a Living Lab project is transferred to a company. This could be done by concentrating data collection efforts on companies involved in Living Lab project rather than collecting it having managerial orientation of Living Labs like performed by the authors. Finally, the authors are considering of high relevance the possibility to have a deeper investigation vis-à-vis relation among and selection of stakeholders by the Living Labs than
just browsing it as in this article. In this selection, empirical evidence about the group of end-user/market representatives within a Living Lab project and theoretical researches about the process of listening to the voice of the customer from the companies gave the authors interesting ideas of researches that were not matching with the purpose of this article.

References


**Internet references**


Interview guide

Firm level

Basic information about the company

What is the size of your company?
When did your start your venture?
Which industry your company belongs to?
Where is the headquarter of your company established?
What is the turnover of your company for the 2009 fiscal year?
What is the owner –board - management relation in the company?
How has the company developed since its inception?
Has the company changed its role, focus or way during its lifespan?

Organization

Could you describe the organizational structure of your company?
Would you define the organization and flat or steep?
Do you have your own R&D department? Is it standalone, or is it collaborating with others?
What are the other departments?
Is the company involved in any form of alliances? If yes, in what form? How are these influencing the company?

Research, product development, routines

Have you ever outsourced your research activities? If yes, could you describe it?
Could you describe your value chain?
As an SME, would you say that horizontal integration is an advantage?
On a long-term view, if your company would become wealthier, would you change your horizontal approach for a vertical one such as big corporation?

Have you participated in shared R&D programs? In what format?

**Living labs**

What is your definition of the living labs?

How did you receive the awareness of living labs?

Did you approach the living labs or did they approach you?

How were the living labs presented to you?

What can the living labs offer that you cannot do yourself?

Do the living labs have better possibilities to acquire information that is valuable to the company, and if yes – why is this?

Did your come first to your collaborator with a knowledge/idea/insight created “in-house”?

What triggered of your collaboration with the living labs?

Was it your first experience of collaboration with university based research?

Did the government/state help by introducing the living labs initiative?

What were your first thoughts about such a collaboration?

What was your approach towards this collaboration?

**Interaction**

Did you have a person “from the inside” of the company when it came to meet and create links with the living lab facilitators?

How many from each side were included in the project?

How formal was the project regarding interaction etc?

Would you say that you created bonds with the living lab’s facilitators during the process?

To what extent were you familiar with the process, purpose and procedures from the living labs side?

How often did your personally interact during the knowledge creation?
Expectations and trust

Can you say it was a trustful collaboration in between both parties?
How could the trust between the parties involved be increased?
What were your first expectations when you started the collaboration process?
Would you say the result fulfilled those expectations?
Did you feel that the result was enough applicable and specific, or was it too shallow and wide?
Was there a discrepancy in the usability in the result as opposed to your expectations?
Was there a discrepancy in the format in the result as opposed to your expectations?

Collaboration

Did you know where this collaboration was leading you to?
Have you been disappointed in any kind of way during the collaboration?
Could you quantify your level of involvement into the collaboration?
Who were the other stakeholders you were in contact with? End-users? Researchers?
Could you quantify your level of collaboration with the other stakeholders?
For how long did your collaboration with the living lab last?
Out of your personal opinion, was the knowledge/technology you acquired from the collaboration valuable when it arrived inside the company?
Who was in charge to collect the final data/information when it had been transferred to the company?
Was it the same person who was in charge during the creation process?
What was your feeling once the collaboration ended?

Results and effects

Were you feeling satisfied with the innovation stage of achievement once it arrived inside the company?
What was the first step of implementation inside the company?
Could you describe what were the main managerial/organizational turnovers/changes that this new innovation brought to your company?
Have you seen/felt any visible changes once this new knowledge arrived into your company?

Did the decision-makers understand clearly and directly what were the short- and long-term opportunities brought by this knowledge?

**Living Labs level**

- What is your background?
- Studies
- Work experience
- Field
- Projects

- What does your job at the living lab consist of? What is your formal position? Do you share your time at the living labs with another task/workplace?
- Can you give an overview of your responsibilities within the organization?

- How many living labs projects have you been involved in and what was your task in those projects?
- Describe how your living lab is organized in the following aspects;
  - General description of the organization (hierarchy, positions)
  - Organization of the projects
  - Background of the people involved in the organization

- On a policy level, to what extent are you related to government or EU?
  - Are you 100% government funded?
    - Did you start the living lab organization thanks to a EU initiative?
    - Did it exist already before?
    - If yes, on what extent?
• If no, what has been the trigger?
  
  o On what extent the EU is influencing your activities?
  o Do you feel a pressure for results coming from EU?
    • Do you have 100% freedom into your initiative?
    • What are their expectations on a short and long term?
  
• What is the defined “mission” and “vision” of your organization?

• Could you describe the overall conception of a living lab project?
  
  o Settings?
  
  o Stakeholders involved in?
  
  o Roles and motivations of every actor?
    • How do you ensure the commitment of every actor?
    • What is the number and share of representatives from the different stakeholders in a typical project? How does it vary and depending on what?
  
  o Industry
    • How do you get in contact with the industry?
    • What is brought to the collaboration by the companies?
    • How is the (above) processed by your entity?
    • Are you totally aware of the companies' intentions and expectations?
  
  o How do you select the researchers you collaborate with? What is the process of selection?

• What is the distinction in difference between researchers and you?

• What is the selection process?

• How can you verify that they suit the project.

• End users?
  
    • What is the process of selection with the end users?
    • What is presented to the end users?
    • Where in the development process are the end users taking part?
- How is end-user input verified?
- Why do you emphasize the end user?
  - Are companies aware of the importance of the above?
  - Could you describe on which extent every stakeholder is keen on collaboration?
- How is the collaboration in the beginning?
- How trust between stakeholders evolves along the project?
- How would you describe your own involvement in this project?
- To what extent do you have an influence during the collaboration?
- How do you describe yourself:
  - Facilitator?
  - Platform
  - Collaborator with a “management” aim
  - Researchers trying to lead a project
- Could you describe to what extent your job consist of project management and what does it involve?
- Do you consider yourself as a researcher or something that could qualify as a manager of knowledge?
  - What is the border between you and the “research” stakeholders.
- What is in your opinion the primary role of the living lab organization?
  - Creating new knowledge that could be use by companies later on in order to commercialize it or to use it to develop new innovation and then helping on the transfer of this knowledge?
  - Networking companies and individuals?
  - Helping companies to find new stakeholders?
  - In your previous projects, could you insure that the outcomes were a full understanding of a commonly created knowledge or more likely information created and exchanged without understanding of every stakeholders and especially the companies? (companies and researchers)
• Would you say that companies involved in the projects typically are interested in short term results (coming up with new innovation which could be later used for profit, ROI) or are they keener on finding new stakeholders and create a long term benefit (networking)?

• How do you ensure that what transferred is not only information which has been created in a project but effective knowledge with full understanding from companies your collaborate with? What types of follow up-activities are undertaken to verify this?

• How is the trustful relation evolving between the different stakeholders during a project? Is there one that typically leads the project? One that speeds it up? One who is slowing down the process? In your opinion why and who?

• According to theory, three factors are influencing knowledge creation – these are trust, familiarity and interaction. To what extent are these factors taken into consideration in a project setting and management, and how is the above factors ensured.