



UNIVERSITY OF GOTHENBURG

Virtual Settings for Co-Creation in a Living Lab

ESBJÖRN EBBESSON

Master of Applied Information Technology Thesis

Report No. 2009-009

ISSN: 1651-4769

Gothenburg, Sweden, May 2009

Virtual Settings for Co-Creation in a Living Lab

ESBJÖRN EBBESSON

Department of Applied Information Technology

IT University of Göteborg

Göteborg University and Chalmers University of Technology

SUMMARY

The gap between what consumers want and what is actually developed has led to a shift within parts of the ICT industry towards a co-creative innovation process. In response to this, the Living Lab emerged as a setting where all relevant stakeholders collaborate together throughout the whole innovation process to co-create and validate IT-products, the user is perceived as one of the Labs most important assets. However, it is still debated how to best include the user in the innovation process. Virtual settings supported by distributed tools have been suggested as a promising option to provide flexibility for both the developers and users.

This study is performed to investigate how a virtual setting compares to a traditional setting when using methods for idea and concept generation in a co-creative innovation process. In order to enable this comparison, observations are carried out at Halmstad Living Lab in both virtual and traditional settings. A literature study is also carried out to acquire a deeper understanding regarding the area of co-creative innovation processes and user involvement.

This master thesis concludes based on the observations that both the traditional and virtual setting has a lot to offer to a co-creational innovation process. Thus, it is suggested that the virtual setting should be considered as a complement to the traditional. If utilized in that manner, the virtual setting has the potential to both empower the user's involvement while also strengthening the Living Labs innovation capabilities.

Keywords: living lab, user involvement, innovation process, virtual setting, co-creation, distributed tools.

Table of Contents

1. Introduction	4
2. Related Literature.....	6
2.1 The Co-Creative Innovation Process.....	6
2.2 The Living Lab.....	7
2.3 Traditional and Virtual Settings.....	10
2.4 Methods for Idea and Concept Generation.....	12
3. Theoretical framework	13
3.1 User Involvement in Living Lab	13
4. Research Approach.....	15
4.1 Research Setting.....	15
4.2 Data Collection.....	17
4.3 Data Analysis	19
5. Findings.....	21
5.1 Planning and Execution.....	21
5.2 Flexibility in Interaction.....	22
5.3 Group Dynamic	24
5.4 Governance	26
5.5 Quality of Contribution	28
6. Discussion	30
7. Conclusion.....	32
References	33
Figure 1: Stakeholders in the co-creative innovation process.....	8
Figure 2: Types of users in an innovation process.....	9
Figure 3: The CSCW Matrix.....	11
Figure 4: Theoretical framework over user involvement in a Living Lab.....	14
Figure 5: Focus groups carried out in a traditional and virtual setting.....	17
Figure 6: Screenshot showing the platform used during the online focus group.....	18
Figure 7: Themes used during analysis.....	19
Figure 8: Scenario creation in traditional setting.....	21
Figure 9: Persona creation in traditional setting.....	22
Figure 10: Example of a daily summary in the virtual setting.....	27
Table 1: Types of interaction in the virtual and traditional setting.....	22
Table 2: Scenario from the virtual setting.....	24
Table 3: Example of a detailed scenario submitted in the traditional setting.....	28
Table 4: Example of a detailed Persona submitted from the traditional setting.....	28
Table 5: Example of a detailed Persona received during the persona focus group.....	29

1. Introduction

The innovation process of Information and Communication Technology (ICT) products and services has traditionally been initiated and executed in a closed setting with too little or too late interaction with the actual market and users. The gap between consumers' needs and what is actually developed is believed to be one of the reasons why the majority of private and public investments return little to no value (Corelabs, 2007a). In an attempt to address this problem part of the ICT industry are now trying to adapt by opening up their organizational borders, by embracing what during recent years has come to be known as open innovation (Chesbrough, 2003). This involves moving away from their vertically oriented thinking, where one organization can handle all R&D by itself, towards a more horizontally aligned philosophy. In this setting, stakeholders, such as suppliers and customers (von Hippel and Thomke, 2002), are invited to innovate through collaboration. The customers in this scenario can be both partnering businesses and even end-users. The interest for collaborations of this kind can also be found on the global level, having been encouraged by initiatives on the EU level (CoreLabs, 2007a). One such initiative is the foundation of the European Network of LivingLabs, with the purpose of strengthening and increasing the innovative capabilities within the EU by involving the user throughout the whole innovation process in a co-creative manner.

The concept of involving the end-user in the development of ICT products is however not a new phenomenon. Within an organizational setting participatory design (Bødker, 1996) can be seen among other efforts as an early attempt to focus development around the actual users. The focus on the users, as seen in the participatory design approach, has been influential on product development, although it has been noted that important social and political aspects have been watered down due to the change from an organizational setting towards a consumer market (Grudin and Pruitt, 2002). The long-term engagement to the users is also said to have been lost along the way by the designers adopting the participatory design practice.

The co-creative innovation process differs from the traditional innovation process and other cooperative design approaches in terms of how the user is perceived. Instead of moving the development to the user, as seen in for example the participatory design practice, the user is instead moved into the innovation process. Within this innovation process, the user is also often seen as more than a traditional user with needs that have to be catered to; instead the user is seen as a source of innovation (von Hippel and Thomke, 2002). It is from within this setting that a growing interest for the Living Lab emerged, with the mission to further increase the role of the user in the innovation process. The user in this context is not only seen as a user in the traditional sense, but also as a consumer, citizen and worker, in a close collaboration with market and technology (Eriksson, Niitamo & Kulkki, 2005). Within this collaboration, the users are able to co-create and help validate products and services in real life settings; this means that they are involved in the innovation process from the very start to the market launch. The Living Lab as a concept is still maturing, which can be illustrated by the wide range of definitions available (Følstad, 2008), but they all share one characteristic, the focus on the user as an important asset.

Even though a lot of work has been done so far within the Living Lab field (Følstad, 2008), there is still a lack of understanding regarding how to involve the user throughout the co-creative processes and how it affects the innovation process (CoreLabs, 2007a; Ståhlbröst, 2008). To further increase this comprehension and to better support the co-creative process, there is a need to research distributed tools and methods (Schumacher and Feuerstein, 2007). There is also a need to research ways to support users' involvement on their own terms in virtual settings

(Ståhlbröst, 2008). The reason for this is to empower users while simultaneously reaching out to a bigger community. The lack of understanding of how to utilize distributed tools for user involvement can also be seen within the area of innovation fostering techniques such as distributed mass-collaborations and crowd-sourcing. These areas can still be considered to be unexplored, even though numerous successful examples exist ranging from Dell and LEGO who efficiently use digital media to harness consumer creativity, to open source projects such as Apache and Linux (Bughin *et al.*, 2008).

The study presented in this thesis takes place at Halmstad Living Lab [1], where methods for idea and concept generation, such as scenario building and personas, have been tested in traditional settings. During the course of the study, methods such as these are used both in a traditional setting supported by face to face focus groups, as well as in a virtual setting utilizing an open source platform for content management tailored to support focus groups online.

The problem statement of the study is defined as: *How do virtual settings compare to traditional settings when using methods for idea and concept generation in a Living Lab?*

The purpose of this study is to deepen the understanding towards the use of distributed tools by investigating what is gained and what is lost when using methods for idea and concept generation in a virtual setting compared to a traditional setting in a Living Lab.

The thesis is organized as follows: the first chapter provides a brief introduction and background to the problem area. This is followed by a review of related research and the construction of a theoretical framework in chapter two and three. Chapter four describes the method used during the study, while chapter five is dedicated to the analysis and presentation of the findings from the study. Finally, a discussion is carried out in chapter six which is followed by the conclusion of the study presented in chapter seven.

2. Related Literature

In order to address the problem statement a review of literature related to co-creative innovation processes, Living Labs, user involvement, traditional and virtual settings and two methods used in ICT development for idea and concept generation were carried out. The literature was used to get an understanding of the area and to create a theoretical framework to be used during planning of the study, observations of traditional and virtual settings and data analysis.

2.1 The Co-Creative Innovation Process

Involving users in the development of ICT products and services is not a new concept within the field of Human-Computer Interaction and Information Systems. There is a wide range of methodologies featuring user involvement, differing in which users are brought into the development, to what extent they are a part of the design process, and when they are brought in (Bekker and Long, 2000). Participatory design (Bødker, 1996) and cooperative design (Greenbaum and Kyng, 1991) are two examples among others of what can be referred to as highly user centered design methodologies featuring systematic use of methods such as prototyping, observations and scenario building to name a few (Bødker and Iversen, 2002). The co-creative innovation process in a Living Lab (Schumacher and Feurstein, 2007) is very similar to user centered design approaches like participatory design in terms of methods used for user involvement (Bekker and Long, 2000), but not in terms of who the actual user is. The objective of a cooperative design approach, as seen in the past, is to create “quality of life” and sociopolitical values within an organizational setting for and with the actual end-user of the product or service (Grudin and Pruitt, 2002). This highly contrasts to the Living Lab setting, in which the user instead represents a possible user of the product or service. In this setting one of the objectives is to create monetary value through the creation of ICT products or services in a co-creative innovation process. Within the innovation process, the user is also often seen as more than a traditional user with needs that have to be catered to; instead the user is seen as a source of innovation (von Hippel and Thomke, 2002).

The innovation process in a co-creational setting differs from the model commonly used to describe a classic innovation process. There exists numerous models that describe the traditional innovation process, most of them being in a linear fashion consisting of the four building blocks; *research, development, production and marketing* (Kline and Rosenberg, 1986). This model has been highly criticized since it assumes that the source of innovation is research as well as for its lack of feedback paths from users based on the notion that user feedback and evaluations are important parts of innovating (Kline and Rosenberg, 1986). In contrast to this, the innovation process in a co-creative setting focus on continuous interaction with the customer throughout the whole model utilizing different methods for user involvement. This co-creative innovation process can be illustrated by the four stages of *idea, concept, development and market launch* as suggested by Reichert (2002). The model is also often used to describe the co-creative innovation process in a Living Lab (Kusiak, 2007; Schumacher and Feuerstein, 2007; CoreLabs, 2007a), although Kusiak (2007) argues that it can be developed further to better describe the product launch and post implementation activities.

2.2 The Living Lab

An early concept of the Living Lab started to emerge during the late nineties at the Georgia Institute of Technology through the use of rooms enhanced with technology that could be used to gather data about users and interactions with artifacts (Abowd, 2000). Today, the term is used to describe a wide array of different kinds of practices within the ICT field and there exists numerous definitions by different authors and organizations. Følstad (2008) identifies three different kinds of Living Labs through a literature study: *environments where you can experience and experiment with ubiquitous computing*, a *testbed* enabling developers to test software and services outside a production environment and finally *an open innovation platform*. Other authors, such as Eriksson *et al.* (2005) describe the Living Lab as a research and development methodology that represents a user-centric approach to develop and evaluate complex solutions within a real life context. The European Network of Living Labs [2] defines a Living Lab as “both a methodology for User Driven Innovation (UDI) and the organizations that primarily use it” while CoreLabs [3] defines Living Labs as “a system enabling people, users/consumers of services and products, to take active roles as contributors and co-creators in the research, development, and innovation process”. The concept of Living Labs can, based on these various definitions, be seen as a methodology, an organization and/or a system. The definition used throughout this paper is an inclusive perspective looking at Living Labs as a milieu where different methods are used to involve all relevant stakeholders in an open process to co-create and validate IT-products and services in a real world setting.

To support the establishment of co-creative Living Labs in Europe the coordination action project CoreLabs was established in 2006. The project was funded by the European Commission’s Sixth Framework Program (FP6) in an attempt to strengthen the innovation capabilities in the European Union. During the project CoreLabs carried out several studies to investigate the practice of the Living Labs participating in the project. Although there are many definitions of what a Living Lab is, the following five key principles were identified as the core of all operating Living Labs within the study (CoreLabs, 2007b):

- **Continuity:** Creativity is strengthened by experience and collaborations over organizational borders. Experience and collaborations are in turn strengthened over time. Users and partners within the Lab build trust together and accumulate knowledge together, over time.
- **Openness:** Openness is crucial for the innovation process in a Living Lab. It is essential to gather a multitude of perspectives no matter whomever or wherever they are. These perspectives might lead to faster development, new ideas and unexpected business openings in the market.
- **Realism:** Realistic expectations and behavior by users and partners is key to achieve results that are valid for the market. All the stakeholders must see the Living Lab as a natural and realistic environment. The focus of a Living Lab should be on real users in a real-life context since this is what distinguishes the Living Lab from other co-creative environments.
- **Empowerment of users:** The innovation process is highly user centered and the user is a fundamental asset for the Living Lab. It is therefore important to stimulate users to keep them motivated and invested in the innovation process.

- **Spontaneity:** In order to develop successful products and services it is not enough to explore needs and requirements in the beginning of the innovation process. The Living Lab must have the ability to detect user's reactions and allow for input through the whole innovation process. Not only from the users, but also from all the stakeholders.

One of the most important elements of a Living Lab approach is the interaction between all the stakeholders along the value-chain (CoreLabs, 2007b). This interaction can be described as a merger between market, technology and society in a collaborative fashion (figure 1) (Eriksson *et al.*, 2005). Being that two parties wouldn't be enough to generate an innovation with sufficient impact on the target audience, all three parties are required to participate in the co-creative innovation process.

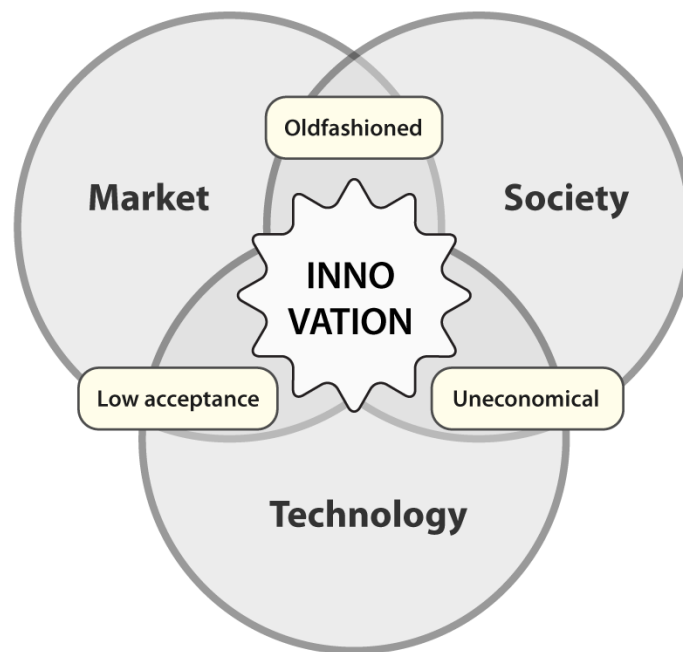


Figure 1: Stakeholders in the co-creative innovation process (Eriksson et al., 2005).

Collaborations that only include society and market will end up in old fashioned solutions, while excluding the market might end up in solutions that aren't economically justified. Finally, collaborations exclusively between technology and market without a focus on the consumers point of view has a tendency to result in products that the consumers aren't likely to buy (Eriksson *et al.*, 2005). One of the core advantages of the Living Lab approach that differentiates it from traditional user centered methodologies is the ability for users to be a part of the development from start to end through a co-creative innovation process and the testing in real life context (CoreLabs, 2007b). The users' ability to contribute to this collaboration is highly dependent on their background and knowledge base. Almost all users are able to bring something to the table but it is important to take into consideration what kind of users they are and what kind of knowledge they bestow. The users' characteristics and their ability to contribute within a development or innovation process can be classified in different ways depending on what kinds of characteristics that are focused on. One example of how the users can be classified is in groups based on their application and object knowledge (Reichwald *et al.*, 2004). Application knowledge refers to their experience with a product or service through use, while object knowledge refers to

knowledge about the actual underlying technology or mechanic of a product. The users can, based on this, be divided into the categories of intuitive, pro, freshman and nerd (figure 2).

	Low Object Knowledge	High Object Knowledge
High Application Knowledge	Intuitive	Pro
Low Application Knowledge	Freshman	Nerd

Figure 2: Types of users in an innovation process (Reichwald et al., 2004).

Another way of classifying users is illustrated by Eason (1987) who divides them into the groups of primary, secondary, and tertiary users. Frequent users of a product or service belong to the group of primary users, occasional users are identified as secondary users, and finally, tertiary users are those users who are affected by the introduction of the product or might influence a potential purchase. Another classification of users within an innovation process can be seen in the shape of the term “lead user” who was introduced by von Hippel (1986) to describe users with a strong present need, whose contributions can be used to predict needs that will become common in the future, in order to enable businesses to develop products better suited for future markets. As an addition to the classification of users Reichwald *et al.* (2004) also identifies three different kinds of contributions in shape of *decision*, *information* and *creation* activities in a co-creative innovation process:

- **Decision:** During decision activities users are able to decide or evaluate given facts, this can be done by, for example, surveys or voting systems.
- **Information:** Information activities enable the user to express needs, preferences or solutions to problems. A common way of doing this is by the use of focus groups and idea competitions.
- **Creation:** During a creation activity the user is able to be creative and is allowed to come up with their own solutions and designs in creative ways, common methods used for creation activities are mock-ups and prototypes.

The toolbox of methods used to support involve the users and support the three levels of contribution is very extensive featuring anything from brainstorming sessions, scenario building and persona creation to field testing in real-life contexts (Kusiak, 2007). The setting where the methods can be incorporated range from traditional face to face activities such as focus groups and workshops to collaborations in virtual settings supported by distributed tools (Schumacher and Feuerstein, 2007).

2.3 Traditional and Virtual Settings

The Living Lab approach enables the user to be a part of the whole innovation process by incorporating a wide range of methods for user involvement (Schumacher and Feuerstein, 2007). These take place both in traditional face to face settings such as focus groups and workshops and in virtual settings supported by distributed tools. The virtual settings also enable the Living Lab to reach a bigger community (Schumacher and Feuerstein, 2007). There is however a lack of understanding regarding how to best involve the user throughout the co-creative innovation process both in the traditional and virtual setting and how it affects the innovation process (CoreLabs, 2007a; Ståhlbröst, 2008). To support users on their own terms and to promote their involvement it is also important to develop and conduct research regarding tools that can be used by users on their own premises (Ståhlbröst, 2008). In order to illustrate the differences in flexibility in terms of interaction available to the users, the use of a focus group will now be used to illustrate what a traditional setting for user involvement might look like. Followed by a brief introduction to what a virtual setting supported by distributed tools might offer to a Living Lab.

2.3.1 The Focus Group as a Traditional Setting

The traditional use of a focus group requires all the participants to be at the same place at the same time to interact together and offers little flexibility in terms of ways to interact apart from the face to face interactions that occur during the meetings. The focus group requires a lot of planning ahead and resources to be successful and includes room-hire, travel costs, refreshments and the ability to schedule participants to meet up at the same time (Bloor *et al.*, 2001). The use of focus groups are a popular way of assessing qualitative data from group discussions in different context ranging from marketing to political campaigning (Preece, Rogers and Sharp, 2007). Although not widely adopted, they have also been used in software development (Kontio, Lehtola and Bragge, 2004; Nielsen, 1997). The number of participants normally vary between six and eight, although some prefer both smaller or larger groups, dependent on logistics or the purpose of the activity (Bloor *et al.*, 2001). During the session participants interact directly with one another to discuss and come up with new ideas that might not have been discovered in a different setting (Bloor *et al.*, 2001; Preece *et al.*, 2007).

Group dynamics and composition is vital when selecting participants for a focus group since there has to be sufficient diversity to encourage discussion. Bringing together an overly diverse set of individuals might result in a focus group's inability to provide sufficient depth of information due to too diverse experiences, views and meanings between the individuals. It is preferred to form groups without conflicting views, since groups featuring participants with too diverse opinions might lead to conflicts that undermine fruitful discussions (Bloor *et al.*, 2001). The ability to put together a balanced group of people that results in good group dynamic is a very important part of facilitating a successful focus group.

Focus groups should appear to be unstructured and relaxed for the focus group members, even though the facilitator should follow a plan of activities and goals for information gathering while governing the group (Preece *et al.*, 2007; Nielsen, 1997). The focus group facilitator should always seek to guide the group, never to control or actively lead the discussion. This does not mean that the group doesn't need to be governed. The facilitator must make sure to avoid that individuals dominates the group discussions, while encouraging the more timid participants to contribute (Bloor *et al.*, 2001). This is to ensure that dominant participants do not overly influence group interactions and consensus. According to Massey and Wallace (1991) focus groups can perform better than individual interviews in generating original responses, and is at

least as good as individual interviews in terms of quality. It's not uncommon to include polling techniques, brainstorming or other methods for idea and concept generation through the course of a focus group.

2.3.2 Virtual Settings Supported by Distributed Tools

The virtual setting is quite different compared to the traditional setting of a focus group in terms of flexibility when it comes to possible ways of interaction. This can be illustrated by the extensive research conducted within the Computer Supported Co-operative Work (CSCW) field regarding groupware. The term groupware has been used for a long time to describe applications that support shared collaborations between individual users of a system (Dix, Finlay, Abowd and Beale, 1998). The term can be used to describe a wide range of systems from email, video conferencing and forums, to shared editors and they can be classified in several ways, most commonly by the use of a time/space matrix. The matrix (figure 3) makes it possible to visualize how, where and when a specific type of groupware operates depending on the context of a system's use (Baecker, Grudin, Buxton and Greenberg, 1995). The time/space matrix is however not limited to computerized forms of cooperation; it can also be used to illustrate how non-computer communication technologies like letters and face to face conversations fit into the time/space matrix (Dix *et al.*, 1998).

	same place co-located	different place remote
same time synchronous	<p>Face to Face Interactions Decisions rooms, single display groupware, roomware etc.</p>	<p>Remote Interactions Video conferencing, instant messaging, chats, shared editors, shared desktops etc.</p>
different time asynchronous	<p>Ongoing Tasks Team rooms, group diaplys, shift work groupware, etc.</p>	<p>Communication & Coordination E-mail, bullentin boards, version control, blogs, group schedules asynchronous conferencing etc.</p>

Figure 3: The CSCW Matrix, based on Baecker *et al.* (1995).

The virtual setting in a Living Lab enables the user to be a part of the co-creative innovation process by tools distributed though the Internet (Schumacher and Feuerstein, 2007). The term “distributed tools” is very wide and is used within a Living Lab to describe tools that can be used over the Internet to integrate the user into the innovation process. A few novel examples can be seen in the shape of toolkits that allows the user to develop and customize their own products (von Hippel and Katz, 2002) or the use of mass collaboration tools like Wikipedia or other community platforms (Bughin *et al.*, 2008). An example of a type of community platform is the web content management systems (WCMS). These platforms offer both flexible solutions to manage and share data through digital media (McKeever, 2003) and a varying range of groupware support. There is a wide range of WCMS available with Drupal, Wordpress and Joomla dominating the present market of open source WCMS (Shreves, 2008). The three market leaders all feature different kinds of groupware support, enabling the logged in users to both interact in a synchronous and asynchronous manner (figure 3) in shape of blogs, e-mail, forums, chats, messaging and shared editors to name a few of the possible options.

2.4 Methods for Idea and Concept Generation

The methods of scenario building and use of personas have been chosen during this study to illustrate two methods that can be incorporated into the development of ICT products and services in a Living Lab. This is by no means the only two possible methods to incorporate during the innovation process in a Living Lab (Kusiak, 2007; Schumacher and Feuerstein, 2007) but serves the purpose well of illustrating two common practices in ICT development.

2.4.1 Scenario Building

Scenario building is a method used to tell stories about users and their activities, the scenarios is told in an informal and narrative fashion to help the user describe a context of use. The scenario also acts as a mediator for communication with the designer in an early stage of a development process (Carroll, 2000). Like a good story, a scenario is more than a sequence of events; it also has an interesting plot and a goal, which in turn makes the scenario depict the interactions between the user's goal and actions (Potts, 1995). All scenarios consist of a couple of key elements (Carroll, 2000), first and foremost it has a setting where the story is being told, and the setting includes actors with a goal or objective. To advance the story and to uncover the above mentioned plot a series of the user or systems actions and events that occur is described. This practice lets the user create with a purpose, and that purpose helps them to be selective, detailed, and focused while maintaining focus on their task of creating a scenario (Bødker, 2000). As with interviews the outcome of scenario sessions varies, open-ended scenarios tend to results in a wider variation of stories while closed scenarios are more detailed by nature. Critics argue that even though scenarios constructed by potential users of the new product might seem reliable, the stories can be based on misconceptions and contain unrealistic assumptions about the context and performed tasks if not empirically grounded with further data (Grudin and Pruitt, 2002).

The scenarios are often generated through the use of focus groups, workshops, interviews or brainstorming sessions and they can be used during most of the design process. The use of scenarios is often a first step to procure requirements from stakeholders (Preece *et al.*, 2007). Usability testing of prototypes, plus and minus scenarios to enable discussion or potential pros and cons of a future product or as an early design activity to find potential solutions is three activities where scenarios might be a fruitful activity (Bødker, 2000).

2.4.2 Personas

Personas are archetypes of potential users and contain very specific and detailed descriptions of hypothetical users, this is a way of tackling the problem of designers designing for themselves or based on assumption, the persona gives the designer something concrete to relate to and can be seen as a mediator for communication (Cooper, 1999). The description of the persona should be detailed, very specific and not idealized, to keep it realistic. In most cases one persona isn't enough, although it might be beneficial to choose one primary persona that represents a larger part of the target group (Preece *et al.*, 2007).

Although the use of personas is intended to give designers something very concrete to relate to during the design process, Blomquist and Arvola (2002) highlights the danger of separating the creation of personas from the rest of the design process, this might lead to designers not fully embracing the use of personas and neglecting to use the personas for what they were intended. At the other end of the continuum is the designer that embraces the use of personas to the extreme by replacing other user centered methods and critical product evaluations needed to empirically ground data (Grudin and Pruitt, 2002).

3. Theoretical framework

In order to help plan the study and act as guidance through observations and data analysis a theoretical framework was created based on the literature findings related to traditional and virtual settings for user involvement in a Living Lab setting.

3.1 User Involvement in Living Lab

The ability to involve users and partners over time is an important part of all Living Lab settings. This also requires a setting that enables the user to be spontaneous (CoreLab, 2007a), and to let the users take part of the innovation process on their own terms (Ståhlbröst, 2008). This clearly relates to what kinds of *flexibility in interaction* that is available to the user taking part in the co-creative innovation process and how well these types of interaction enable the user to be a part of the process on their own terms. This theme is especially interesting when comparing a virtual setting to a traditional setting, since a traditional setting might offer spontaneity and realism in shape of face to face meetings at specific times, while a virtual setting; dependent on its composition of groupware (Baecker *et al.* (1995) might offer *flexibility in interaction* and spontaneity.

The ability to involve the users over time and on their own terms is also associated with resources and planning. Activities in a traditional setting require quite a lot of planning in shape of getting in touch with all participants and scheduling them for specific events, and resources in terms of room-hire, refreshments, and travel costs (Bloor *et al.*, 2001). This puts pressure on both the facilitator of the activities and the user. The virtual setting offers completely different types of interaction based on how it is planned and carried out, which makes *planning and execution* of the activity an important aspect of user involvement in a Living Lab.

To successfully include users in a co-creative innovation process a setting that stimulates discussion and creativity is required. In a focus group this is achieved by good *group dynamic* and *governance* of the group (Bloor *et al.*, 2001). The group dynamics is highly dependent on the group's composition, it is important that the participants are diverse enough to stimulate discussion and creativity while avoiding too conflicting views (Bloor *et al.*, 2001). The governing or guiding the participants is an important task in a focus group, done in an effort to both keep the participants on track (Preece *et al.*, 2007; Nielsen, 1997) while trying to avoid that the group is being dominated by overly influential participants (Bloor *et al.*, 2001). It is not uncommon that methods for idea and concept generation are incorporated in the focus group to further enhance or tap into the participants' creativity; examples of this can be seen in terms of methods like brainstorming and scenario building.

Reichwald *et al.* (2004) define the three different levels of contribution from users in a co-creative innovation process as decision, information and creation activities. They further identify four different kinds of users: intuitive, pro, freshman and nerd (figure 2), based on their familiarity with application and object knowledge. Other authors defines users by other *user characteristics*, such as Von Hippel (1986) who introduce the term "lead user", and Eason (1987) who base his definitions of primary, secondary and tertiary users on how close relation the users have to a system. Regardless of what definition is chosen, the choice of users and type of activity will reflect on what kind of contributions that is being made. This makes it important to reflect over the purpose of the activity, what kinds of users to involve and what the desired result of the activity is. Therefore it is important to keep *user characteristics* and types of activities in mind

while selecting which participants and methods for user involvement to incorporate in the innovation process.

The desired result of an activity also reflects back to what the actual activities are supposed to deliver. The aim of a focus group is to create a setting that stimulates discussion (Bloor *et al.*, 2001). While methods such as scenario building (Carroll, 2000) and personas (Cooper, 1999) both aim to produce concrete scenarios that showcase the use of a product or service and archetypes of potential users, both have very distinct characteristics. Since scenarios and personas are dependent on the details of these characteristics (Carroll, 2000; Cooper, 1999), the *quality of contribution* might prove to be an important factor to take into consideration when comparing the use of methods in different settings.

Theme:	Indicated by:	Source:
Flexibility in Interaction	Interactions available to participants.	CoreLab, 2007a; Ståhlbröst, 2008; Baecker <i>et al.</i> , 1995; Bloor <i>et al.</i> , 2001
Planning and Execution	Ease of planning and executing the activity.	Bloor <i>et al.</i> , 2001
Group Dynamic	Group composition and flow of discussion.	Bloor <i>et al.</i> , 2001
Governance	Ease of governing or guiding activities.	Preece <i>et al.</i> , 2007; Nielsen, 1997; Bloor <i>et al.</i> , 2001
User Characteristics	The characteristics of participating users.	Von Hippel, 1986; Eason, 1987, Reichwald <i>et al.</i> , 2004;
Quality of Contribution	Level of detail of what is being contributed.	Carroll, 2000; Cooper, 1999

Figure 4: Theoretical framework over user involvement in a Living Lab.

4. Research Approach

Qualitative methods are common within the social sciences to aid researchers in studying social and cultural phenomena in contrast to quantitative methods that enable studies of natural phenomena (Myers, 1997). Qualitative research methods help the researcher to understand social and cultural contexts, an understanding that largely is lost when textual data is quantified. The comparison between two different settings, as being done in this study, could possibly have been done by an attempt to compare quantified data. The researcher however chose to carry out a qualitative study, based on the assumption that the data required to address the problem statement mainly is generated through observations of social interactions, and that a qualitative analysis of the data would be more insightful than an analysis of quantified data, since the object of study were how activities in two different settings occur. Another way to address the problem statement would have been an interview study with Living Lab practitioners and users with experience of virtual settings in the early stages of the innovation process, but since there is not much experience within the Living Lab field related to virtual settings this was not an option.

Research is always based on an underlying assumption about what can be considered as valid research, to be able to fully adapt a research method, it is important to know what these assumptions are (Myers, 1997). Chua (1986) identifies three different paradigms of qualitative research based on the underlying philosophy: positivist, interpretive and critical. Myers (1997) argue that the interpretative researcher in the information system field typically tries to understand the context of the information system and how it effects and is affected by process and context. The interpretative paradigm therefore provides a good foundation for observing and understanding the processes such as idea and concept generation in different context.

The selected research method for the study presented in this paper can therefore best be described as a qualitative interpretive study investigating the use of methods for idea and concept generation in a traditional and a virtual setting at Halmstad Living Lab [1].

In order to build an understanding regarding Living Labs, user involvement and traditional and virtual settings for user involvement a study of related literature was carried out. The study resulted in a theoretical framework (figure 4) covering themes related to user involvement in traditional and virtual settings in a Living Lab. The framework was used as a guide for planning, observations when collecting data and during data analysis. The data collection took place during four focus groups; three of them took place in a traditional setting with face to face meetings and one of them took place online in a virtual setting supported by the use of a web content management system (WCMS). The purposes of the focus groups for the study were to utilize methods were users could be involved. The focus groups in a traditional setting were carried out first, to provide guidance for how to incorporate the methods and how to facilitate them in the virtual setting.

4.1 Research Setting

The study was planned and executed at Halmstad Living Lab. As follows Halmstad Living Lab is introduced and the two different settings used during the study are described.

Halmstad Living Lab [1] is a co-operation between a multidisciplinary team of researchers, partners from the industry and non-profit organizations and is hosted by Halmstad University. The focus of the Lab is to enhance the innovation process for companies while providing value

adding IT-innovations to the consumer. The Lab is currently operating within the healthcare and media industry with several funded research projects. The models, methods and tools used in the Lab covers user involvement in every step of the innovation process and therefore concern both the creation and validation of new innovations.

The first step of creating the two different settings used during the course of the study was to decide what methods for idea and concept generation to compare. The area of methods that support idea and concept generation in a Living Lab is wide, ranging from simple brainstorming sessions, scenarios and personas to the use of mock-ups (Schumacher and Feuerstein, 2007). Since the aim of the study was to compare the use of methods in a traditional and virtual setting, the methods of scenario building and personas were selected. This is due to the fact that they both require interaction by the participants of the activities to be constructed while also resulting in something concrete that can be compared (i.e. the scenario or persona being created by utilizing the methods). It would also have been interesting to compare methods such as brainstorming and other idea generation activities. The comparison between the two settings would however have involved estimations of how innovative or groundbreaking the ideas were, something that would have needed extensive research and experience. The next step was to create the actual settings to compare.

4.2.1 The Traditional Setting

A common way of involving users in a collaborative fashion in development is by the use of face to face activities such as workshops or focus groups (Preece, Rogers and Sharp, 2007). Traditional focus groups, where the participants meet up at the same place and at the same time were therefore selected to represent a traditional setting. The face to face focus groups where the scenarios and personas were created was carried out in a conference area setting, supported by whiteboards and secluded areas where participants could form smaller groups and discuss without interfering the other participants.

Since focus groups were selected as the setting it was important that the composition of the focus group could be said to represent a valid focus group. Focus group participants are often purposively picked to match a predefined background characteristic, this is also often the most important characteristic (Bloor *et al.*, 2001). To form representative focus groups with shared backgrounds, users from Halmstad Living Labs network of end-users were contacted and used to form two groups. Since the shared backgrounds matched the purpose of the specific focus groups, they could be seen as valid representations of focus groups.

4.2.2 The Virtual Setting

The most important requirement kept in mind while deciding how to set up the virtual setting was that it had to be able to support both the ability for the Living Lab to involve users over time to support continuity while also offering a lot of flexibility and freedom to individual users. This made online conferencing or other types of groupware that only support real time communication and collaborations insufficient. Instead the choice fell upon a community platform in shape of a WCMS. To provide cost efficient alternatives for creating the virtual setting and to promote openness, the three market leaders in open-source WCMS (Shreves, 2008), Drupal, Joomla and Wordpress were examined further. All three proved to be valid options for the purpose of involving users in a co-creational innovation process since they all provided flexible tools for interaction and content creation in shape of support for different kinds of groupware. Finally

Drupal [4] was selected due to the ease of administration and customization through its modular structure.

Drupal modules [5] that supported synchronous and asynchronous remote communication were then used to create an environment that enabled users to take part in the focus groups on their own terms. Most of the modules used were core modules, these modules allowed for basic content creation, content management and interaction in shape of forums, comments, messaging and polls and is part of the basic Drupal installation. To further customize the platform a couple of external modules were added and modified to enable real time chat between participants and submission forms to support the creation of personas and scenarios. Drupals administration panels allowed for basic customization and administration of themes, modules, languages, and users but also an overview of user activity on the platform.

At first it seemed like a good idea to use the same focus group participants in both the traditional and virtual setting. Since this would have made sure that the participants all had the same user characteristics. However this would have meant that all the participants would have had prior experience of creating scenarios and personas, which probably would have ended up skewing the result of the study. Therefore a new set of participants were selected. While selecting the participants for the virtual setting an additional characteristic came into play, computer literacy. This since computer literacy might end up affecting some participants' ability to participate in activities carried out online (Bloor *et al.*, 2001; Nielsen, 1997). The participants for the online focus group were then purposively selected based on background experience and computer literacy to create a well rounded group with computer literacy ranging from high to low.

4.2 Data Collection

To provide sufficient data for analysis four focus groups were carried out, three in a traditional setting and one in a virtual setting. Data was gathered during the focus groups in the traditional setting by use of video, photos, audio recordings and notes taken during the focus group. All of the activities also resulted in deliverables in shape of sheets of papers with the generated personas and scenarios, which was photographed or digitized for storage. This provided a comprehensive collection of data that could be used in a later stage for further analysis.

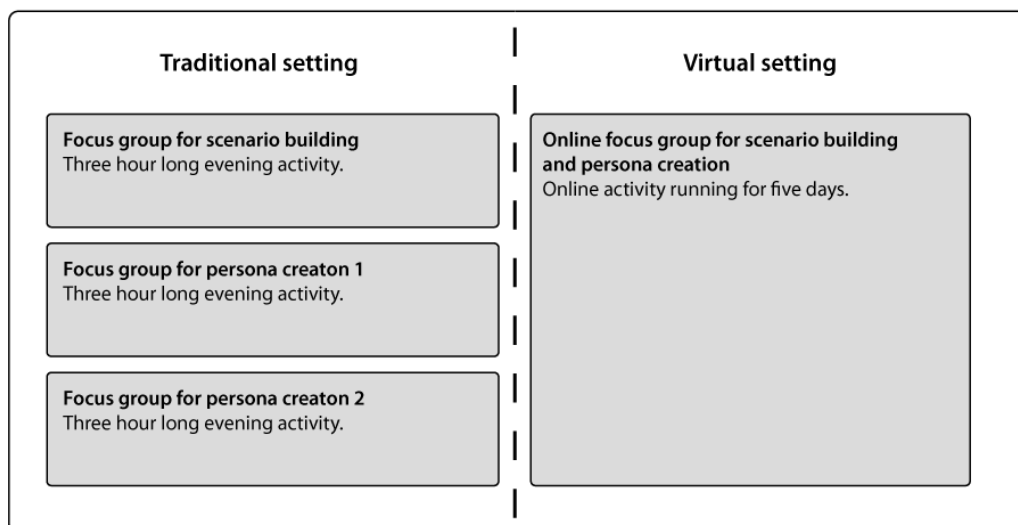


Figure 5: Focus groups carried out in a traditional and virtual setting.

The focus group for scenario building in a traditional setting took place within the Secure at Home – Living Lab project, a VINNOVA funded research project carried out by Halmstad Living Lab. The focus group was organized as a three hour long activity on the 15th of October 2008 where a business representative from Free2Move a SME specialized on wireless communication met seven primary users between the ages of 20 to 45 years old representing five different sporting communities. The focus group was organized and executed by three representatives from Halmstad University. The researchers role during this activity was to help organizing and moderating the scenario building activities while collecting data. The practical purpose of the activity was to generate ideas about how the business can develop and tailor an ICT product using Bluetooth technology to enable wireless communication for sporting practitioners.

The two focus groups for persona creation in a traditional setting took place within the Secure at Home – Smart Locks project carried out at Halmstad Living Lab. The Secure at Home – Smart Locks project was also a VINNOVA funded project with one of the objectives to support and empower elderly people by the creation of ICT services and products. Seven primary users between the ages of 50 to 60 years old were, during the focus groups tasked to create personas representing primary and secondary users. Both of the focus groups were organized and executed by the researcher. The first focus group took place on the 10th of November 2008, and the second focus group took place two weeks later, on the 24th of November.

The focus group for scenario building and persona creation in a virtual setting took place using a customized WCMS. The purpose of the focus group was to generate scenarios and personas related to the use of e-newspapers, an area related to the Media IT [6] group at Halmstad University and the UbiMedia project [7]. During the focus groups the nine participants between the ages of 20 and 35 were asked to create and discuss personas for e-newspaper users and possible scenarios describing the use of e-newspaper. The focus groups were organized as ongoing activities spanning from May 6th to May 10th, during this period of time all participants were free to log in and take part of the focus group material whenever they wanted to.



Figure 6: Screenshot showing the platform used during the online focus group.

All data generated through the use of the web CMS during the focus groups in the virtual setting was saved in a database with timestamps. Deliverables in shape of personas and scenarios were saved in the database as well to provide easy access during analysis. During the focus groups the researcher also took notes continuously.

4.3 Data Analysis

When dealing with qualitative analysis of data it is important to reach a balance between a systematic approach to analyze the data and intuition (Cornford and Smitherson, 2006). This can be seen to represent the two different sides of a continuum while dealing with analysis of qualitative data, where a middle ground is preferred in most cases. There is also a danger that techniques used for content analysis leads to an overly systematic process with a focus on specific words or wordings which might produce a distortion of the data dependent on how respondents utilize their vocabularies. To minimize the risk of this kind of data distortion the researcher made memos during the activities to aid the process of analysis in a later stage. Memos can be a good way of summarizing what you did and how you did it, while also containing hunches and ideas of the meaning of the data you collect (Myers, 2009).

There are many different ways of analyzing and interpreting qualitative data, each and all of them with different prerequisites and uses, themes to examine and analyze can either be uncovered through examining the data or by theoretical studies (Myers, 2009). To aid the process of analyzing the data from the traditional and virtual settings the researcher therefore decided to adapt parts of the theoretical framework uncovered during the literature study (figure 4).

For the purpose of analysis during the study a four step coding model inspired by Myers (2009) six step coding model were created. Myers model consists of *sampling*, *identifying themes*, *building codebooks*, *marking texts*, *constructing models* and *testing models*. The model seemed very rigorous and robust and is meant as a framework for how to analyze qualitative data. In this case however, the gathered data isn't limited to interview material and large portion of it is based upon observations, which made some of the steps in Myers model not fit for the purpose of the analysis carried out during this study. As follows the four steps inspired by Myers model that were carried out during the analysis in this study will be described in detail.

Theme:	Indicated by:
Flexibility in Interaction	Interactions available to participants.
Planning and Execution	Ease of planning and executing the activity.
Group Dynamic	Group composition and flow of discussion.
Governance	Ease of governing or guiding activities.
Quality of Contribution	Level of detail of what is being contributed.

Figure 7: Themes used during analysis.

Identification of themes: During the first step of the analysis the themes that were of interest during observation and data analysis were identified. This was made during the literature review

in the beginning of the study that resulted in the theoretical framework (figure 4). All of the themes in framework seemed to apply for both observations and analysis except user characteristics. The user characteristics theme only seemed to apply for when actually planning the activities. This phase resulted in a framework used for analysis (figure 7). The use of the theoretical framework could be seen both as a guide for the researcher during observations, but also as a way to strengthen the reliability of the study. If someone were to replicate or carry out a similar study, the theoretical framework would enable the researcher to both know what to focus on during observations and also while analyzing the data.

Sampling: After carrying out the observations during the focus groups in the traditional and virtual setting the data that had been collected were prepared during the sampling phase. This included gathering and organizing notes of observations, video and audio recordings and the received scenarios and personas.

Marking texts: To enable the marking of relevant findings, the themes from the framework used for analysis were used to identify relevant observations from the activities. During this phase the audio and video material were compared to the notes made during the focus groups while complementary notes were being made based on new findings. The notes were then color coded based on their corresponding theme to enable an easier comparison. Findings from the audio and video recordings were then transcribed. Some of the findings were also hard to categorize since they bordered between several different themes, in these cases the findings were allowed to belong to several different themes.

Comparison of themes: The marked up material made a comparison between all the themes possible, this enabled the researcher to discover similarities and differences regarding what are gained and what are lost between the two settings. In some cases it was very easy to spot similarities and differences between themes, such as the case of *flexibility in interaction* were it was easy to judge how the participants interacted, and how they chose to interact by just observing. While other themes, such as *group dynamics* proved to be harder, in these cases the researcher had to rely on “gut feeling”. This made the researchers ability to judge and draw conclusion a critical part of both observation and analysis. After the comparison key quotes from the collected data were then used to illustrate significant findings in the different settings.

All in all, some significant changes were made to Myers six step model to better reflect this study, the steps *building codebooks* and *identify themes* were merged and replaced by *identification of themes*. Further modifications to the model were made by renaming *constructing models* to *theme comparison*. Myers (2009) describes the *construction of models* as “involves identifying how the themes, concepts, beliefs and behaviors are linked to each other”. This is also what is being done during the *theme comparison*; the reason of the change of name was just to better reflect this study.

5. Findings

The analysis will illustrate a comparison between the traditional and virtual setting based on the theoretical framework used during the data collection and the analysis.

5.1 Planning and Execution

The number of participants in a focus group normally varies between six and eight (Bloor *et al.*, 2001). The amount of participants sometimes makes it complicated to set dates for the focus group in the traditional setting and a lot of time is spent just trying to find the same opening in everyone's schedules. This was also the reason why all the activities in the traditional setting were held in the evenings. In comparison, it was much easier to schedule participants for the focus group in a virtual setting, since they could plan their own involvement during the five day long activity.

Focus groups in virtual settings tend to be cheaper and more resource efficient than focus groups in a traditional setting since equipment, refreshments, room hire and travel costs that are vital for a traditional setting can be replaced by a much cheaper virtual setting (Bloor *et al.*, 2001). This is also true to some extent in the comparison of the virtual and traditional setting during this study. Both the traditional and virtual setting required a lot of planning. In the traditional setting, presentations and activities had to be prepared beforehand and the conference rooms had to be scheduled. Due to the activities being held during the evenings, making it so that participants had to skip dinner in order to make it on time to the activities, light refreshments and coffee had to be provided. The virtual setting also demanded a lot of preparations, most in terms of configuring and customizing software and setting up the platform, which in some cases were very time consuming because of necessary coordination with the IT staff that ran the servers utilizing the WCMS platform.



Figure 8: Scenario creation in traditional setting.

5.2 Flexibility in Interaction

The two different settings offered very diverse ways of communicating and interacting between the participants; in the traditional setting the participants were limited to synchronous co-located interaction, also referred to as face-to-face interaction. While the virtual setting enabled the participants to interact with each other using groupware, supporting both synchronous and asynchronous remote interaction (table 1).

Table 1: Types of interaction in the virtual and traditional setting

	Traditional setting	Virtual setting
Synchronous	Face to face interaction	Real-time chat
Asynchronous		Forums, Comments, E-mail, Site-wide messaging, Submission forms.

The interaction between the participants in all of the focus groups in the traditional setting took place in two forms, large group discussions where all participants were present, and teamwork in smaller groups. All of the focus groups in the traditional setting started out with a group discussion around a conference table, where the evening's agenda was presented and discussed. The idea and concept generation took place in the shape of teamwork with two to four members, each group relocated into more secluded areas where they created personas and built scenarios. The work was then presented by the participants in a big group discussion towards the end of the evening where everything was summarized.



Figure 9: Persona creation in traditional setting.

In the virtual setting, all material regarding the focus groups agenda and how to communicate with other participants was presented on the front page the first time they logged in. The presentational material contained informational texts, inspirational videos and links to other online sources with more information. The participants were then able to interact with other participants. They could use private messages or real time chat to talk to one another and the focus group leader. The forums provided a space for discussions, and to supply the ability to

comment on previous posts or personas and scenarios, which were submitted by a form. Even though they were given all these options, the participants seemed to favor asynchronous forms of communication and used this to comment and discuss in the forums. Very few of them used the real time chat or private messaging. On the rare occasions where someone did use the chat, it was to ask the facilitator for guidance:

Joakim: "I would like to see more examples of scenarios"

Facilitator: "Oh okay, I'm on it"

Facilitator: "There you go, there is a couple of examples in the scenario forum"

Joakim: "Oh, taking a look at them"

Joakim: "Okay, so the purpose is to use personas in the scenario? :)"

Facilitator: "You can use personas, yourself or pretty much any fictional character; do what serves the purpose best"

The participants were very straight to the point and always kept to the topic of the focus group in the chat. In contrast to this the participants in the traditional setting were very conversational during the breaks between the activities where they were also served coffee and refreshments.

Towards the end of the first focus group for persona creation in the traditional setting some of the participants mentioned that they felt a bit pressured and stressed during the focus group. They also clarified that this wasn't caused by the lack of time since they felt that they wouldn't have been able to improve their personas even if they were given more time. Instead they explained that their stress was caused due to a lack of time to reflect, because they didn't want to rush the work with the personas. None of these issues were mentioned during the activities in the virtual setting. In relation to this, Bloor *et al.*, (2001) argues that focus groups in virtual settings often encourage reflection, since participants are able to let opinions and information from other participants sink in before contributing. This can perhaps be illustrated by some of the very detailed contributions and commentary made by participants in the virtual setting.

The flexibility in interaction possibilities in the virtual setting also made it possible for the participants to plan their own schedule of when and how to contribute. The virtual setting gives time for reflection, since the participants were able to log on and share their thoughts without being bound to a specific time. This contrasts to the traditional setting where the activities are organized into a specific order on the agenda at a specific time and date, restricting any flexibility of schedule or reflection. The participants of the virtual setting didn't seem to favor any specific time of day to log on; there was activity from early morning until late night.

Focus groups in a virtual setting have been criticized due to requirements of computer literacy and familiarity with the virtual setting used as a medium (Bloor *et al.*, 2001). The computer literacy requirement might end up in a skewed discussion due to an over representation of contributions by those with high computer literacy (Bloor *et al.*, 2001; Nielsen, 1997). The notion that computer literacy affects contribution in a negative way was not supported by this study. On the contrary, participants with low computer literacy contributed a lot, and in some cases more so than participants with high computer literacy.

5.3 Group Dynamic

A strong reason for organizing a focus group is to generate discussions and ideas that might not have been uncovered in a different setting (Bloor *et al.*, 2001; Preece *et al.*, 2007). Many of the group discussions in both the traditional and virtual settings proved to illustrate how ideas were generated in this fashion, and how participants were able to discuss each other's misconceptions. This was exemplified in the traditional setting by the discussion that arose regarding the misconception of how female immigrants live. The topic was brought up during a discussion about the lack of ethnical diversity in the personas that were created during the first focus group. The facilitator introduced the idea of creating two new personas, and possibly giving them a non-native Swedish background. This stirred up a discussion about immigrants and almost all of the focus group members participated. It was obvious that the members had very different experiences of immigrants:

The men have had better opportunities than the women; the women have often stayed at home while the men went to work.

Some of the participants in the background nodded and agreed while a few others continued to discuss the situation, and how favorable it would be to create the two new personas to add diversity. Suddenly one of the women objected in a very loud manner, it was clear that she didn't agree with what everyone had to say:

No, it's not like that at all, the new immigrants, who came here after the war in the former Yugoslavia, it wasn't the same situation at all, men and women, everyone was working, it's a big difference...

Most parts of the group agreed and made small additions while the woman continued her story about the life of an immigrant in Sweden. At the end of the discussion all of the focus group members agreed on the importance of including personas with an immigrant background, and the importance of not turning them into stereotypes.

Similar discussions were seen in the virtual setting, illustrated by the scenario where one participant suggested the use of e-paper devices for medical care (table 2). The scenario lacked a lot of depth in terms of detail, but proved to be an excellent catalyst for discussion about the applicability of e-paper devices in a medical setting.

Table 2: Scenario from the virtual setting.

Scenario name	Getting diagnosed by the doctor.
User and context	Who: Göran, 73 years old. Where: At the retirement home. When: Afternoon.
Description	He uses his device to send pictures of his bad leg to his doctor. The doctor diagnoses him and sends a recipe for medicine to Görans e-paper device.

The scenario was submitted by an anonymous participant and posted on the forum by the facilitator to promote further discussion. The first comment received was very detailed and claimed that it was impossible for a doctor to diagnose something just by looking at a picture.

This was soon met by another comment with suggestions on how the scenario in question could be improved to be more realistic:

It would be possible to discuss potential medicinal treatment and side effects with the doctor though? Like, describing symptoms that arouse after taking medicine?

In the end they agreed that it would be more plausible to use the device just for the purpose of receiving prescriptions for medicine, the actual diagnosis was something that no e-paper device, no matter how good, could help out with:

This is a good idea, but sadly it's not something that you would be able to carry out by using an e-paper device. To diagnose someone through a camera has a lot of flaws. The doctor basically has to touch the patient to be able to diagnose him [...] It is however a neat idea to use the device to ask other doctors for their opinion or to send and receive electrical recipes.

This also relates to group composition, since a focus group has to have sufficient diversity to encourage discussion (Bloor *et al.*, 2001). The above-mentioned discussions clearly show how the participants were able to discuss and share thoughts based on their diverse background experiences and knowledge.

The level of commitment was in general very high in the traditional setting, which can be illustrated by how excited many of the participants were when it came to presenting their personas and scenarios, in some cases they almost seemed to fight over who was to present a scenario or persona and often ended up taking turns:

Eva: "We were talking about a small diode."

John: "Number three was.."

Eva: "When, But that doesn't really matter."

John: "That's pretty irrelevant."

Eva: "It's more or less around the clock, given we don't climb that much during the night, not that often at least."

John: "We were talking about a small diode."

Eva: "We saw the benefits of using a small diode that you can turn on while using it during the night."

John: "You communicate continuously, and then you can run into problems ... open communication is important in a situation like that."

Eva: "In a situation like that you want full duplex."

This was also exemplified in the persona creation focus group in a traditional setting where the participants ended up collaborating to create personas with shared backgrounds, something that they weren't supposed to do. One participant, who obviously was very excited over the idea of merging the personas backgrounds, asked the following question to make sure that this collaboration wouldn't ruin the applicability of the personas created by the group:

Can Abir be related to Ali? Is that possible? Because I have been talking to Anna [a participant from the other group], and I think we can work this out [merging the background of the personas], wouldn't that be fun?

It was interesting to see that all the participants were interested in putting down extra work to make this collaboration work.

The nature of the virtual setting makes it impossible to judge how emotionally invested participants are when commenting, discussing or submitting personas and scenarios, but the level of detail put into many of the comments and contributions indicated that the participants in general were very committed to the activity. The discussions on the forums were often very relaxed and the participants were often sharing their own experiences in a casual manner:

I subscribe to Sydsvenskan (damn good paper) and I like that it often comes in at least three parts. During the weekends it is often four to five parts with different content. My family subscribed to it while I grew up and people never fought about the different parts. Apart from that it is excellent to use when firing up the stove!!!

The dynamic between the participants in both settings seemed to be good; the part where the two settings really differed were in terms of how much time the participants spent discussing and interacting together. It is hard to put a number on how many discussions there were or how deep they were, since the two settings presented very different ways to interact. However, it is obvious that the participants in the traditional setting spent more time discussing together while also covering more topics.

5.4 Governance

During a focus group it can often be a hard task for the facilitator to keep the discussion on track (Nielsen, 1997). Planning the introduction in the virtual setting was very efficient in this sense, and it also made it impossible for other participants to interfere or influence when information was to be presented to the group. Due to the asynchronous nature, the information was presented to the participants in the shape of text and video. During the traditional settings participants often asked questions, which in some cases brought the participant or facilitator to stray off topic. An example of how hard it can be for the facilitator to steer a traditionally set discussion is illustrated by the rather dominant business representative during the scenario building focus group, which focused too much on limitations, thus possibly crippling the later discussions. To steer away from this focus the facilitator repeatedly tried asking leading questions without being too blunt:

But you [the business representative] will be able to sort this out, right?

This didn't really help, and the focus on limitations continued. Despite the unwanted focus, the presentation resulted in a very fruitful discussion regarding possible uses of wireless devices. This discussion, often filled with technical terminology was also very detailed:

You would want full duplex between the two of us [the co-climber] while having a connection at hold between the rest [of the climbers] [...] He will be able to see that we have radio contact, digital radio contact [...] I also want to see who I'm able to get in touch with and if they are outside my reach or in radio shadow, or if I can get in touch with someone else within my reach [...] the diodes should then clearly illustrate who I'm able to get in touch with or not. It might be different signals or colors with different meanings, I also want GPS localization.

To support discussion in the traditional setting the facilitator made summaries on the whiteboard to help the participants get perspective on what was being discussed, in a similar manner the

facilitator in the virtual setting posted summaries of discussions and contributions being made by participants on a daily basis on the virtual platforms login page (figure 10). The virtual platform also enabled the facilitator to send out summaries by e-mail to encourage participants to contribute to the focus group.



Figure 10: Example of a daily summary in the virtual setting.

The persona creation in a traditional setting was carried out by two small groups consisting of three to four participants, the teamwork in small groups seemed to be a good way to get people to work together, but it also demanded governing to make sure that the groups were balanced out in terms of creative participants. After the first focus group for persona creation in the traditional setting, the facilitator noticed that one of the groups seemed to pay greater respect to details based on the personas that were handed in:

While Lars stayed home with the kids he thought a lot about the future and how new technology can be utilized within homecare. Lars has always had a fear of getting blamed for things that might happen when he's working in an elderly client's home. He has brought up this anxiety to his superior but not gotten any feedback. He also feels that he is met by suspicion by women towards him [as a man] and his work. (Excerpt from the miscellanea part about the persona Lars).

While the other group's personas were a lot more condensed when it came to detail:

She has seen that webcams are used in Denmark to monitor people, and is interested to use this technology to help her take care of her dad. (Excerpt from the miscellanea part about the persona Greta).

To balance out this creativity, the facilitator split up the group of creative participants and made them form groups with their less creative counterparts the next time they worked together. This seemed to be a good initiative since it appeared like both of the groups were able to generate personas with a high level of detail. In comparison, there was no easy way to organize teamwork like that in the virtual setting. The virtual setting, however, enabled the facilitator to keep track of the last login of the participants, statistics that could be used to send out e-mail to motivate less active users to be more active.

5.5 Quality of Contribution

In the traditional setting every single participant seemed to contribute to a high degree when it came to creating personas and scenarios. The contributions were often made in shape of collaborations between two to four participants. This is no surprise since they more or less were forced to work together in the face to face context the traditional setting provided. In contrast to this, most of the contributions in the virtual setting came from individuals, and even when they did collaborate, it was always clear who the idea had originated from.

The quality in terms of detail varied a lot between the traditional and the virtual setting. According to Carrol (2000) a scenario has five key characteristics. During the course of this study these characteristics were expressed as *who*, *where*, *when*, *what* and *how*. The scenarios that were received during the study usually had all five of these, although in some cases they weren't all that detailed or were merged into each other. The participants in the traditional submitted nine scenarios, all of them very detailed (table 3).

Table 3: Example of a detailed scenario submitted in the traditional setting.

Scenario name	Riding instructor out in the forest with pupils
User and context	Who: Riding instructor. Where: Out in the forest with young pupils. When: During the daytime.
Description	A riding instructor is out in the forest with a large group of younger students training their horse riding skills during the daytime. The instructor is fairly young and is a bit nervous because she is responsible for all the children's well being. The communication device helps the riding instructor to keep in touch with all the children, having the ability to inform them about approaching cars etc. It also makes it possible for the instructor to have a dialogue between her and the children. She also gets instant feedback if one of the students falls off a horse.

The participants in the virtual setting submitted six scenarios. The scenarios differed a lot in terms of detail compared to the traditional setting; four of them were very detailed and in some cases even more detailed than the scenarios from the traditional setting, while two of them lacked a lot of detail (table 2). These differences were also seen in the case of the personas generated in the two settings.

Table 4: Example of a detailed Persona submitted from the traditional setting.

Persona name	Ali
Age	45 years old.
Occupation	Previously worked as a bookstore manager in Iraq, now as a cabdriver.
Life situation	Married to Fattma with three children. He lives at the same street as Ali's mum. Ali has three siblings in the US and two in Sweden. He works as a cabdriver with an irregular work schedule. Their two youngest children were born in Sweden; the oldest sister was born in Iraq and has problems adjusting to the Swedish culture. She goes to high school and wants to integrate herself with the Swedish society. Ali wants her to take care of

	grandma, something that she doesn't really want to do. Fattma works as a janitor at a school.
Interests	Both Fattma and Ali enjoys reading books both in Swedish and their native tounge, although Fatmma has problem grasping the Swedish language. Ali has less problem with this and enjoys reading Swedish books and to improve his Swedish. In his spare time he often brings his two sons to soccer practice. He's very active in his sons club
Life experience	The family escaped from Iraq and finally ended up in Sweden where they eventually got a permit to stay, they are now Swedish citizens.
Miscellaneous	In his spare time he often socializes with his mother while his daughter and wife tend to her. Ali has often thought about opening a bookstore in Sweden to sell Arabic literature. Ali and Fattma's common interest is their newly acquired colony lot where they grow vegetables and flowers.

A persona is supposed to have enough detail to make them pass as a "real" user; they are also supposed to have "quirks" to make them seem less stereotypical and more alive (Cooper, 1998). The seven personas that were generated in the traditional setting were both very detailed and had a lot of characteristics that made them seem less stereotypical, this can be illustrated by when the participants teamed up to create personas with shared backgrounds (table 4).

Table 5: Example of a detailed Persona received during the persona focus group.

Persona name	Pierre
Age	17 years old.
Occupation	High school student.
Life situation	Pierre is studying natural science at high school. He's single and live with his mom and dad. It's a working class family living in a small suburb outside an average sized Swedish city. He does well in school but isn't that popular. The school is starting to bore him and he has planned to take a break from the studies after he graduates.
Interests	Pierre's favorite hobbies are his computer and his moped. He's using the computer to chat, play games and school work. Pierre use his moped to get to school, in the future he wants to get a motorcycle but he doesn't make any money and he's not really interested in getting a part time job or a summer job. Pierre plays badminton and floor ball each weekend with a couple of friends from the neighborhood.
Life experience	Pierre only experience is from school, the computer and repairing his computer so far.
Miscellaneous	Pierre's family isn't religious and Pierre doesn't really see himself as a religious kind of guy, but when he's facing a challenge he often prays to some kind of undefined "higher being".

The six personas generated in the virtual setting differed a lot in terms of quality; some of the personas were highly detailed (table 5), even more detailed than the personas from the traditional setting, while one them lacked sufficient details to be used as a persona.

6. Discussion

The problem statement of the study is defined as: *How do virtual settings compare to traditional settings when using methods for idea and concept generation in Living Lab?* Alongside with the purpose of investigating what is gained and what is lost when using methods for idea and concept generation in a virtual setting compared to a traditional setting in an effort to increase the understanding of distributed tools in a Living Lab. As follows the findings are now discussed in a Living Lab perspective.

The ability to involve users throughout the innovation process is one of the most important aspects of a Living Lab approach (CoreLabs, 2007b). Both of the settings examined during the course of the study enable the participants to interact while being creative and generating ideas and concepts. These abilities are seen as two important forms of contribution in a co-creative innovation process (Reichwald *et al.*, 2004). However, the two settings differed in terms of flexibility concerning when and how the users were able to contribute. In the traditional setting, the participants of the focus group were limited to synchronous interaction in the same place. In the virtual setting, however, the participants were free to use both synchronous communication in shape of real time chat and messaging, as well as asynchronous forms of communication such as forums and external messaging systems. The differences in terms of interaction abilities between the two settings resulted in benefits and shortcomings, the rest of the discussion will therefore be dedicated to address these differences and the implications they might have for a Living Lab.

The strength of a focus group in a traditional setting is that it enables quick and efficient face to face interactions between the users and is an excellent way of sparking creativity (Bloor *et al.*, 2001). The participants in both settings seemed to be dedicated and committed to the activities they took part in. There were, however, fewer contributions of personas and scenarios in the virtual setting and the participants also seemed to work more individually, although this is no surprise. The nature of the traditional setting made it hard to work alone; participants were more or less forced to collaborate. The lack of teamwork is a shortcoming of the virtual setting, since, according to Bloor *et al.* (2001) and Preece *et al.* (2007), one of the reasons to organize a focus group is because the interaction between the participants might end up generating new ideas. Based on this notion, less interaction could mean less creative ideas, which is important from a Living Lab perspective since it might have negatively affected the capability to innovate. As a way to counter the lower amount of contributions and further stimulate creativity in the virtual setting, a plausible solution is to increase the amount of users involved. Due to the scalability of virtual settings, this would not affect the costs or planning. It does, on the other hand, mean that more users have to be recruited. Another solution might be to add even more flexibility in terms of how the users can interact in the virtual setting.

The ability to steer or govern the group differed between the two settings. This is an important part of organizing a focus group since a lack of guidance, according to Nielsen (1997) and Bloor *et al.* (2001) might ultimately skew the result of an activity. Both settings enabled the facilitator to keep the group on track by summarizing activities and promoting collaborations and contribution. However, the traditional setting allows the facilitator to monitor the participants work and directly answer questions before making a contribution, which might prove to be useful in terms of steering participants in the right direction. In contrast to this, the participants in the virtual setting favored asynchronous interaction while working; real time chat was rarely used. The lack of direct feedback paths and ability to monitor the participants' work in progress means less control over the group for the facilitator in terms of governing abilities. The virtual setting,

however, enables the facilitator to keep better track on individuals, meaning that the facilitator can spend more time on individuals that need more help than others, without addressing the whole group.

In terms of planning and involving the user, the asynchronous nature of the virtual setting makes it a lot more efficient in terms of involving the user throughout a whole innovation process; an aspect highlighted by many authors as key for a Living Lab approach (CoreLabs, 2007b; Schumacher and Feuerstein, 2007; Eriksson *et al.*, 2005). The virtual setting made it very easy to keep in touch with the participants over the duration of time. The users were also able to plan their own involvement and participate on their own terms; important aspects to fulfill in order to further empower the users in a Living Lab setting (Ståhlbröst, 2008). The ability for the users to plan their own time in the virtual setting also made it easier to plan and execute the activities for the facilitator since the only prerequisite was the ability to allocate enough time for the focus group during the five day period the virtual setting was operating. Less time had to be spent coordinating the participants' schedules. In this sense, the virtual setting proved to add more in terms of continuity, spontaneity and ability to involve the users over time than in a traditional setting.

As illustrated the virtual and traditional setting both offer benefits to idea and concept generation in a Living Lab. Does this necessarily mean that one has to sacrifice the benefits that one setting offer by strictly utilizing the other? No, certainly not. The traditional setting of a focus group offers a tried and tested milieu for gathering users to discuss and create together. While there is a downside and inconvenience of availability and necessary proximity to the meeting, the ability to carry out an activity like that can prove to be a very important asset in terms of user involvement in a Living Lab. In comparison to this the virtual setting offers a way to involve users over time, without having to put a lot of strain on them in form of travel times and ability to show up at specific times. It enables a way of distributing information to them and ways to contribute and take part of the activities on their own terms, no matter where they live. This enables the Living Lab to reach out to a bigger community. By using one setting to complement the other one can reap the benefits of both. The virtual setting offers time for reflection and an ability to involve a wider spectrum of users in a flexible manner, it also enables the Living Lab to reach users that might not have the resources or ability to devote time to activities in a traditional context. By utilizing the virtual setting as a complement or extension to the traditional setting the Living Lab is also able to address and strengthen some of the core principles (CoreLabs, 2007a) of a Living Lab. It offers *continuity* by enabling user involvement over time while potentially *empowering the users* by involving them on their own terms, while the bigger community offers a wider diversity of users. The bigger community means a wider perspective in terms of users from different cultures and contexts which improves the capability of creating realistic products for realistic markets, strengthening both the principles of *openness* and *realism*. Finally, it also offers *spontaneity* for both all stakeholders in terms of the ability to take part and be involved over time in different activities through the innovation process.

Looking back at the study, it is also important to highlight some of the improvements that could be made to the method used to gather and analyze data. It was sometimes very hard to back up findings with sufficient data from the observations, the theme of group dynamics can be used to illustrate the problem. For the observer it is obvious if the dynamic in a group is good or bad, but this is very hard to illustrate by just a few quotes or a short description. In a scenario like that it might be fruitful for a future researcher carrying out a similar study to use complementary interviews with the users to gather more data which can be used to paint a richer picture.

7. Conclusion

Compared to a traditional setting, virtual settings offer a lot of flexibility in terms of interaction for both the Living Lab practitioners as well as users who are involved in methods for idea and concept generation. The price for this flexibility is a lack of the fruitful discussions and collaborations that might occur in a traditional face to face setting. In turn, this could affect idea and concept generation in a negative way. It is also harder to govern the participants' work in the virtual setting due to the lack of real time interaction. Despite these drawbacks, a virtual setting adds a lot of benefits for both the Living Lab practitioner and participating users. The users gain a lot of freedom, and are able to plan their own participation on their own terms. This also means that the Living Lab is able to involve users from a bigger community, not bound to geographical areas.

Therefore, this study concludes that both settings add potential benefits to the practice and almost seem inseparable at times. Thus, it is suggested that the virtual setting should be considered as an extension or complement to the traditional setting as opposed to replacing it. If utilized in this manner, the virtual setting has the potential to empower both the users' involvement in the innovation process while also increasing the innovative capabilities of the Living Lab in terms of generating creative ideas and concepts from a diverse user base.

This study also contributes to the ongoing research regarding how to best involve the user during a co-creative innovation process and the users' influence on this process. This by addressing how virtual settings supported by distributed tools, and the flexibility that these tools offer to the user, affect their ability to be a part of the innovation process.

The contribution from this thesis should not be looked upon as a definite truth for how virtual settings compare to traditional settings in a Living Lab, the scope of the study is too narrow for this. It can, however, act as a valuable tool for reflection upon potential benefits and drawbacks regarding the use of virtual settings in co-creational innovation processes.

To further extend this study and to deepen the understanding regarding the use of virtual settings in innovation processes and Living Labs, the following research areas seem interesting based on the findings during this study: The diversity of groupware and distributed tools available offers a lot of flexibility in terms of customization and creation of virtual settings. How do different virtual settings compare to each other when involving users in a co-creative innovation process? It might also be fruitful to evaluate how virtual settings compare to traditional settings during the full lifecycle of a co-creative innovation process.

References

- Abowd, G., Atkeson, C., Bobick, A., Essa, I., MacIntyre, B., Mynatt, E., Starner, T., (2000) Living laboratories: the future computing environments group at the Georgia Institute of Technology, *CHI '00 extended abstracts on Human factors in computing systems, April 01-06, 2000, The Hague, The Netherlands*.
- Baecker, R.M., Grudin, J., Buxton, W.A.S. and Greenberg, S. (1995). *Readings in human-computer interaction: toward the year 2000*. San Francisco: Morgan Kaufmann Publishers.
- Bekker, M.M., and Long, J.B. (2000). User involvement in the design of human-computer interactions: some similarities and differences between design approaches. In S. McDonald, Y. Waern, G. Cockton (Eds.), *Proceedings of HCI-2000: People and computers XIV - Usability or else!, Sunderland, UK, September 5-8, 2000*. (pp. 135-147). London: Springer Publishing.
- Bloor, M., Frankland, J. Thomas, M., and Stewart, S. (2001). *Focus Groups in Social Research*. London: Sage Publishing.
- Blomquist, Å., and Arvola, M. (2002). Personas in Action: Ethnography in an Interaction Design Team. In *Proceedings of NordiCHI*, Tampere, Finland.
- Bughin, J., Chui, M., and Johnson, B. (2008). The next step in open innovation. *The McKinsey Quarterly*, June, 22-29.
- Bødker, S. (1996). Creating conditions for participation: Conflicts and resources in systems design. *Human Computer Interaction*, 11, (3), 215-236.
- Bødker, S. (2000). "Scenarios in user-centered design - Setting the stage for reflection and action", *Interacting with computers*, 13, (1), 61-75.
- Bødker, S., and Iversen, S. O. (2002). Staging a Professional Participatory Design Practice - Moving PD beyond the Initial Fascination of User Involvement, In *Proceedings of NordiCHI*, Tampere, Finland.
- Carroll, J. M. (2000). Five reasons for scenario-based design. *Interacting with computers*, 13, (1), 43-60.
- CoreLabs. (2007a). Building Sustainable Competiveness - Living Labs Roadmap 2007- 2010: Luleå University of Technology - Centre for Distancespanning Technology.
- CoreLabs. (2007b). D2.1A Best Practice Report. Luleå, Sweden: Luleå University of Technology, Centre of Distance-spanning Technology.
- Cornford, T. and Smithson, S. (2006). *Project Research in Information Systems*. New York, N.Y.; Palgrave.
- Chesbrough, H.W. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Cambridge, MA: Harvard Business School Press.

- Cooper, A. (1999). *The inmates are running the asylum*. Indiana: Macmillan.
- Dix, A., Finlay, J., Abowd, G., and Beale, R. (2004). *Human–computer interaction (Third Edition)*. Englewood Cliffs, NJ: Prentice-Hall.
- Eason, K. (1987). *Information technology and organizational change*. London: Taylor and Francis.
- Eriksson, M., Niitamo, V., and Kulkki, S. (2005). State-of-the-art in utilizing Living Labs approach to user-centric ICT innovation – a European approach. *Centre of Distance Spanning Technology at Luleå University of Technology, Sweden, Nokia Oy, Centre for Knowledge and Innovation Research at Helsinki School of Economics, Finland*.
- Følstad, A. (2008). Living Labs for innovation and development of information and communication technology: a literature review, *The Electronic Journal for Virtual Organizations and Networks*, 10, 100-131.
- Greenbaum, J., and Kyng, M. (1991). Introduction: Situated Design. In J. Greenbaum and M. Kyng (Eds.), *Design at Work*, (pp. 1-24). Hillsdale: Lawrence Erlbaum Associates, Inc.
- Grudin, J., and Pruitt, J. (2002). Personas, Participatory Design and Product Development: An Infrastructure for Engagement, in *Proceedings of Participatory Design Conference*, 144-161.
- Kline, S., and Rosenberg, N. (2006). An overview of innovation. In R. Landau and N. Rosenberg (Eds.), *The positive sum strategy: Harnessing technology for economic growth*, (pp. 275–305). Washington, DC: National Academy Press.
- Kontio, J., Lehtola, L., and Bragge, J. (2004). Using the focus group method in software engineering: obtaining practitioner and user experiences. *Empirical Software Engineering, 2004. ISESE '04. Proceedings*, 271-280.
- Kusiak, A. (2007). Innovation: The Living Laboratory. *Computer-Aided Design & Applications*, 6, (4), 863-876.
- Massey, A.P., and Wallace, W.A. (1991). Focus groups as a knowledge elicitation technique: an exploratory study. *IEEE Transactions on Knowledge and Data Engineering*, 193-200.
- McKeever, S. (2003). Understanding Web content management systems: evolution, lifecycle and market, *Industrial Management & Data Systems* 103, (9), 686-692.
- Myers, M. D. (1997) Qualitative Research in Information Systems, *MIS Quarterly*, 21, (2), 241-242. *MISQ Discovery*, http://www.misq.org/discovery/MISQD_isworld/. MISQ Discovery, updated version, last modified: November 5, 2008 URL <http://www.qual.auckland.ac.nz/>
- Myers, .M.D. (2009). *Qualitative Research in Business & Management*. California: Sage Publications
- Nielsen, J. (1997). The Use and Misuse of Focus Groups, *IEEE Software*, 14, (1), 94-95.

Potts, C. (1995). Using schematic scenarios to understand user needs, In *Proceedings of the conference on Designing interactive systems: processes, practices, methods, & techniques*, Ann Arbor, Michigan, United States, 1995.

Preece, J., Sharp, H., and Rogers, Y. (2007). *Interaction Design: Beyond Human-Computer Interaction*. New York: John Wiley & Sons, Ltd.

Reichert, S.V. (2002). Die Gestaltung des Produktinnovationsprozesses, In M. Reichart (Eds.), *Prozessmanagement mit System*, (pp. 97-132). Berlin: Wissenschaftlicher Verlag.

Reichwald, R., Seifert, S., Walcher, D., and Piller, F. (2004). Customers as Part of Value Webs: Towards a Framework for Webbed Customer Innovation Tools. In *Proceedings of 2004 Hawaii International Conference on Computer Sciences (HICSS)*, Hawaii, 2004.

Schumacher, J., and Feurstein, K. (2007), Living labs – a new multi-stakeholder approach to user integration, Presented at the *3rd International Conference on Interoperability of Enterprise Systems and Applications (I-ESA'07)*, Funchal, Madeira, Portugal.

Shreeves, R. (2008, February 25). *2008 Open Source CMS Market Survey* [WWW document]. URL <http://waterandstone.com/downloads/2008OpenSourceCMSMarketSurvey.pdf>

Ståhlbröst, A. (2008). *Forming Future IT – The Living Lab Way of User Involvement*. Diss. Luleå Tekniska Universitet.

von Hippel, E. (1986). Lead users: a source of novel product concepts. *Management Science*, 32, (7), 791–805.

von Hippel, E., and Katz, R. (2002). Shifting Innovation to Users via Toolkits, *Management Science*, 48, (7), 821-833.

von Hippel, E., and Thomke, S. (2002). Customers as Innovators. *Harvard Business Review*, 80, (4), 74-81.

[1]: See <http://www.living-lab.se>

[2]: See <http://www.openlivinglabs.eu/>

[3]: See <http://www.ami-communities.eu/wiki/CoreLabs>

[4]: See <http://www.drupal.org>

[5]: See <http://drupal.org/handbook/modules>

[6]: See <http://media-it.hh.se>

[7]: See <http://www.ubimedia.se>