

Asbjørn Følstad (2009):

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In Steffen Budweg, Sebastian Draxler, Steffen Lohmann, Asamusch Rashid, Gunnar Stevens (Eds.),

International Reports on Socio-Informatics (IRSI),

Open Design Spaces Supporting User Innovation Proceedings of the International Workshop on Open Design Spaces (ODS'09)

(Vol. 6, Iss. 2, pp. 43-55)

Co-creation through User Feedback in an Online Living Lab: A Case Example

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Abstract. Co-creation in Living Labs is emerging as a promising approach to user involvement in innovation and development processes within the field of information and communication technology. However, the current literature on Living Lab co-creation practices is scarce. To contribute to the discussion on co-creative practices in Living Labs, the RECORD online Living Lab is presented. An example case from the Living Lab is provided, involving user feedback on service ideas and refined concepts. The case was related to a music community website, and we received feedback from several hundred users. The case provides early insight in the use of quantitative and qualitative feedback mechanisms in the online Living Lab. The experiences from the case are summarized as lessons learnt.

Introduction

Living Labs hold promising opportunities as open design spaces supporting user innovation, and may enable developers of information and communication technology (ICT) to meet their innovation challenges through involvement of users in the innovation process. One Living Lab definition, aiming to summarize a minimum common core for Living Labs described in the literature, states:

Living Labs are environments for innovation and development where users are exposed to new ICT solutions in (semi)realistic contexts, as part of medium- or long-term studies targeting evaluation of new ICT solutions and discovery of innovation opportunities (Følstad, 2008, p.116).

An emerging Living Lab trend is to regard Living Labs as environments enabling context research and co-creation activities. Co-creation may be understood as the involvement of users in early stages of innovation and development processes, either through the collection of user feedback in response to given ideas or design suggestions or as participatory ideation and design activities.

The trend of regarding Living Labs as environments for co-creation is exemplified by the European Network of Living Labs (ENoLL), who on their website states that:

A Living Lab is about experimentation and co-creation with real users in real life environments, where users together with researchers, firms and public institutions look together for new solutions, new products, new services or new business models (ENoLL, 2008).

Current Living Labs for ICT development and innovation typically are established in geographically defined areas, where new technology is provided to the participants in their every-day environment. However, in response to our recognition that online environments not restricted to a limited geography are the most important context for many ICT innovations, we now see the appearance of virtual or online Living Labs with geographically distributed participants. Online Living Labs seem to share the overall goals of user innovation with other Living Labs. However, the participants of online Living Labs typically are involved through online environments rather than in their off-line every-day environment.

In this paper we will present how an online Living Lab has been set up in order to support co-creation through user feedback. The aim of the paper is to provide an example case and lessons learnt, in order to stimulate discussion and further development of online Living Labs.

The paper is structured as follows. First we will provide a summary of previous work on user-feedback and co-creation in Living Labs. Then we will present the RECORD online Living Lab, followed by an example case from this Living Lab. The case is the first to be run in the RECORD online Living Lab, and represent user feedback in the phases of idea generation and conceptualization.

Previous Work

User Feedback and Co-creation in Living Labs

User feedback and co-creation are only partially overlapping concepts. User feedback may be collected for purposes other than co-creation, and co-creation may be conducted through other means than just collection of user feedback.

The vast majority of Living Labs described in the literature seem to include user feedback in some sense; typically for evaluation and validation purposes

(Følstad, 2008). However, user feedback collected for evaluation purposes often seem to be conducted in later stages of innovation and development, barring the users from participating as co-creators. For example in Living Labs for experimenting with ubiquitous computing services in real world settings (e.g. Abowd, 1999; Beigl, 2002; Intille et al., 2005) user feedback is typically collected on running prototypes, and the users do not seem to be involved in activities to systematically enable co-creation.

Only a subset of the Living Labs described in the literature is explicitly associated with co-creation aims or activities. However, for these Living Labs co-creation seem to be one of the most important characterizing purposes (Følstad, 2008).

User feedback serving a co-creation purpose may be collected in relation to early development phases of design and initial prototyping (Pierson & Lievens, 2005), or possibly as early as needs and requirements analysis or ideation (Mirijamdotter et al., 2006; Näkki & Virtanen, 2007; Näkki & Antikainen, 2008).

Living Lab Implementations of User Feedback for Co-creation Purposes

In spite of the fervor with which co-creation is argued in the literature describing Living Labs for co-creation, only few authors describe processes and methods actually supporting Living Lab co-creation (Følstad, 2008). Two exceptions from this are the descriptions provided by Pierson and Lievens (2005) and Näkki and Virtanen (2007) / Näkki and Antikainen (2008).

Pierson and Lievens (2005) presented a co-creation process involving context research and analysis, confrontation of users with new technology, and feedback collected in conjunction with the technology confrontation. Pierson and Lievens presented the process as being based on ethnographical principles, and associated it both with quantitative methods, such as surveys and log data analysis, and qualitative methods, such as interviews and focus groups. The process was particularly configured for a Living Lab embedded in a geographically delimited area where new technology is implemented in the every-day context of the participants.

Näkki and Virtanen / Näkki and Antikainen presented OWELA (Open Web Lab); a platform supporting the design digital media products and services. The OWELA platform is designed to support the innovation process from early stage foresight-based user research to late stage testing and commercialization. Facilities for user feedback include a social bookmarking tool allowing participants to mark and communicate interesting findings both on the web and in the real world (Näkki & Antikainen, 2008) and the IdeaTube allowing communication and discussion of service scenarios and design ideas “*in the same style that videos are rated and commented in the popular video service*

YouTube.” (Näkki & Virtanen, 2007, p. 3). The authors state that the online facilities for user involvement may be supplemented by traditional user-centred methods such as focus groups.

The OWELA is an online Living Lab where user feedback is collected from geographically distributed participants through online environments. This is also the case for the RECORD online Living Lab which is to be presented in the following section.

Overview of the RECORD Online Living Lab

The RECORD Living Lab is being set up as part of the research project RECORD (2007), to meet user involvement challenges in ICT development. It is meant to serve Norwegian ICT developers; and is established within a research project involving industry and research partners. The RECORD Living Lab consists of two main components: A panel of participants and an online environment.

Panel of Participants

In order to involve a fairly representative set of users, and not just the most committed, the RECORD Living Lab includes 3000 potential respondents meant to be as representative as possible for Norwegian Internet users age 15-40 years. In addition to this representative sample, sub-samples of >400 participants are established for industry partners targeting restricted user groups. These sub-samples may be partially overlapping with the nationally representative sample, as presented in Figure 1.

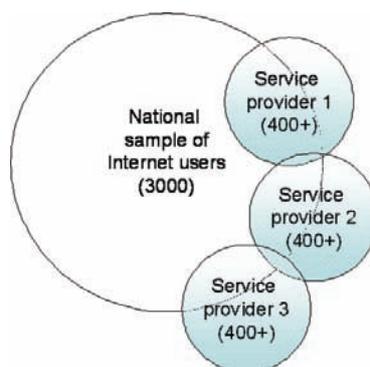


Figure 1: RECORD online Living Lab panel of participants

We aim for the Living Lab participants to (1) help us investigate service contexts and emerging patterns of service use, (2) provide design feedback and engage in design discussions, and (3) participate in user-centred evaluation.

Online Environment

An online environment for user feedback will be established, utilizing online community solutions to allow:

- Presentation of ideas, concepts and prototypes in text, pictures, video, or as clickable prototypes
- User comments and ratings of the presented ideas, concepts and prototypes
- User-user and user-developer discussions
- Users posting design revisions or alternate design suggestions.

At the time of the case example presented in this paper, we only had available an online environment serving one-way communication in an online survey fashion. The case yielded interesting results, but did not allow us to explore discussions between designers and users, or allow users to post design revisions.

Online Living Lab Cases

In the RECORD Living Lab, we have run cases involving user feedback on ideas, concepts and prototypes. The cases have been related to a music community website, a music webshop, and a football supporter community; all involved in the RECORD project. All cases have included two or more interactions with potential users during the design process, where ideas and designs have been presented at different levels of sophistication.

Case: User Feedback on Service Ideas and User Interface (UI) Concepts

Context of Development

The case was conducted in relation to a music community website, Urørt (www.nrk.no/urort), used by unsigned Norwegian artists to share their demo material with the general public. Urørt is run by the Norwegian state broadcaster NRK, contains the music of ~21.000 artists, and is visited by approximately 12.000 unique users each day.

The case was run by two designers in the RECORD project, with the aim to develop future service concepts for Urørt. The service concepts were to be socially oriented, in particular targeting mobile services or functionality to navigate in large amounts of audio-visual content.

The design process included an explorative phase of idea generation, and the development of two service concepts presented as UI visualizations in short videos.

User Feedback Considerations

We wanted the design process to allow rapid user feedback on a range of design ideas, as well as user feedback on more developed concepts. Requesting user feedback on a range of design ideas is reminiscent of the position of Tohidi et al. (2006) who argued that presenting users for multiple design solutions makes usability evaluation more aligned to typical design processes where multiple solutions are explored in parallel, and also that the user feedback becomes more relevant, and that the users feedback may be seen as more relevant in that they provide “*more and stronger criticisms when appropriate*” (ibid, p. 1243).

Also we wanted users from the same population to provide feedback on a few refined concepts, developed on basis of the initial set of ideas.

In order to enable this, we set up the following user feedback process, presented in Figure 2.

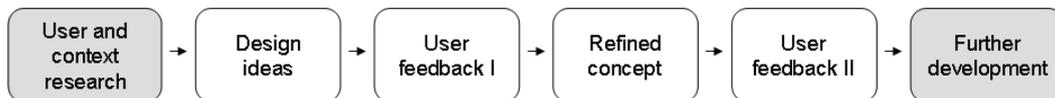


Figure 2: User feedback process of Case 1. Gray boxes are outside the scope of this study.

The Idea Phase: Presenting 24 Ideas for User Feedback

On basis of initial user and context research, 24 design ideas were developed. The idea presentation format was so-called idea cards, where each idea is presented with a short text and an associated description. Two example idea cards are presented in Figure 3.

Translations

3. Map of Norway
Note: This idea is not limited to mobile phone
To explore music at NRK Urørt you may take a map of Norway as your starting point, combined with different filters. You may zoom in to an area to see more details.

4. Make and share lists
Anyone can make lists in the treasure vault where you may add tracks you feel belong to this list. You may make lists with friends, all being able to add tracks to the same list. You may also subscribe to lists, so if you find a list you like you may be updated on changes in it.

Figure 3: Two example idea cards, with Norwegian text translated to English.

The participants were randomly assigned to one of twelve sets of idea cards, which they were requested to provide feedback on. Each set contained four idea cards, and were constructed such that each idea card was presented either (a) first to some participants and last to others or (b) second to some participants and third to others. The reason for presenting the idea cards in different orders was to control for order effects.

The feedback for each idea card consisted of one qualitative and four quantitative items. The items are presented in Table I.

Quantitative items	Qualitative item
I believe this is a very good idea I would use such a function a lot I would like to show such a function to my friends This function would be highly suitable for Urørt	We would like for you to tell us about your impression of this idea! What are the strong and weak aspects of the idea? And how may we improve it? Suggestions on how we can take the idea further are also welcome.

Table I: Items for user feedback on the Urørt service ideas.

Results - User Feedback in the Idea Phase

The idea cards were presented to 136 users of the Urørt service. Ninety-two of the users (68%) gave feedback on all the four idea cards that was presented to them. Each idea card received feedback from between 10 and 26 participants; this variation was caused by chance.

It was interesting to note that the bulk of the respondents failing to respond to all four idea cards (66%) did so before providing qualitative feedback for the first idea card they were presented for; the remaining 34 percent of the fallouts were distributed across the idea cards presented second, third and fourth.

The quantitative user feedback helped us rank all 24 ideas. Two of the three ideas that were subsequently refined into service concepts were among the top three ranking idea cards.

The uni-dimensionality and inter-item reliability of the four quantitative items was investigated separately for all 24 idea cards. Inspection of correlation matrixes showed significant ($p < .05$) positive bivariate correlation between all possible item pairs for 16 of the 24 idea cards. Cronbach's alpha was found to be $> .80$ in 23 of the 24 analyses. This indicated satisfactory inter-item reliability and supports the use of the four items as an aggregated score.

The qualitative feedback was of varied quality between the participants. Some contributed a lot of input, others next to nothing. In total the 136 participants provided 393 instances of qualitative input, which were between 1 and 133 words in length. The participants provided more feedback on the first idea card

presented to them than on later cards. E.g. the median number of words for feedback on the idea card presented first was 31 (n=107, 25. percentile=14, 75. percentile=52), whereas the median number of words for the card presented fourth was 20.5 (n=92, 25. percentile=12, 75. percentile=33.8). Such a difference would be statistically significant if tested according to a Wilcoxon signed ranks test (n=87, Z=-7.79, p<.001). Feedback examples are provided in Table II.

Each participant's average number of words across the four qualitative items was found to have a significant positive correlation with the participants' reported interest in music (n=107, Spearman's rho=.258, p<.01), as well as their use of Internet for listening to and downloading music (n=107, Spearman's rho=.260, p<.01). This seems to indicate that participants who perceived the design ideas as closer to their sphere of interest also provided more feedback.

Feedback detail	Examples of qualitative feedback
High detail	What is most important regarding the music, in my opinion, is not whether it is from the town of Rjukan, Oslo or Lillesand, but whether it is good or not. Still, it may be fun for local bands to see the other bands that are nearby... Locations for concerts would be interesting to get presented, so that was a good idea. Possibly you could include booking information and similar. It is important to keep this site updated, so it does not end up including a lot of links and mail addresses that do not work.
Medium detail	I like that you may choose where in the country you want your music from. A good way to explore new bands. An additional function to this as e.g. genre-search would make it even better.
No detail	Would not have used it.

Table II: Example qualitative feedback, for idea card 'Map of Norway' presented in Figure 3. The "High detail" example is from the upper quartile in word length, the "Low detail" from the lower.

The Concept Phase: User Feedback on UI Visualization Videos

Following the user feedback on the idea cards, the two designers of the RECORD project refined the ideas represented in three of the idea cards into concepts presented as UI visualizations in short videos (1-4 minutes in length).

One of the concepts was related to navigation in the base of tracks available from the Urørt website. The concept was related to the idea card 'Map of Norway' presented in Figure 3. The UI visualization of the concept was presented as a 4 minute video (see <http://vimeo.com/1117473>; voiceover in Norwegian).



Figure 4: Screen shots of videos visualizing the UIs of the two Urørt service concepts.

The other concept was related to social use of Urørt on handheld devices, exemplified by an iPhone. This concept took as its starting point two idea cards, including ‘Make and share lists’ presented in Figure 3, but included other ideas as well. The UI visualization of the concept was presented as four 1 minute videos (see <http://vimeo.com/1111108>; voice-over in Norwegian).

As in the idea phase, the participants were requested to provide their feedback both on quantitative and qualitative items. Due to considerations regarding what kind of user feedback that was needed, we were only partially able to use the same items for user feedback as in the design phase. For the navigation concept we were able to use the same four quantitative items as presented in Table 1. For none of the concepts we were able to use the same qualitative item as presented in Table 1. This was in particular due to that we in this phase also wanted user feedback on specific details of the concepts.

Results – User Feedback in the Concept Phase

The concepts were presented to 112 and 113 participants respectively. 71 of the participants were recruited from the group of Urørt users, the remaining were recruited from the national Living Lab panel.

Seventy-five participants (67%) completed the questions related to the navigation concept (Map of Norway) which was presented as one video. Sixty (53%) completed the questions related to the handheld concept (presented on an iPhone).

The navigation concept (Map of Norway) was scored by 94 participants on the same four quantitative items as in the idea phase. A Principle component analysis, to investigate the uni-dimensionality of these four items, indicated one strong factor. Cronbach’s alpha was found to be .92.

The quantitative scores for the navigation concept were all lower than for the idea card. However, the difference was only significant for one of the four items, and the results may well be due to regression toward the mean since this idea card was among the highest rated.

As it was for the idea card, the qualitative feedback for both concepts was of varied quality between the participants. Overall, the qualitative feedback on the video presentations was somewhat shorter and less detailed than the feedback on the idea cards. However, the reason for this may be caused by the nature of the questions used, rather than the presentation format or the content of the presentation.

Also for the video presentations, the number of words in the qualitative feedback (investigated only for the first qualitative question) was found to have a significant positive correlation with the participants' reported interest in music ($n=86$, Spearman's $\rho=.25$, $p<.05$), as well as their use of Internet for listening to and downloading music ($n=86$, Spearman's $\rho=.20$, $p<.05$).

Discussion

The presented case was the first case of user feedback from the RECORD online Living Lab used in a design process. User feedback was provided on early service ideas and, subsequently, on concepts visualized as video UI-presentations.

The online environment used for the study only supported one way feedback, and not discussions between the participants and designers. In spite of this limitation, we learnt some interesting lessons. These will be discussed below. Following this, some comments will be made on future work related to user feedback in the RECORD Living Lab.

Lessons Learnt

On Participant Fallout and Strain

Two initial concerns when conducting this study was: How will the participants react to participate in a design-oriented study? And will exposure to different ideas tire them out? We were satisfied to observe that approximately 2/3 of the participants completed the idea card feedback. Similarly 2/3 of the participants completed the feedback for the concept on navigation (Map of Norway), presented as one video. However, only about one half of the participants completed the feedback for the handheld service (presented on an iPhone), presented as four 1 minute videos. The concept presented as one video caused as much participant fallout as four idea cards, and the concept presented as four videos caused more participant fallout.

With regard to the idea cards, it was interesting to note that the majority of the participants falling out did so before responding to the first idea card. One interpretation of this is that the participants not wanting to provide the kind of feedback we asked for found out immediately and left. The participants remaining after the first idea card largely seemed to be willing to complete the whole

feedback. However, some indication that the participants were strained by being presented to more than one idea was found in the number of words included in their qualitative feedback. The feedback on the idea card presented first was markedly longer than the feedback on the following idea cards.

On the Quantitative Feedback

The quantitative feedback was found to be useful for ranking the idea cards, providing background for selecting the ideas to be pursued as refined concepts. Both of the two refined concepts were based in one of the ‘top three’ idea cards.

However, the quantitative feedback was not perceived as useful to compare the users’ enthusiasm for the idea presented through the idea card and the related concept presented through the videos. The reason for this was that we were not able to control for factors such as confounds and regression toward the mean.

The quantitative measure used for idea card feedback showed unidimensionality and satisfactory inter-item reliability. Also, the four items seem to have high face-validity as a general measure of the users’ enthusiasm for presented ideas and designs. Possibly it may be useful to include these items in a future standard measurement.

On the Qualitative Feedback

The level of detail provided in the qualitative feedback varied strongly across the participants. Some of the feedback was relevant, interesting and useful as foundations for refining the concepts. Others contained little or no detail.

It was interesting to find that participants’ presumably finding the ideas and designs more relevant (due to their higher music interest and frequency using Internet to access music) tended to provide more voluminous feedback. This seems to indicate that participants who experience the application area more relevant to their interests will be motivated to provide richer feedback.

It is likely that the limitation of the online environment used for this study, not enabling discussions between designers and users, limited the usefulness of the qualitative feedback. A relatively small proportion of the feedback items were perceived by the designers as being highly relevant. Possibly, being able to pursue interesting leads in the feedback through user-designer dialogue would serve to increase the importance of the qualitative feedback.

Further Work

The use of an online Living Lab to provide user feedback in the phases of idea generation and early design has provided promising results. Important issues for further work include (1) to improve the participants’ engagement, to make a larger proportion of the participants provide fairly detailed feedback, and (2)

allow discussions and social interchanges in the Living Lab, moving us closer to full fledged co-creation. Allowing such interchanges will e.g. provide opportunities for designers to pursue interesting leads in the qualitative user feedback, so that more relevant, nuanced and targeted feedback may be collected.

Improving Participant Engagement

Within the RECORD online Living Lab we will work to improve the participants' engagement by investigating how the presentation of ideas and designs, as well as the way questions are asked, can affect the engagement of the participants. Such investigations may be linked to an exploration of causes for participant dropout.

Also, it may be interesting to explore ways to improve the match between respondents' interests and the application area. However, it is necessary to balance such a possible engagement benefit with the possible cost of bias in the participant sample.

Towards Full-fledged Co-creation

Within the RECORD project, we are currently working to establish an online environment enabling asynchronous discussions and dialogues between users and designers across longer periods of time.

In the presented case, only one-way feedback is collected. However, we aim to use a combination of survey tools and social media software to establish a service where (1) the participants can get easy access to other users' comments and ratings of presented ideas, concepts and prototypes and (2) users, designers, and developers can engage in discussions. Eventually, we also aim to (3) establish Living Lab procedures for users to post alternate design suggestions themselves.

The first version of this service, supporting the first two points above, will be available for trials in the first half of 2009. We hope that access to other users' comments and opportunities for users, designers and developers to engage in a shared discussion will improve the Living Lab as an arena for co-creation.

Acknowledgments

This study was conducted within the research project RECORD, supported by the Norwegian research council's VERDIKT program. The presented service ideas and concepts were designed by Jon Olav Eikenes and Jørn Knutsen at the Oslo school of architecture and design, and are presented with their kind permission.

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