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Open Design Spaces Supporting User Innovation

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Open Design Spaces Supporting User Innovation: Perspectives and Challenges

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Introduction

"End-users, as owners of problems, bring special perspectives to collaborative design activities that are of special importance for the framing of problems. The 'symmetry of ignorance' requires creating spaces and places that serve as boundary objects where different cultures can meet. Boundary objects serve as externalizations that capture distinct domains of human knowledge, and they have the potential to lead to an increase in socially shared cognition and practice." (Fischer 1999)

The successes of platforms like Wikipedia, Facebook Apps, Yahoo! Pipes, Scratch or the whole Firefox Ecosystem are only some examples of the enormous extent of social creativity and user innovation that emerged in the Web and beyond recently. Active communities of users in the role of co-designers are more present and important than ever before. This is amplified by the current trend of evolutionary software design (in Web 2.0 terminology also known as perpetual beta), where systems are subject of continuous development with a constant participation of its users. The underlying socio-technical concepts create the opportunity of designing new and innovative spaces for participation. We call this vision the development of *Open Design Spaces supporting User Innovation*, where people with different interests and cultural backgrounds can meet. The term Open Design Spaces reflects our intention to span across related concepts and visions of different communities and focus on developing and analyzing spaces for user-driven innovation and co-creation. These spaces and places serve as a structure, having a social, organizational, and technical face.

Enterprises, communities and organizations increasingly discover this new way of thinking as a chance to set up new forms of end user integration. By empowering end users to participate and providing spaces for communication and collaboration, user innovation could lead to economic benefits in product innovation and quality improvement and to new business models such as Open Innovation (Chesbrough 2003) or Crowdsourcing (Howe 2006). Affected organizations need to develop concepts and methodologies to manage end user integration and face the upcoming challenges with the aim to tap the full potential of the social creativity of an active community of co-designers.

Dimensions of Open Design Spaces

These issues were addressed by the *International Workshop on Open Design Spaces supporting User Innovation (ODS '09)* that was held in conjunction with the *2nd International Symposium on End User Development (IS-EUD 2009)* on March 2nd 2009 in Siegen, Germany. More than 30 participants from countries like Argentina, Belgium, Denmark, Germany, Italy, Norway, the United Kingdom and the US took part in the workshop. Several dimensions of Open Design Spaces were discussed, such as:

- Who participates and how is participation legitimated?
- What design activities should be supported – creating ideas, creating solutions?
- What are the roles, incentives and motivations of the participants?
- What are the underlying ideas and how are they realized in concrete (social & technical) systems and methodological approaches?
- How to evaluate user participation and validate user contributions?

- How to deal with specific challenges such as long-term or massively distributed approaches?
- How to manage and integrate user participation in business?

Accordingly, one major interest of the workshop has been the cross-fertilization of the different perspectives on the topic, identifying similarities and differences, deducing common patterns, good practice solutions and, last but not least, discussing new opportunities of realizing *Open Design Spaces* in times of Web 2.0 and Social Software. The main focus of the workshop was on winning users as an active community of co-designers – including user acceptance, quality improvement, efficient processes, and economic benefits?

Perspectives on Open Design Spaces

Six presentations by workshop participants were held during the workshop, starting with an invited talk and continuing with five presentations focusing each on another topic related to Open Design Spaces.

Pelle Ehn was invited to give an introduction on Open Design Spaces from his point of view. To Ehn, Open Design Spaces are either a place, environment, area, or platform to create "things" based on creative commons and supported by open ended infrastructures, architectures for creative production, living labs, or similar. "Things" can be governing assemblies and places, collectives of humans and non-humans, or events in the life of a community. Unlike design artifacts being participating representatives, Ehn considers "things" as socio-material assemblies.

Liesbeth Huybrechts, Tanguy Coenen, Thomas Laureyssens, and *Priscilla Machils* discuss the role of *boundary objects* in participatory design processes. They observe that designers and technology developers go out to be engaged in activities in the field. Like impressionists in the 19th century, they leave the closed environment of their studios and design labs in order to get in direct contact with open, living spaces. However, the opportunities offered by new media and technologies also shape the way the spaces are structured and represented.

Interested in participatory design processes, Huybrechts et al. take up the question of structuring and representing such spaces by studying practices of *mapping* in design projects. They show that mappings can serve as boundary objects since they are plastic enough to be viewed or used differently by several communities and stable enough to serve as interfaces between these communities. Therefore, mapping practices are essential methods for collaboration as they allow knowledge sharing in open, living design spaces. The authors describe the application of such boundary objects in different use cases and discover that a hybrid set of boundary objects can be used for communication between different communities and users.

In line with the observations of Huybrechts et al., *Michael J. Huber, Ulrich Bretschneider, Jan Marco Leimeister,* and *Helmut Krcmar* present a classification of tools and functionalities that can be used to support creative processes within *Communities for Innovation*. Their theoretically based analysis focuses on the domain of software development with the aim of fostering collaboration and creative activities that lead to new ideas and ultimately result in customer-driven innovations. Huber et al. emphasize the importance of opening up innovation processes, especially for small and medium sized software companies. This approach is often referred to as *Open Innovation* (Chesbrough 2003). It suggests that innovations should not be developed exclusively within the borders of one company but should be co-created in networks of heterogeneous stakeholders. Similarly, *Tobias Schwartz, Johanna Meurer,* and *Gunnar Stevens* interpret Open Design Spaces mainly as places for Open Innovation that enable contact with new ideas, knowledge, or technologies created by others. By means of a case study, they show how a software company can get in contact with external knowledge and successfully adopt it.

Living Labs are also strongly related to Open Design Spaces and Open Innovation as they are usually characterized by user-centric environments for open innovation that support the early and continuous involvement of users (Schaffers et al. 2007). *Asbjørn Følstad* reports on co-creation through user feedback based on the RECORD Living Lab. This Living Lab is based on a panel that includes about 3000 potential respondents and serves as representative sample for Norwegian Internet users age 15-40 years. Combing a panel and a Living Lab approach, the RECORD case provides interesting insights how these two might enrich each other.

Finally, *Jörg Niesenhaus* classifies several forms of user involvement in the development of digital games. Since user involvement in game development has already some history, possible adoptions of successful concepts to non-gaming contexts were discussed. Niesenhaus points to concrete examples where gamers successfully took part in game development and improvement.

Future Challenges of Open Design Spaces

The workshop closed with a panel discussion on future challenges of Open Design Spaces. One line of discussion was concerned with challenges regarding the implementation of Open Design Spaces. Some important issues identified are:

- Openness and structure need to be balanced to provide space for both creativity and guidance. Too much openness can, however, overburden users. Vice versa, too much structure and guidance can limit their creativity.
- Users should be involved from beginning to end in order to enable them to be competent co-designers. All team members must be aware of a possible increase of time-consuming discussions.

- There is a need for a common language between users and developers as they have different mental models. This could lead to a conceptual design vocabulary that is sufficiently expressive and equally understandable to users and developers.
- Design artefacts (e.g., layouts, protocols, drafts, objects, prototypes, etc.) and design environments should enhance team communication and play a key role in the implementation of any Open Design Space. Collaboration environments are vitally important.

In a second line of discussion, economical challenges were raised. It was asked how economical benefits and a return of investment can be ensured in the implementation of Open Design Spaces:

- Cost-benefit models need to be developed providing metrics how to evaluate qualitative effects (e.g., higher user experience).
- Investigating Open Design Spaces in long-term studies is crucial in order to get a better understanding of the economical benefits.
- Real user innovations need to be identified and evaluated.
- The integration of externals (e.g., customer, subcontractor, etc.) requires a special consideration of trust and economic issues.

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Living Spaces: A Participatory Design Process Model Drawing on the Use of Boundary Objects

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Abstract. This paper focuses on the study of individuals, collectives and organisations in the creative sector, experienced in participatory design processes, using media and technology. We want to discover how they introduce media and technology to stimulate the sometimes difficult conversation between different disciplines, but also between experts and users. We call the used media and technology 'boundary objects' and use the method of 'mapping' to represent good practices in participatory design in a spatial way. The boundary objects used in the studied cases are often hybrid in nature: different and sometimes strange 'things' are introduced at different moments in time and place, according to the needs in the conversation with user groups or across disciplines. The mapped spaces where conversations took place were as open as possible for input and own design (open space). This enables the prediction of the uses of the design after the design process, often through iterative design processes (meta- and agile design). In interaction with the observation of these real-world cases a participatory design model, using a hybrid set of boundary objects to collaborate with other disciplines and with 'users', is developed. This frames in a European and a Belgian research project *Living Spaces* (EFRO and IvOK).

Introduction

In this paper we ask the question how creative individuals, collectives and organisations stimulate conversations and collaboration between experts and users and different disciplines through using ‘new’ media and technologies. This is relevant because in our society, we are increasingly surrounded by new media technologies. This offers opportunities for designers to work outside their designlabs, for media researchers to engage in activities in the field, for technology developers to set up mobile projects in our daily spaces and for artistic entities to organise exhibitions outside the traditional art context. In other words, they work in situ, in locations and this implies that they have to take into account the communities, the public and private actors that live in and construct these locations in their everyday lives. Hybrid spaces are produced on a daily routine by hybrid forces (public and private, social and cultural). Therefore projects search for hybrid contact zones with the producers of these spaces. Cross-disciplinary and participatory work makes this possible.

We started to observe cases of (groups of) people with experience in ‘hybrid’ participatory design because we felt the need to share knowledge about high-quality research into the specific social, economic and cultural context of the planned interventions, new working methods and skills, feedback models for the users of these spaces and knowledge about ethical dimensions and implications of projects. We observed and will observe some good practices in using a hybrid set of boundary objects to negotiate with users and people from other disciplines. These good practices inspire:

- the development/design of a hybrid set of boundary objects that could negotiate participatory design processes in the future.
- the main question of this paper: What is the role (in space and time) of boundary objects in participatory design processes?

In what follows we will indicate how we have developed the idea of the design process model based on the mapping of real world situations. We will put this research into context through discussing related work and will finish with some conclusions. But first, we need to explain the system of mapping.

A method we used while observing collectives and artists is mapping. Mapping is used to visualise a process or situation in space and time. Mappings capture the real-world situations of participatory processes used in design and art practice. In this way, mapping is observing and analysing how individuals and organisations 'perform' in a participatory design process, in order to develop an idea of a hybrid model negotiating the participatory design process. Through the maps we analysed how participatory art and design projects develop, using different collaborative media. The observed cases were different in scale and in how they wanted to engage locations, other disciplines or communities in their work.

The practice of mapping itself is also a tool for collaboration, it functions as a medium between the participants to jointly map their participatory practices. We created a low-tech mapping system, an open and extendible set of icons allowing participants to make their thoughts explicit in a visual way in the form of a map situated in space and time. Whereas the semantic space created during a participatory design events is not just visual, but also linguistic, tactile and emotional, the visual aspect of the mapping is combined with a verbal notation of the conversations triggered by the icons.

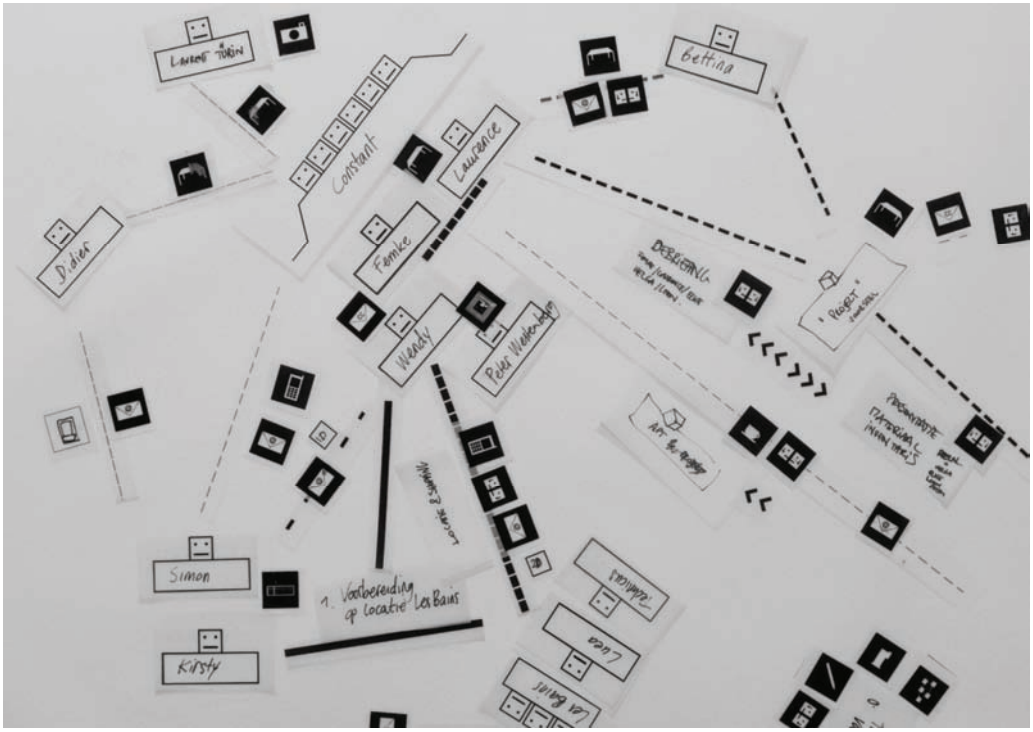

Figure 1. Enlargement of map created at Constant

The set of icons is developed as a mapping system to thoroughly analyse participatory methods used in design processes. During a mapping session, the set of icons is used to discuss the context, the people and the time and space aspects of a participatory project under scrutiny and simultaneously maps the findings of the conversations. The developed labels and icons illustrate the different elements[1]. The icon set comprises icons of people, tasks and different collaboration methods. Empty icons are also available to create new icons during discussions. In some cases, the participants draw on existing icons to specify them. In this way icons can be added and adjusted, implying that the system is never complete and open for iterative refinement. Arrows and lines are also part of the mapping system; arrows generate flow and lines indicate packages of information exchange. For instance thick lines pointing out intense non-stop

1 Visit www.interface-our-space.be/projects/participatory-mappings to view the mapping system.

collaboration and dotted lines to illustrate collaboration on a regular base. The icons are situated on tracing paper and are jointly repositioned and re-arranged. After each phase, a new sheet of tracing paper is added on top of the previous one, which will allow for analysis of the evolution of the project in time. The icons are attached to the tracing paper with removable/repositionable glue, this connotes that a mapping is never fixed and can be modified afterward if necessary.

For example, if during a conversation about the first phase of concept development is mentioned that person X emailed five times a week with person Y, two icons of persons are placed on the tracing paper (tagged with 'phase: concept development') with their names written on the icon, a dotted line is situated between the two person icons and an email-icon and two arrows are positioned next to the dotted line to indicate two-way emailing. Another example: if during the preparation phase person A sets up a financial plan about the project with person B and C, which was a very intense period of communicating over email, Skype conferences, and collaborating on a shared document like Google Doc, the following icons are placed on the tracing paper (tagged with 'phase: preparation'): a task icon with financial plan written on it, three person icons with their names, thick lines placed in a triangle between the three persons, next to the lines a Skype icon, email icon, cc-email icon and a shared document icon (view figure 1).

Conclusions drawn from the mapping will be described later. First, we will briefly describe creative collectives, organisations and artists we cooperated with.

- FoAM is an art and design collective that is reflective in character. Their projects take the form of gatherings of users, researchers, artists, ICT experts and designers in open spaces to collaborate around the theme media and ecology.
- The art collective Constant cooperates directly with communities in their daily spaces. The cross-disciplinary group develops projects to engage users to be more critical of their everyday technological environment or to stimulate the exchange in the community around certain topics.
- Frederik De Wilde is an individual media artist who collaborates with different collectives (like OKNO or Lab[au]) to develop one project in different phases. His projects do not work directly with communities in locations, but try to engage users via interactive interfaces.
- The last case is a mapping of Z33 in collaboration with Thomas Lommée. Z33 is an art centre which organises design and art projects. We mapped how they develop participatory projects with artists and designers in concrete projects. At the moment they work towards a project with designer Thomas Lommée. He develops an idea of open source architecture and will work with a local community to assemble a project.

All of the observed projects are artistic in character, but could at the same time inspire innovative designs of media, business, technology and applications. The media these artists, designers and collectives use or create to communicate with disciplines and with users are inspirational examples for the development of a model of hybrid set of boundary objects. This model has the goal to mediate the conversations in future participatory projects, in cross-disciplinary teams and with users. It is perceived as a possible answer.

Related Work

Participatory design projects do not only have a participatory output (like the work of Frederik De Wilde), they have also been developed in a participatory way. Participatory design has many variations, uses different techniques and methods of which we will not be able to provide a full overview, but we will select some insights in relation to our Living Spaces[2] project.

Participatory design is usually defined as a design process that includes end-users as full participants in activities leading to software and hardware computer products and computer-based activities (Greenbaum & Kyng, 1991; Muller & Kuhn, 1993). It is related to a series of methods like design games or performance. These participatory methods are very useful when media and technology are used to strengthen the relation between people and with specific places, online or in the physical environment. One variation of participatory design - collective design –describes the engagement a hybrid set of partners in a design process. Pelle Ehn writes about...

> (...) communities-of-practice where the situated practices are carried out in a direction towards legitimate participation and access to the communal artifacts. Such collective design communities can e.g. be communities-of-practice of professional designers, overlapping communities-of-practice between users and designers, or communities of stakeholders including not only designers and users, but also interpreters, jurors and legislators. Especially we think of collective design in terms of 'understanding others understanding' (as suggested by Krippendorff) or as "being in service" (as suggested Nelson and Stolterman) (Ehn, 2002).

This cross-over between designers, users and stakeholders creates hybrid communities of interest that co-create or produce design together. The interaction with other systems – political, social, ecological and economic – is one central aspect in this definition. Victor Papanek (1985) called this holistic approach 'social design'. Nowadays, the Design Council (UK, project RED) calls it 'transformation design' (Design Council, 2007). Both approaches champion a holistic design process, meaning that design is seen as a 'complete' happening that

2 ‘ Living Spaces’ is a research project funded by EFRO and IvOK. Since November 2008 art centre Z33 (Hasselt, BE), Expertise centre for Digital Media (Diepenbeek, BE) and Media & Design Academy (Genk, BE) are involved. For more information visit www.interface-our-space.be.

goes beyond visuality, functionality or pleasure. The inclusion of users in the process – a second aspect in the definition – is stressed in the 'inclusive design' approach of the Helen Hamlyn Research Centre (RCA). In other words, they and the target group design an action together and this is an impulse for certain target groups, such as the elderly, to take their lives into their own hands (www.hhrc.rca.ac.uk).

Michael Muller (2002) published a interesting reflection on how participatory design methods can respond to the hybridity of the boundary zone (or third space) between software developers and end-users in HCI. We would like to stress that this boundary zone is – certainly in the observed cases – even more hybrid then described by Muller, since next to end-users and software developers, visual designers, artists, private and public partners could play an important role in the field of HCI. His work pointed out that using the concept of hybridity in participatory design can lead to more effective collaboration processes. To evaluate if a specific method answered to the hybridity of the boundary zone, the author observed it in relation to the issues of *"novelty, ambiguity, and renewed awareness of possibilities, occurring at the margins of existing fields or disciplines"*. He concluded that...

> Hybridity is thus at the heart of PD, fostering the critical discussions and reflections necessary to challenge assumptions and to create new knowledge, working practices, and technologies. When we consider HCI as a set of disciplines that lie between the space of work and the space of software development, we see that the hybrid third spaces developed within PD have much to offer HCI in general" (Muller, 2002, p. 24).

The 'experience design' approach of the Media & Design Academy (Belgium, Genk) is – like inclusive or social design – also aimed at the holistic design of actions. It explicitly starts from peoples' experience of their altered environment and therefore tries to design together with the users. This approach places emphasis on giving form to experiences, using hybridity, alienation and experimentation with new technologies as the driving force for change (Jansen, Schoffelen & Huybrechts, 2008). Next to including users, the approach interweaves design with other disciplines such as the arts and ICT. Experience design is used to generate meaning in a critical way (Shedroff, 2006). This can be achieved by approaching the known as alien, since that is where creativity lurks. This is a technique that is also used in anthropology and other scientific disciplines (Papanek, 1985). Conversely, designers also learn to think out of the box by approaching things or people that are alien to them as if they were everyday affairs. Papanek (1985) considers that such techniques can enable designers to open doors that have not been opened, since they develop an affinity for the alien. This can lead to possible answers that become permanently interwoven with society.

All of the described approaches use participatory and/or holistic models. Specific for the experience design approach is that the arts play a crucial role as a driving force in this field, because it stimulates a different view on the collaboration and that it is a concept that embraces hybridity, alienation and conflict as a driver for change.

Real World Cases

We will discuss the real-world cases - mentioned in the mapping paragraph - in relation to the concepts of boundary objects, open space and agile- and metadesign, which all inspire the design of a participatory design model.

Boundary Object

An important precondition towards participatory design is communication. Indeed, people need to understand each other and need to be willing to exchange thoughts. As is clear from the study of communication in fields like semiotics, having people understand each other is not trivial and can benefit from a structured approach. To participatory design communication for knowledge sharing, this can be an important driver to the design activity. Boundary objects are then introduced to share insights that are particular to the various participants, but also to make the conflicts visible that exist between the knowledge from different disciplines, since in this confrontation innovation lurks.

In order to allow knowledge sharing between people, we adopt the approach of 'perspective taking' (Boland & Tenkasi, 1994). Perspective taking denotes a process that allows the capturing of a relevant part of the knowledge domain (a perspective) by people who are not familiar with it. In order to allow perspective taking, perspective making is necessary, pointing to a process during which the knowledge domain of the community is made explicit. Perspective making is in itself useful to the holder of the knowledge, as it structures his knowledge domain and possibly reveals assumptions. The critical study of these assumptions can trigger double-loop learning (Argyris & Schön, 1978), during which previous assumptions are challenged and revised.

Boundary objects can be understood as the outputs of the perspective making process. The concept was originally introduced by Star and Griesemer (1989) to refer to objects that serve as an interface between different communities. A boundary object stimulates the communication between disciplines, users and professionals. According to Star and Griesemer (1989), a boundary object is an entity shared by several different communities but viewed or used differently by each of them. Boundary objects can take many different shapes (e.g., text documents, cognitive maps, spreadsheets, etc.). In general, Star (1989) discusses three characteristics of an effective boundary object: (1) it establishes a shared language for individuals to represent their knowledge, (2) it provides a means for

individuals to specify and learn about their differences and similarities across a given semantic boundary, and (3) it facilitates a process where individuals can collaboratively transform their knowledge.

In design processes these boundary objects can be introduced to make people playing various roles and work together. Boundary objects – in the definition of Star – are not only introduced to establish a shared language, but also provide a means for individuals to specify and learn about their differences. We learn from our case studies, that conflict, difference and alienation are key elements to design for change. Boundary objects should not only transgress differences, but also shift the view of every participant from the everyday to the strange, and the strange to the everyday (Papanek, 1985). To make some invisible aspects in the collaboration project visible, designers like to introduce boundary objects like strange objects in a conversation: objects that create friction and controversy. This added value of friction and controversy is introduced in theories like 'design for social friction' (Jensen & Lenskjold, 2004), the 'dramaturgy of the interface' (Zielinski, 2006) and 'design noir' (Dunne & Raby, 2001).

In line with Star and Griesemer's description, the individual icons and the maps they form could be considered as a boundary object. It is even better to state that the icons and the maps are boundary objects ‘in development’, because the icons and the maps are open for iterative refinement. They will constantly be adjusted to eventually become a hybrid set of boundary objects, an inspiring and stimulating set for the mediation of participatory processes.

In one case Peter Westenberg (member of Constant collective) tried to question how public technological networks are in the city and how they are used to control or restrict us. Westenberg organised a number of ‘network walks’ through the city of Hasselt. The company I-City Hasselt, one of the organisers of the wireless networks in the city, the inhabitants of the city, the artists and the more regular visitors of the art centre Z33 could explore the networked space with a pair of ‘intelligent’ shoes, equipped with simple cameras, microphones and metal detectors to detect/discern technological networks in a number of ways. Also they could use inexpensive consumers electronics such as a receiver to hack into the intelligent and seemingly impenetrable surveillance camera system of a shop. With this receiver, the walker can receive images, but also bring his/her images into the system. These shoes and receivers could be regarded as boundary objects, because they make the conversation about the public character of the internet (a difficult and abstract subject) between public, artists and ICT experts/owners possible. The work of Westenberg actively seeks out the mentioned ‘friction’. The people who walked together with Peter became engaged in the problematic of privatised internet space and played – together with the artist – creatively with the given tools. Although temporary, the artists, the company members, visitors of Z33 and the inhabitants of the city made their networked space together.

This artistic case uses a hybrid set of boundary objects in a participatory design process. This event took place in a few phases. More phases with different partners could have lead to a design proposal for a city network, designed in a more participatory way. We conclude from this and other cases that participatory projects need different work packages to become a sustainable process.

Figure 2 proposes the creation of a hybrid set of boundary objects with a hybrid set of partners in different work packages (events). At each event, the participants are able to physically engage in modifying existing boundary objects and creating new ones.

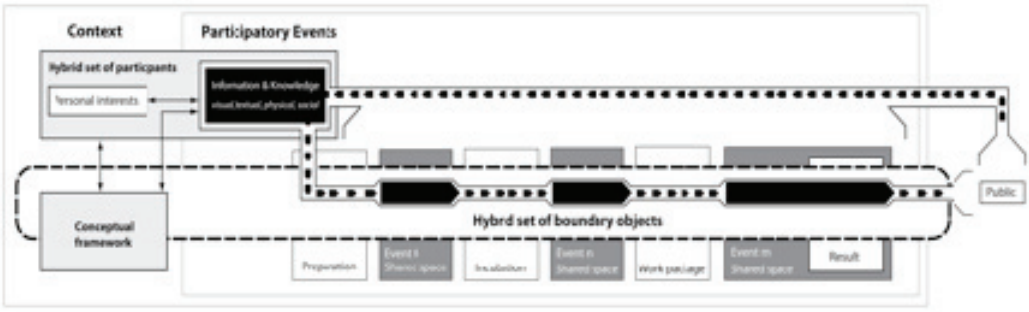

Figure 2. Participatory design model

We revealed this need for hybridity in objects and partners by mapping real world cases. We make the use of boundary objects in different phases of the cases visually explicit through our own ‘low-tech’ mapping system. The information and knowledge held by the different participants is a vital input of the boundary object creation, but is also altered by the boundary object manipulation (i.e. in the case of the mapping, adding new icons to the existing icon set). This produces a constructivist learning process during which perspective making within a work package takes place, but can also stimulate perspective taking between work packages. Note that the arrows flowing from the information and knowledge box are placed before the first meeting, to indicate that the participants should have a way to gather and package their information and knowledge in a way that is ready to be used during the first design meeting. In this way, participants are given ‘home work’ which, if performed, will make the initial open space meeting and the subsequent meetings more efficient.

Open Space

From the cases we studied we saw a lot of projects emerge from an open space. For FoAM this is a key way of working, Constant also starts from open meetings, workshops, walks, etc. to generate ideas with the communities they make projects for. The Open Space Methodology (Owen, 1985) is a self-organising process where equal participants create and manage their own agenda through parallel

working sessions. In open space meetings the topics of conversation are not pre-arranged, as is the case in other types of meetings. Instead, the topics of conversation are allowed to emerge by consensus from the meeting's participants. After a number of conversational topics have been set, a space is defined in the venue for discussing each topic. Participants are allowed to move about freely between different spaces.

An example: FoAM organises an open space meeting in Singapore to enrich the public debate around environmental sustainability, ethical living and eco technology to create a more luminous green world. They invite participants from various disciplines that do not meet that often, such as artists, designers, academics, activists, social entrepreneurs, economists and policy-makers. FoAM started with asking all the participants to email ideas, texts, drawings,... The sent material was not actually used in the workshop, because the participants could not use a laptop. In the open space meeting people had to propose topics for the meeting and choose a table, related to a topic. One of the topics raised, for example, was the sustainability of flying all the international participants to Singapore. Overall, the workshop was a rich discussion that generated a lot of ideas in the form of maps, drawings, texts and soundfiles. After the workshop some of the participants proposed to produce texts about the workshop.

We find the open space paradigm to correspond well to the problem of participatory design. It is especially in the early stages of design, where the problem is often still ill defined, that the grassroots approach of the open spaces method can be useful. Leveraging the wisdom of the crowd attending the participatory design meeting and channeling the creative energy through a structured process can result in a better understanding of the design problem at hand. One of the advantages is that it allows people without previous acquaintance to collaborate in a semi-structured way. However, communication between strangers can be hard and people from different disciplines use different ways to communicate (e.g. in a verbal or visual way). In the FoAM workshop a set of boundary objects was used to answer to these communication issues. People were emailing information, people used tables, people were making maps and people were processing maps afterwards.

Since tables were often used in the observed cases to gather different disciplines, users and experts around certain topics, we started to think about the concept of the table. A lot of information is lost on the way because the ‘physical’ maps on the ‘wooden’ tables are not produced in a digital way. Our observations[3] also showed that when the information and knowledge flow is mostly verbal. During face-to-face workshops, the use of a digital table could be a solution. It would not only keep traces of the information and knowledge exchanges, but would allow a richer communication, facilitating equal participants to work and

3 ‘ Luminous Green’ by FoAM, ISEA2008 in Singapore (Huybrechts, 2008) and ‘Space Cowboys’ by Z33 & MDA (KHLim) in Hasselt (Belgium).

discuss on both a verbal level as well as a visual one, enriching the communicative possibilities. In addition, working around a table and seeing each other face-to-face is conductive to the establishment of trust which is fundamental to the establishment of prolonged collaboration. The different profiles, backgrounds and expertise participating in the workshop do not necessarily share the same 'language'. Adding a visual layer, that is open and adjustable to all participants, creates a different dialogue and enables everyone to join the conversation. Furthermore, conducting collaborative acts around a table is a very familiar situation and we therefore believe it to be a good mediator for a creativity support environment. As explained by Roy Ascott (p.173):

> "Within the table-top, a horizontal creative arena, we can fully engage in analogue modelling, speculative restructuring of systems, contemplation of the rich interconnections of events and the infinite pathways between bonded meanings. Table-top behavior enables us to invent and rehearse alternatives, to exploit the fecund ambiguity of new relationships and the dynamic uncertainty of movements of meanings."

More specifically, the table will be used to create boundary objects in a collaborative way. One cannot predict the shape of a boundary object after it has been created and one should not restrict the semantic space in which the boundary object is to be constructed.

Furthermore, we concluded that the observed art and design collectives work on an international basis, with an international public and cannot always meet physically in a face-to-face situation. Therefore we decided to search for a way that face-to-face open space meetings can be continued online afterwards.

The digital table could be a hub to trigger conversation in face-to-face meetings and facilitate creative and cross-disciplinary participatory processes. Since these processes are often stretched over large periods of time and happen in different spaces, a mediating hybrid system could allow for multiple access points and a circulating information and knowledge flow across the participatory design process. The system under development could strive for online social media spaces to integrate with physical places. It could be web-based in the sense that participants should be able to manipulate the boundary objects online in the periods between design events, yet during the events, there should be a physical co-design mode.

In our design model under development (figure 2), the open space method will be used as a first way to engage in participatory design. In order to facilitate the first *n meeting*s in the design process, the web-based part of the hybrid set of boundary objects will allow people to contribute information at forehand.

In figure 2 the open space method is applicable to event 0 and remains applicable to subsequent events until an actionable work package structure is achieved. It is not necessarily the case that consensus on an actual work package decomposition is achieved during the first meeting. The number of events needed

to achieve closure in terms of work packages is expected to depend on the complexity of the design problem, the quality of the synergy between the event participants, how well the problem has been defined and the effectiveness of the boundary objects used during the events.

Agile & Meta-Design

The introduced participatory design model can be described as meta-design (designing a designprocess). “Meta-design is a conceptual framework defining and creating social and technical infrastructures in which new forms of collaborative design can take place” (Fischer & Giaccardi, 2004). Meta- design includes an iterative design process, related to agile methods found in software design and project management. With agile methods, meta- design shares that “it is grounded in the basic assumption that future uses and problems cannot be completely anticipated at design time, when a system is developed” (Fischer & Giaccardi, 2004).

Agile methods have emerged from the field of software development to counter the waterfall model of "requirements, design, implementation" which had proved useful, but also has some inherent flaws (Larman & Basili, 2003). Especially complex development projects, in which design questions are often ill defined, make it hard to look ahead. When the design process only holds a single requirements and design phase and the project has a long life span, the waterfall model can result in an output that is not adequate to the needs of the audience for whom the design process has been undertaken. When designing socio-technical systems, for example, the co-evolution between the social and technical parts of the system is continuous, constantly re-defining the socio- technical gap. It has therefore been argued (Schwaber, 2003) that an iterative approach to design and implementation is preferable to the one-pass waterfall model.

Agile development manifests itself in the iterative way of working, but also in the fact that people are very important. In an agile approach, the requirements and the design are re-evaluated iteratively. This can be done by people performing the different roles that are – according to literature and observation – necessary in the whole design process. A general trait shared in all participatory design projects is the presence of designers and prospective users. However, due to the hybrid nature of design processes, the design approach should not be restricted to these two essential roles. Indeed, design processes occur in a hybrid context and should therefore include knowledge input from other relevant societal areas. In doing this, insights can be obtained on more peripheral topics like the economic, political or juridical aspects of the design problem. An open space meeting aiming to support a participatory design process could therefore have the following roles: prospective users, designers and context advisers. The definition of the roles played by the different participants is to be done during the open

space meetings, knowing that one person can play multiple roles. We believe the above three roles present a good starting set of roles in an open space participatory design meeting, but do not want to limit the nature and the number of roles that are available. Indeed, a design event for a particular design problem may very well require new roles to be defined.

To explore the iterative interaction between the different roles participating in the design process mediated by boundary objects, we introduce the concept of "informance" (Laurel, 2003). Informance is a fusion of 'information' and 'performance'. Design researchers start out from people in real-world situations and interpret that information by means of empathy. Therefore designers can perform in order to perceive the world as the people they are studying. Thus, design research is based partly on empirical facts, but also uses the imagination, since the people for whom we are designing frequently cannot fully express their needs in words (Huybrechts & Jansen, 2007). In observing and trying out how people 'perform' in a situation where a boundary object is introduced and changing roles between designers, users and software developers for example, researchers and users can adapt a set of boundary objects together to improve its role of stimulating collaboration and communication between hybrid partners in an iterative way.

In figure 2 the agile nature of the design process is reflected in the various events taking place and in the hybrid set of participants. As was discussed above, the first n meetings are organised as open spaces, until a stable work package structure is formulated. Between each open space meeting is a period of incubation during which participants can alter boundary objects using a web-based interface. Additionally, the knowledge and information shared during the initial event is processed and reflected on, and new ideas are generated. Having the boundary object that was used during a previous event at hand (e.g. using a web-based interface) can be useful to call to mind connections and topics raised during the previous event. After this initial open space stage, n meetings take place that are organised using a more ad hoc methodology and in which the various participants engage in the creative boundary object. Through informance the designers/researchers can observe and experience through role-playing how the object mediates the interactions and how they can make improvements.

Evaluation and Conclusion

The mappings capture the real-world situations of participatory processes used in design and art practice. In this way, mapping is observing and analysing how individuals and organisations 'perform' in a participatory design process, in order to develop an proposal for a set of boundary objects. In a later developmental phase, the hybrid set of objects will be introduced in their daily work routines.

Subsequently, observing their 'performances' we can observe how the set of hybrid boundary objects mediates the participants' interaction. The conclusions drawn from these observations will in turn lead to the iterative adaptation and improvement of the boundary objects' functions.

Since the used mapping method is recently developed, we will describe some essential remarks based on the four cases:

- The participatory manner of the mapping and the physical act of gathering around a table and jointly placing and positioning icons while discussing how a project evolved, has several advantages. By naming tasks, phases and participants and identifying them with icons, the collaborative and participatory processes become visible and tangible. This makes the discussion and mapping more accessible and makes participants sharing their thoughts and opinions easier. The table set-up goes along with body language and tone and exposes more information about the relationships and emotions between participants in the project organisation.
- The method of mapping only works when it is properly facilitated, with someone leading and provoking questions, especially in the beginning. Through the mapping process the participants become comfortable with the mapping system and realise the value of the mapping and their active participation. The interaction between the participants changes too. In the second half of the mapping sessions the interaction between the participants changes. The participants showed more comfort and were eager to have an opportunity to share their experiences of a project they were heavily involved in.
- The mapping workshops often shifted towards a debriefing of the organisation of a project. The debriefing is mostly skipped because organisations want to work on new projects and is often lacking structure and a critical view. This mapping method gives the chance to add structure to allocate time and put participants in a situation where critical reflection is possible. In this debriefing of their work they were not only sharing positive experiences, also grievances and disagreements during the project. These negative comments could have potentially positive implications for future projects, by redefining roles, opening up communication and learning from past mistakes.
- The interaction between the participants and the resulting maps were still too biased by ‘social desirability’. By introducing more ‘strange objects’ in the conversation – as mentioned when we talked about the role of friction in collaborations – we could improve the mapping system. This will be researched further.
- The analysed projects are all collaborative in nature. A lot of collaborative work still involves individual working periods whereas many details are not shown.

We have focused on the role of boundary objects in participatory design processes. In order to do so, we have discussed participatory design models, the role of boundary objects, open spaces and agile development in relation to four observed cases. Hybridity, friction, role-playing, iterative design and possibilities to process information between work packages played a central role. To put these observations into practice, we are designing our own hybrid set boundary objects. In the upcoming period of the research project, we aim to build, test and refine it (in an iterative way) in the observed real world cases.

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Making Innovation Happen: Tool-Support for Software Related Communities for Innovations

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Abstract. "Crowdsourcing" is currently one of the most discussed key words among IS and innovation researchers. The major question for both research and business is how to find and lever the enormous potential of the "collective brain" to broaden the scope of "open R&D". Thus, Communities for Innovations seem to be a promising way for integrating customers into innovation processes. But what are necessary and suitable functionalities and tools concerning a virtual Community for Innovation? Based on the principles of theory driven design, in this article we identify creativity supporting functionalities and tools that can be systematically selected and implemented for a virtual Community for Innovations in the field of Software development. Being deduced from theory on creativity support tools, these components foster the successful collaborative creation of ideas, thus leading to promising innovations.

Introduction

The Potential of Open Innovation for Software Companies

Innovative strength in Germany compared to other countries can be found in the domain of engineering and industrial commodities. A prominent example is the German automobile industry (Holl et al., 2006). However, this can not be stated for German software producers, which are only average compared to other leading European countries or the US. According to a survey by the German Federal

Ministry of Education and Research, German software producers lack a business culture fostering systematic innovation activities. There is no systematic brainstorming in order to generate innovative ideas and ideation takes place informally without sustainability and is often driven by coincidence (Holl et al., 2006, p. 118). Furthermore, software producers' management of innovation is not using the innovative potential of its stakeholders consisting of for example its own staff, sub-contractors and end-users. These stakeholders are often rather seen as sources of need-information than of solution-information. Solution information represents not only the customer's needs and wishes but also customer based suggestions that describe how to transfer these ideas into marketable products (E. von Hippel, 1994). As a consequence, German software producers generate fewer "real" innovations compared to software producers from other countries. As they are often organised as a one-man as well as one-product business, they usually generate incremental innovations, improving their existing software products over a long period of time without generating disruptive or radical innovations. However, this situation will endanger software producers' future perspectives in the highly competitive software market.

A chance for software companies to overcome these problems lies on opening up the innovation activities to external resources. Thus, customer and stakeholder integration into innovation activities are seen as an important competitive strategy, especially for small and medium sized software producers. This approach often is referred to as "Open Innovation" (Chesbrough, 2003; E. von Hippel, 2006; E. von Hippel & Katz, 2002). Literature describes the integration of customers and other stakeholders as one of the biggest resources for innovations (Tidd, Bessant, & Pavitt, 1997; Wagner & Prasarnphanich, 2007). The underlying idea is: The integration of stakeholders will open up the company's innovation funnel – more potential perspectives or ideas for creating innovations come to the innovation process. Or in other words: the amount of innovation potential that can be poured into the innovation funnel is rising because more actors are actively involved. Therefore, the company gains more ideas for innovations. Thus, the principle of collective intelligence or wisdom of crowds is the underlying assumption of Open Innovation (Libert & Spector, 2007; Surowiecki, 2005).

Communities for Innovations for Software Companies

These so-called Open Innovation Systems require communication and interaction between all parties involved, namely the company's internal actors as well as its external stakeholders. Therefore, a couple of methods and instruments exist and are used in practice. They allow stakeholder integration into the early stages of the innovation process. Literature describes three core-methods: the Lead-User-Method, Internet-Toolkits, and Ideas Competitions. (1) The Lead-User-Method

implies systematic identification of single innovative customers - so-called lead users - and their integration into workshops in order to generate ideas and concepts for new products or services together with companies' employees (Eric von Hippel, 1988). (2) With the help of User-Toolkits, customers are asked to design concepts for new products via the Internet or a standalone software application (E. von Hippel & Katz, 2002). (3) By conducting Ideas Competitions, companies attempt to collect innovative ideas from customers (Walcher, 2007).

The problem with existing methods and practices is that they exclusively focus on integrating a single individual into the innovation process and none of them fosters collaboration amongst involved parties. In Ideas Competitions, even competitive situations are induced preventing collaboration among idea contributors. But collaboration has been identified as a great potential of stakeholder integration (Gascó-Hernández & Torres-Coronas, 2004). Research shows that most innovations are not the result of a single inventor but rather of collaboration processes where many individuals contribute their individual knowledge, experiences, and strengths (Franke & Shah, 2003; Gascó-Hernández & Torres-Coronas, 2004; Nemiro, 2001; Sawhney, Verona, & Prandelli, 2005). Furthermore, established methods and practices solely serve the early stages of the innovation process where ideas for innovations are generated. There are no practices or methods available that allow involved parties to enhance or elaborate collected ideas into innovation concepts or even prototypes.

Collaboration can often be found in virtual communities, e.g. in the context of Open Source Software (E. von Hippel & von Krogh, 2003). Therefore, Bretschneider et al. (2008) introduced the concept of a company induced virtual Community for Innovations consisting of the stakeholders of a software company, especially customers and company members. Previous work on community building in other domains has shown that to a certain extend it is possible to influence building and establishing virtual communities according to specified goals (Leimeister & Krcmar, 2005, 2006).

The proposed Community for Innovations aims at supporting software companies at every stage of its innovation process. Acting via an internet-platform, the community members can generate ideas and collaborate with other community members. Each member of this community can submit ideas, connect with idea contributors that submitted similar or complementary ideas, and elaborate ideas in collaboration with matched members. Thus, the community enables forming various networks/teams that will collaboratively elaborate better, more meaningful, and relevant ideas compared to those initially submitted. Using this mechanism will help select the best ideas and will increase the benefit for the company significantly. The underlying, linear evolution process from the perspective of a single idea is shown in figure 1.

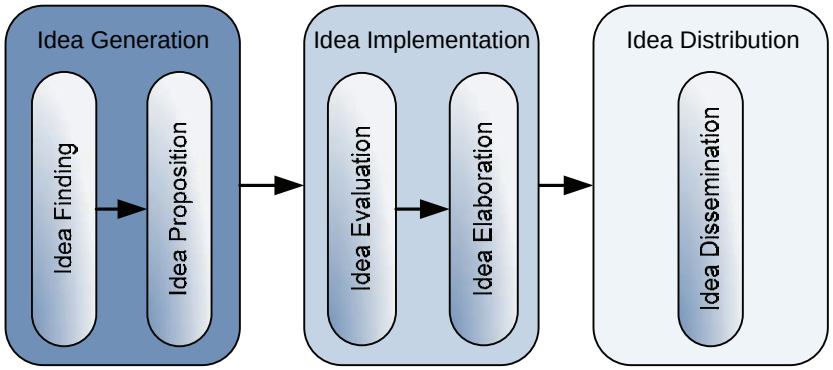

Figure 1: The idea evolution process of the concept of Communities for Innovations

Bretschneider et al. (2008) assume that ideas generated in this manner will likely carry much so-called solution-information. On the basis of those elaborated ideas the formed networks/teams can start developing innovative software prototypes collaboratively.

The proceeding of this paper is as follows: In section two we introduce theory on creativity supporting software-tools. Following, on the basis of the theoretical background, we derive an assembly of functionalities and tools for an internet based community of innovaiton which are suitable to support creative activities focusing on the area of software companies. Section four will conclude our work with a discussion on further research in this area.

Theoretical Background: Activities and Tasks of Creative Work

The activities of the members involved in innovation value creating are highly creative and activate an individual's creative process (Amabile, Conti, Coon, Lazenby, & Herron, 1996). The GENEX framework developed by Shneiderman (1999, 2000, 2002, 2007) proposes four activities and eight corresponding tasks in creative work as shown in figure 2. According to Shneiderman, this list does not make any claim to form a complete list, but it can act as a kind of checklist for the development of creativity supporting software tools (Shneiderman, 2002).

The activity *Collect* contains the tasks *Searching* and *Visualizing* for making existing existing information accessible and comprehensible. Thereby, information can be represented by various types of media such as photos, movies, sound files or plain text. The challenge for developers of creativity supporting tools is the choice or development of tools and functionalities which enable interpretation, representation and ascertainability of these heterogeneous formats and also their interrelations in an effective and efficient way.

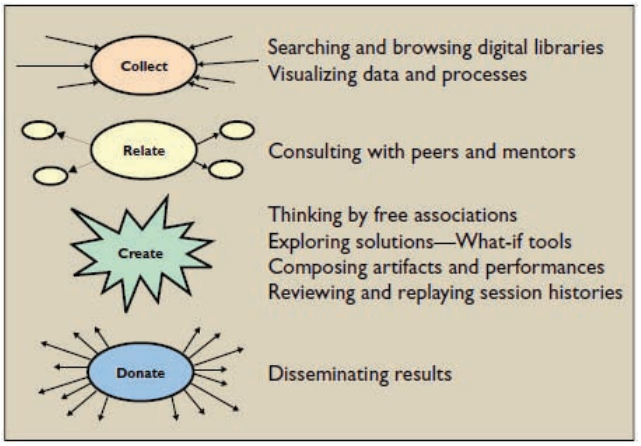

Figure 2: Activities and related tasks according to the GENEX framework (Shneiderman, 2002)

The activity *Relate* refers to consulting with other people such as peers and mentors. Consulting thereby can be supported by consultation tools which enable and support communication in consideration of the dimensions time, space and amount of participants. The dimension time contains the question whether the supported communication takes place in a synchronous (e.g. by chat, telephone or voice over ip) or asynchronous way (e.g. by mail). The dimension space deals with the question whether the communicating peers are located at the same place or separated from each other. The amount of participants affects the amount of communication channels which have to be provided in order to enable two or more participants to communicate (in consideration of the dimension time).

The activity *Create* contains overall four tasks namely *Thinking by free associations*, *Exploring solutions – what-if tools*, *Composing artefacts and performances* and *Reviewing and replaying session histories*. Thinking by free associations, sometimes also called *brainstorming* or *lateral thinking* (De Bono, 1971) covers a wide range of possible functionalities and tools as there are lots of ways to enable free association, for example Mind maps or Thesauri. *Exploring solutions- what if tools* refers to tools which implement functionalities to observe results when changing single values of a more or less complex experiment. Examples would be spreadsheets. Composing Artefacts and replaying session histories refers to tools which enable the composition and rearrangement of existing artefacts to new compositions. Functionalities for *Reviewing and replaying session histories* (moving forward and backward in the history of the composition process) thereby ensure the preservation of each state during the composition process.

The activity *Donate* refers to disseminating results to others (e.g., peers and mentors). Thus, elaborated ideas can serve as artefacts others in turn can use as basis for their creations.

Tools and Functionalities for IT-based Support of the Innovation Process

In order to derive functionalities and tools for software related communities for innovations, we apply a theory-based approach as proposed by Briggs (2006) to develop non-intuitive design choices that produce successes beyond those possible with an intuitive non-systematic approach. In the following we will derive functionalities and tools for communities for innovations following the GENEX framework.

Each of the activities of the GENEX framework can be assigned to one or more stages of the evolution process of a single idea. During the generation and implementation of an idea, tasks out of the activities “Collect” and “Relate” emerge and can be supported by suitable functionalities and tools. After these two stages follows the dissemination of an idea to the community implying tasks out of the activity “Donate”.

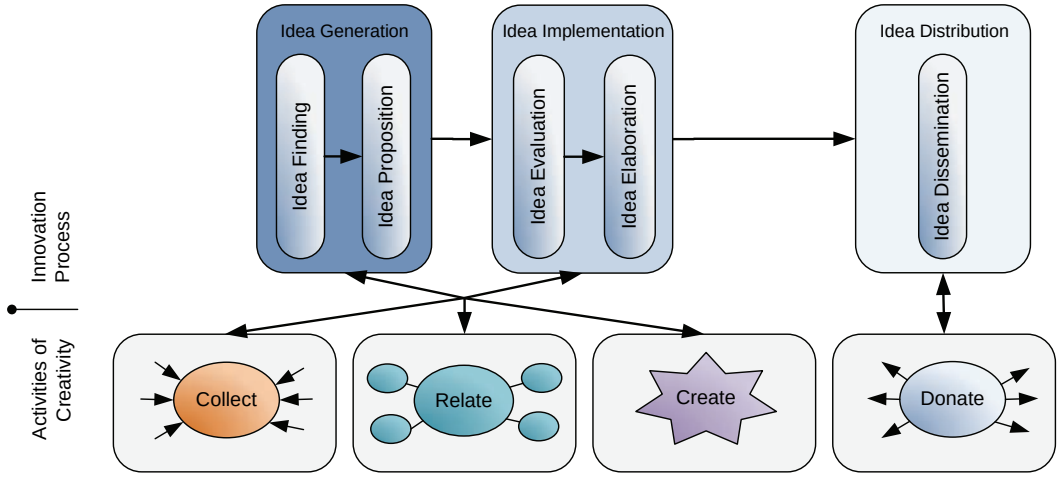

Figure 3: Activities of Creativity assigned to the innovation process

In order to systematically identify and classify tools and functionalities supporting a community for innovation’s idea evolution process, in the following we use a classification scheme on the basis of the activities and tasks the GENEX framework implies. Although, we focus on communities for innovations for software companies, the classification itself - to a certain extent - represents a generic scheme for innovation communities in general. The activities and tasks probably emerge in every Community for Innovations.

Activity	*Task*	*Tools / Functionalities*
Collect		
	Searching	Filter (e.g. Table Filter), Keyword Search, Logical and Context Operators, Regular Expressions
	Browsing	Continuous Scrolling, Pagination, Tag Cloud, Hyperbolic Browsing, Thumbnails, Carousel View, Sorted Views
	Visualizing	Tag Cloud, Hyperbolic Browsing
Relate		
	Consulting	Email, Instant Messaging, Voice over IP, Chat, Forum, Conference Call, Blog, Wiki, Newsgroups, Comments, Address Directory, "Find an Expert" functionality, "Tell a friend" functionality
Create		
	Thinking by free associations	Mind maps, Copy & Paste, Live Preview, Drag & Drop, Modelling Languages / UML, Interface Mock-up Tools, Collaborative Text Editing, Collaborative Drawing
	Exploring	Device Simulator, Modelling Languages / UML, Interface Mock-up Tools, Integrated Development Environments
	Composing	Wiki, Live Preview, WYSIWYG Editor, Copy & Paste, Interface Mock-up Tools
	Reviewing & replaying session histories	Versioning, Session History, Wiki
Donate		
	Disseminating	Idea Description, Attachments, SVN, Hosting, File Sharing

Table 1: Tasks and corresponding tools / functionalities

Supporting "Collect – Activities"

Activities in the domain of collecting information contain tasks of searching and visualizing. Concerning communities for innovations in terms of an internet based virtual community, we identified functionalities and tools as presented in table 1. The core functionalities in this area enable various ways of browsing, formatting, filtering, browsing and visual processing of information.

Search tasks imply functionalities to define search keys for example in terms of single keywords, combinations of keywords by logical and context operators or regular expressions. Furthermore, search tasks can be supported by filtered views of data for example using table filters.

Supporting the *browsing* of data, functionalities are required which enable a clearly arranged, intuitive and easy to use interface for browsing few as well as a lot of data sets. Suitable functionalities here are various forms of presentation

such as thumbnail previews, hyperbolic browsing, tag clouds, pagination or sorted views (cp. figure 4).

Support for *visualization* tasks overlaps with support for browsing tasks. They can also be supported by functionalities such as tag clouds or hyperbolic browsing mentioned above. These tools and functionalities help users in gathering relevant information out of large amounts of data (cp. figure 4).

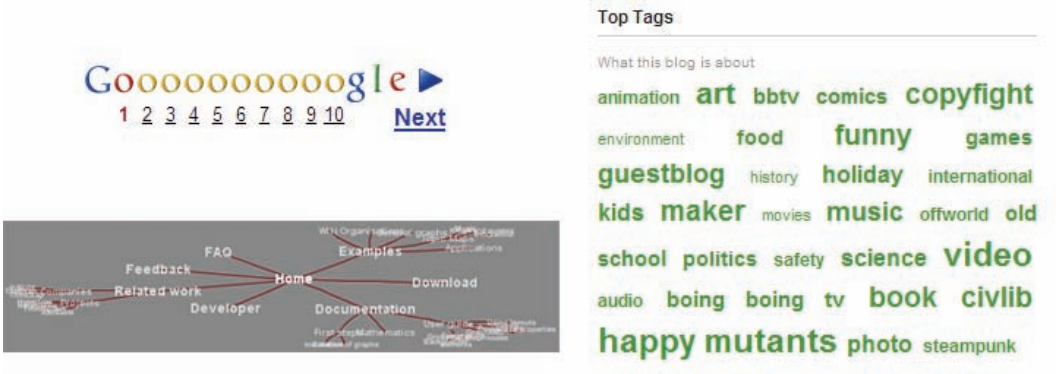

Figure 4: Pagination, tag cloud, and hyperbolic browsing (clockwise from top left; sources: google.com, technorati.com, mfirst.de)

Supporting “Relate – Activities”

Tasks in *relating* activities are all about communicating with other people such as peers and mentors within or also outside of the Community for Innovations. Besides common and well-established functionalities fostering communication such as email, instant messaging and conference calls, we also focused on how to find peers to communicate with for example in order to get assistance on specific topics. Therefore, we consider tools such as “Find an Expert” tools, which propose community members with expertise in a special topic (cp. Maybury, D'Amore, & House, 2001), address directories or at least searchable user profiles providing personal information. In this domain, the parameters place and time have to be considered in order to support the different requirements of a Community for Innovations. Wikis, Blogs and the use of comments for example cover asynchronous communication whereas instant messaging and chats cover synchronous communication.

Supporting “Create – Activities”

Supporting creating activities includes the majority of functionalities and tools we identified as suitable. In this area, a vast amount of functionalities and tools exists fostering thinking by free associations, exploring, composing and reviewing & replaying of session histories. We focused on general approaches such as Mind

maps, Wikis, WYSIWIG Editors, collaborative text editing or drawing (cp. Baecker, Nastos, Posner, & Mawby, 1993; T. Buzan & B. Buzan, 1996; Leuf & Cunningham, 2001) as well as on tools and functionalities dedicated to software development. The latter for example covers the use of interface mock-up tools and device simulators (cp. Shneiderman, Plaisant, Cohen, & Jacobs, 2009), modelling languages such as UML or even the integration of integrated development environments (IDE) such as eclipse.

Supporting “Donate – Activities”

Donating activities refer to the dissemination of a participant’s results to the Community for Innovations. The dissemination can be realised by basic functionalities of an internet based platform such as the possibility to post the description of an idea and maybe several attachments which is included into an idea-pool. This pool in turn combined with functionalities and tools supporting collecting activities can serve as a basis for other community members executing tasks such as search and browse. Regarding communities for innovations for software companies, in our opinion, domain specific tools fostering the management of source code (e.g. Subversion) or the hosting of digital resources are suitable (e.g. by FTP servers or file-sharing solutions).

Conclusion

In this paper, we derived classes of functionalities and tools for IT-support in software related Communities for Innovations based on a classification scheme we deduced from theory. The requirements we identified are not exhaustive but a first starting point. Moreover, the collection we presented still has to be evaluated in terms of adequateness, usefulness and user acceptance. As we currently are engaged in specifying and establishing a Community for Innovations for software companies, we will implement the mentioned functionalities and tools as a firs application of the classification scheme. Thus, we will also be able to evaluate the proposed classification scheme in future work.

Even though we deduced the classification scheme focussing on its use for software related communities for innovations, to a certain extent it can be used for any Community for Innovations. In future work, we will enhance and generalize the classification scheme in order to cover Communities for Innovations in general.

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On the Social Construction of Open Innovation

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Abstract. In this paper we want to illustrate examples of Open Design Spaces (ODS) and raise the question how to organizing the openness for practicing Open Innovation (OI). In a case study, we studied the role of a small sized software enterprise (SME) in a software development project that has the form of a more or less contingent value web. In that way the project constitutes an ODS where heterogeneous actors participate. In our research we study the participation of the SME on that ODS and we study the way the SME makes use of new opportunities for innovational development given by such spaces. In a critical reflection of our experiences, we raise the question, how openness must be organized so that it supports the sustainability of the individual SME as well as Open Innovation (OI) as a whole.

Open Design Spaces as Places for Open Innovation

In the software branch the competence to innovate - coming up with new ideas and bringing them successfully into the market - becomes a sine qua non in general. Therefore, almost any company makes huge efforts to improve their way

of commercialization of their industrial knowledge, with the aim of creating new ideas to reach sustainable growth and to stay competitive. In current innovation management literature the conception of Open Innovation (OI) is suggested as the novel approach to develop innovations more efficient.
OI follows the paradigm that *"firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology"* (Chesbrough 2003, p. XXIV).

This means, that new innovations are not developed exclusively within the borders of one company, but are co-created in networks (value webs) of heterogeneous stakeholders, such as (communities of) users, hobbyist developers, universities or even competitors. OI constitutes and is constituted by a platform or 'open innovation space' to create, develop and discuss new customized products and services in a heterogeneous network (Piller et al. 2004). Taking up the ideas of this workshop, we call this room in the following Open Design Spaces (ODS).

This ODS provides the chance for a company to get in contact with new ideas, knowledge or technologies that are created by various stakeholders with heterogeneous cultural backgrounds. Initially, these new ideas often have the form of - metaphorically spoken - tiny, dirty gold nuggets that are burrowed deeply in the bulk of ODS. In the mud of ODS there might be 'innovation seeds', which contain novel 'need knowledge' or 'solution knowledge' (Reichwald and Piller 2006) which have the potential to mature to innovations which can be brought into a rising market.

Herzog (2008) stresses, that the introduction of an OI paradigm should come along with a change in the firm's innovation culture, because such innovation seeds can only be adopted if a company overcomes the not-invented-here syndrome (Lichtenthaler and Ernst 2006). The organizational culture needs to produce a climate where it is not important whether an innovation seed comes from an external or internal source. Becoming aware of the essential importance of OI processes in economic our work has a strong interest in researching these ODS supporting companies coming up with innovative products.

From this perspective, we interpret ODS as the places which obtain new opportunities for innovational development. In realm of software development, a special case of OI spaces is given by Open Source Software Development (OSSD) (Bitzer and Schroder 2006; Feller et al. 2007; Henkel 2007) or by ICT innovation (Williams et al. 2005) like our case. In particular we illustrate in this paper our empirical data of how a SME of the German software branch makes use of their relationship with its uses to drive innovation in the context of a business simulation game which is used in business school lessons.

The paper is organized as follows: After presenting our research methodology and the case study conducted, we will introduce the SME and its value webs in more detail. Afterwards, we will discuss our empirical findings of how the SME makes innovative use of its ODS. The paper ends with a conclusion and some lessons learned.

Research Methodology

In our research we are interested in practices of a SME of the German software branch using innovation potentials given through ODS. Our analysis and our findings are out of a research project about End User Development (EUD). In this project we cooperate with different software companies to integrate EUD concepts in their products. As a part of this project we conducted a case study in a SME, to analyze and understand how the EUD orientation is reflected in their daily work practices. Therefore, we focused in this research not the technical challenges, but the organizational challenges to bring EUD into praxis. In particular, we wanted to analyze the issue, how the SME organize their costumer knowledge (cf. Meurer 2008; Nett et al. 2008).

The study was conducted from September to December 2007, mainly based on ten interviews of one hour of duration each. In the study it was possible to interview all employees with a fix contract: the CEO of the enterprise, the CIO, one apprentice of IT-technology, two marketing employees, one additional technician and one designer. Additional interviews were conducted with one former marketing employee, as well as with one designer and one development freelancer, both of them with a long record of contracts with the company. All interviews were based on a semi-structured guideline, which contained questions on the role, tasks and responsibility of the interviewees in the enterprise. Further, questions were asked about processes and communication media in the context of possible knowledge on or contact to the clients. Interviews left room to answer according to an own relevance-system. Interviews were recorded, transcribed, paraphrased and analyzed. We interpreted the empirical material in two steps. Firstly we paraphrased the material and identified on this way sequences which are under our theoretic lens of great interest. Secondly analyzed in detail with the sequence analysis, a hermeneutic Kunstlehre suggested by Ulrich Oevermann (cf. Titscher et al. 2000).

In reaction to the issue of the workshop, we have taken a look on our empirical data using the idea of ODS as an analytical lens. As we have pointed above, we do not assume that the participation in heterogeneous value webs exist in a vacuum, but constitute by interacting new spaces, ODS where new ideas and knowledge can be used as innovation seeds. We use this vague interpretation of ODS as a heuristic construct in order to organize our empirical material.

In particular, we interpret ODS not as physical entity, but as a social entity. From this perspective we argue that the ODS is given by the structure of the social network that becomes relevant in the design process, because these value webs constitute the necessary room for cooperation in distributed production and consumption processes.

To make it easier for the reader to follow our outlines we give in the next chapter a brief introduction into relevant characteristics of the SME and present

the social aspects of the relevant production and consumption networks. Afterwards we focus on the adoption of the innovation seeds in this very ODS.

Introducing the SME and its Value Webs

The SME was grounded in 2002 from three students, who learned to know each other during a common work project in university, which gained a price for its innovative idea.

The software enterprise works in the field of educational products and is one main manufacturer of an online business simulation game. The business game is a web based product implemented in Flash, and is publicly available for the teachers (also called tutors) and the pupils. While the teachers introduce the game in their classes, it is played by their pupils in school or at home. The company develops and administrates the simulation game and also holds the intellectual property.

Particularly, the software enterprise was interesting for our EUD project because they want to redesign their business game after EUD principles. The game which is used in business school lessens from teachers and their pupils should allow its users a more flexible use context in regard to adapt complexity on different didactical learning matters.

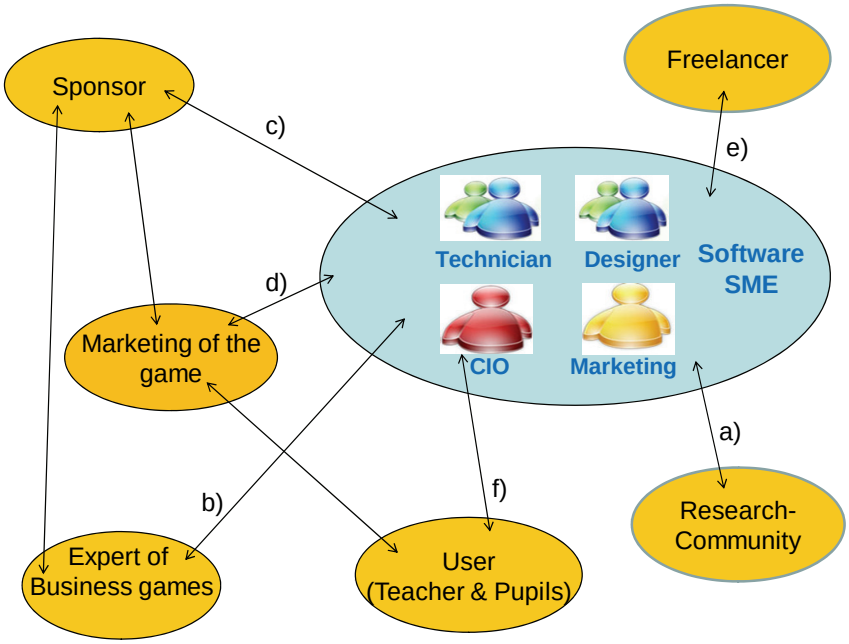

Figure 1. Schematic view of the relevant social network producing and consuming the business simulation game.

The production of the business simulation game is embedded in a wide and complex value web. This is not unusual, but rather often necessary for software SME, especially in the area of new media and creative industries.

In particular, production and consumption of the business simulation game are not completely separated spheres of existence but rather mutually constitutive, shaping the ODS of the product. Figure 1 presents a visualization of the network given by the production and consumption of the software product.

The first relationship in the network is given by the cooperation of the company with the users of the game (f). For them, the game is free of charge, because the development and administration is paid out of the education sponsoring budget of commercial enterprise.

The development activities have to be negotiated with the sponsor (c). In the development of the game logic referring to the didactical topics, the company cooperated with a professional expert on business simulation games (b), additionally it cooperates with a network of free employees in question of interaction design (e).

In addition, merchandise of the game is done by a third organization (d), which was created as a public-private partnership to foster the use of computers in schools. The company was interesting in our EUD research project because they want to redesign their business game in a way that allows its users (the pupils) a more flexible use context with regard to adapt complexity on different didactical learning matters. In designing an EUD version of the game, the SME is cooperating with regional universities (a).

In such ODS all the different groups can create new innovation seeds whenever interaction and communication takes place.

In respect of our EUD focus, we especially search for examples of user innovations, in the next chapter we want to explore some chosen examples out of our data, where the employees of the SME narrate about their costumer's relationships. The given examples are assorted related to our understanding if not or if the SME adopt on innovation seeds.

Making Innovative Use of Open Design Spaces

One observation was that the users of the business game communicate with the software SME through a communication channel, which was originally developed as an electronic registration form. Initially, this registration technology was created by the company to handle administrative affairs such as announcements or notices of removal. However, the users 'mis-'use this channel also as a feedback channel to communicate with the software SME. For example, the users address problems applying to the product, but also made suggestions and proposals, such as to make the business game adaptable, to be able to create individual company names with the own likeable color. Another customer's idea was to play the game as a peer-to-peer version with fragmented company roles.

This example illustrates that although the producer does not offer their users “proper” feedback channels, the users still respond to an astoundingly large extend by a creatively “mis-“use of the registration form and bring themselves ODS into being. Form a theoretical perspective this example also demonstrates, that forming and using ODS are connected activities.

In reaction to this respond (“*we get round about three mails a day*”), the company points that they want to act on these suggestions and is planning to implement the mentioned user-ideas. Further the SME developed in this new space of interaction an extra field for contact.

Besides, these felicitous uses of ODS which are opened up by the users and are innovative returned by the software SME, we can also identify many situations where intensive interaction takes place, but where seeds of innovations leave unused.

We want to illustrate some of the examples we have found where ODS are not responded and used as innovation seeds. One characteristic example is that the interviewee, in the preliminary discussion preparing our study, explained how the enterprise lacked of customer feedback. But in contrast, it was just one of our surprising findings that the SME obtains a lot of customer feedback, (and that the company, as showed in the last chapter, even developed innovations in reaction to such unanticipated user behavior).

Another example is illustrated by a speech of another employee, where he states:

> ”[T]hus, we always get such requests. I want to have this and that, this I would like to do, but I cannot. Can you help me to get this feature? At any time the point comes, where we said, so let’s put these requests together and make a list, such a top fife list. Somehow, the mails are saved now“.

The employee describes here a situation, when the company gained a lot of unexpected costumer feedback. This sequence shows very clearly a crisis situation, in which the company must decide how to cope with a mass of user feedback as one kind of Open Design Space. But the crises how to interact with the various costumer feedback is not initiated by the aim bringing up this social phenomena for OI practices, but to keep handling the feedback in an administrative way. So, the enterprise to adopt the new interaction channel with their costumers offered by the ODS mainly from an administrative perspective, archiving the mail and range the feedback after its frequencies. This strategy addresses the administrative issues to manage the various costumer feedbacks, but in opposite to concepts like Lead User Innovation (Hippel 1986), the chosen solution is no strategy to identify innovation seeds in the flood of user feedback.

A third example of an unused chance to practice OI is stated by several interviewees as an impressed workshop. They told us, that they “had to” hold a user-workshop which was initiated by the employer of the business game. The workshop took place with the teachers (the users) and with the small enterprise (the developers of the business game).

The SME employees complain that the workshop had "failed". One interviewee describes the workshop as follows:

> „Only one (teacher) was able to play though the game. This one gave good feedback, too. When the teachers played [the business game] with their pupils this was a hole catastrophe. The teachers endeavor but it was a big chaos". More pregnant another interviewee pointed: "it [the business game] can really design the complete lessons for a half year so extensive it is designed. That has really nothing to do in art and music classes (.) it is perceived wrong by the teachers even through it is communicated properly by us".

In the phrase "*it [the business game] can really design the complete lessons for a half year*", the interviewee pointed out the benefit of the business game that it is able to design the whole school lessons. However, an interesting aspect of this phrase is that the game is put in the active role of designing the school lessons, while the teachers obtain a passive role.

The protocol also demonstrates in respect to the designed artifact that the technical and the didactical level are amalgamated, which makes it difficult to analyze both interwoven issues about the use of the business game as separate ones. The protocol also demonstrates in respect of the designed artifact that the technical and the didactical level are integrated, which makes it difficult to deal with both interwoven issues as separate ones. Nevertheless, if software developers want to respect the domain expertise of its users than the analytical separation of technical and domain issues becomes necessary, illustrating that social scientist postulate of 'value-freedom'[1] becomes a relevant issue for the software design, because the phrase "*it is perceived wrong by the teachers even through it is communicated properly by us"* indicates an amalgamation of the normative judgments made by the interviewee. This is an indicator that the company does not reflect on the difference between their own conception and the conception of their clients, as we know it for example from (semi-) professionalized disciplines like social work or psycho therapy (cf. Meurer 2008 for a detailed analysis of this issue). In particular, using the spirit of the technical product as a measure of the user´s practices reflects the technocratic attitude of the company. The transcript demonstrates that unlike the before communicated aim of the company, to design the game flexible and usable for various user contexts, the enterprise communicates their own role in communicating the `right' usage.

This sounds like a pejorative judgment of the company's practice based on an anti-technocratic value system of the researchers, but this interpretation would misinterpret our argument. However, our interest is not to demonstrate that the company does not work in a proper way because they do not follow our value system. The point we want to highlight is a different one, namely the question

[1] The postulate of the value-freedom (or the neutrality of normative judgments) can be summarized as the advise that social scientist should be aware, if an judgment is grounded in the own value system or in the one of the subject-matter (cf. Weber 1998).

why we do not found a level of reflection in the company which might explicate their different perspective of business games.

It is plausible to assume, that the company does not see the benefits of such an additional level of reflection. If we study that issue from the technological focus of the company and searching for a plausible explanation for our empirical observation, our first working hypothesis is that the missing level of reflection is an expression of a technocratic identity. This working hypothesis is grounded in the consideration that for a social constructivist the reflection on different world views is an obligatory part of their identity, while for a technocrat it will be optional.[2] Therefore, one can expect that if the company has a social constructivist identity, the reflective level is manifested in the empirical data, respectively a technocratic identity.

Therefore our first tentative case hypothesis is that the technocratic identity becomes a burden to get aware of the variety of user innovation seeds, because of the missing level of reflection. The contact with the different cultures of participants of ODS should be perceived as a resource, however in our case the different cognitions between them and their customers are mainly perceived as a defect and not as a seed of innovation. While a technocratic position is neither good nor bad in general, but just one way of reality construction, we argue in a generalizing manner that a technocratic identity becomes a burden to make use of the full innovation potential provided by ODS. Committing themselves to the concept of EUD and being an active member in ODS it should be in the intention of the company to be aware of the seeds of innovation. Arguing from this perspective, we would state that it would be also in the interest of the company to reflect on the technique centric identity in order to prevent a shortened perception of ODS.

Although this is a first, very speculative interpretation, it raises interesting topics about the appropriation of ODS. Here, the example of unused chances gives a fist impression, why companies do not appropriate these new opportunities of customer interaction given by ODS in order to discover innovation seeds.

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[2] A positivistic, technocratic position assumes that in the case if I make a contradicted proposition about one object than someone else, I can proof which proposition is correct (resp. incorrect), but that it makes no sense to say that both judgment are correct. In opposite to this, an interpretative, social constructivist position would argue that judgments are relative to a specific life form (Lebenspraxis) and in this case, where I and the other person do not belong to the same life form, I have to get an interpretative understanding (deutendes Verstehen) of the different life form, before I can make a statement about the proposition of the other person. At least, this leads on four different options to interpret the contradiction: 1. I do not share his world view, but from this perspective the proposition is right; 2. I do not share his world view, in addition from this perspective the proposition is wrong; 3. we have the same world view and he is right (and I'm wrong); 4. we have the same world view and he is wrong (and I'm right). One might argue that a proposition if wrong, if it is based on a wrong life form, but this assumed that we can judge on life forms in the same way if a life form will judge on proposition. Some good reason, why this is not possible is given by Winch (1958, chap. 4).

Conclusion

In the presented first tentative findings of our empirical case study we identify various ODS which might offer several opportunities for innovations. In particular, we show examples of possible user innovations, where users make creative suggestions and proposals (e.g. the registration form, new areas of applications like music and art lessons, or on the workshop) which we have interpreted as innovation seeds.

Summarizing the given examples of handling the interaction with the value webs, we come to a first conclusion that the main problem is not the lack of ODS in general, but the problem of becoming aware of the opportunities in such ODS and to manage these opportunities. In the observed cases, the company has taken some reactions, but they are not systematically exploited. This raises the question of the social construction of OI and the appropriation of innovation seeds - a question that is often been ignored in literature.

Generalizing our findings, there the little awareness of ODS while OI is related to the identity and routinized interpretation schemes of the actors. In our case study, ODS is neither reflected in the organization as a challenge nor as a basis for innovation processes. This is in line with the finding of Davenport & Prusak (1998), that it makes a difference to develop an innovative product and to develop an innovative development environment enabling the development of innovative products, and that the opportunities to share knowledge are the crucial prerequisite for the latter.

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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 that 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.

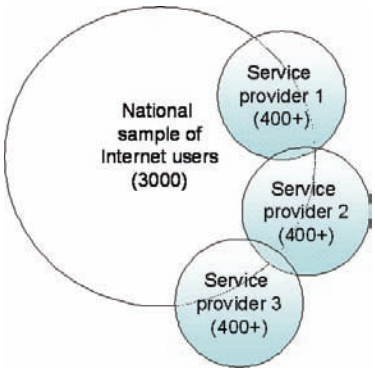

Figure 1: RECORD online Living Lab panel of participants

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 to 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.

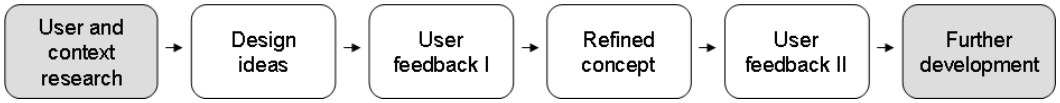

Figure 2: User feedback process of Case 1. Gray boxes are outside the scope of this study.

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.

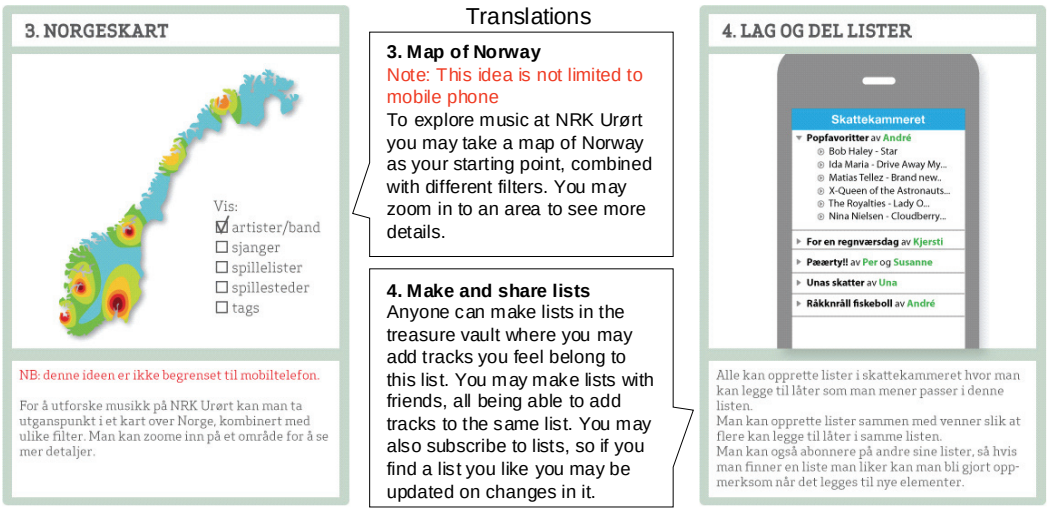

Figure 3: Two example idea cards, with Norwegian text translated to English.

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).

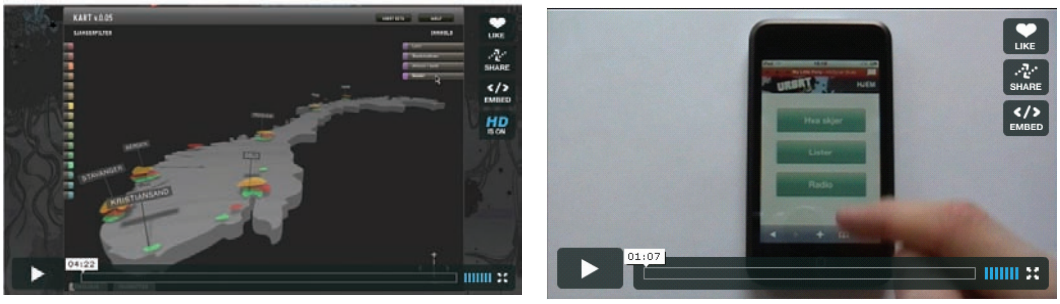

Figure 4: Screen shots of videos visualizing the UIs of the two Urørt service concepts.

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 thorough 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 uni-dimensionality 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

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Challenges and Potentials of User Involvement in the Process of Creating Games

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Abstract. This article gives a short overview about the history of user involvement in the area of digital games and describes the specific challenges and potentials of the participation and motivation of users in this application area. It specifies the different degrees and types of user involvement and outlines the current state of the art. Moreover, the article discusses the implications of user involvement for game companies and users with a special regard to user-generated content and gives an outlook on future development.

Introduction

Within the past years the game industry has gone through an overwhelming economic growth and analysts foresee a strong growth in the nearby future as well (despite the current depression). The branch of game development and publishing is already a major industry with its strongest markets in North America, Japan, and Europe. The nine European core markets[1] sold video and computer games worth €7.3 billion (excluding hardware sales) (Nielsen Media Research, 2008) in 2007. Games software sales in the U.S. recorded €6.9 billion (9.5 billion dollar) in 2007. The annual growth of the industry ranges from 17% (U.S. sales between 2003 and 2006) (Entertainment Software Association, 2008) up to 21% (German sales between 2006 and 2007) (BIU - German Association for Interactive Entertainment Software, 2008).

[1] The European core markets are Great Britain, Germany, France, Italy, Spain, the Netherlands, Switzerland, Sweden, and Finland.

User involvement in Digital Games

It is not a new phenomenon that user communities participate in the development or improvement of a product. In fact, it is extremly rare to find industries that do not attract user involvement (Edery and Mollick, 2009). Users do not only gather around software products, they build communities around sports, cars, food and even healthcare products. So, what is so special about user involvement in the area of digital games?

At first, the relation between game company and gamer looks like many other relations between producers and consumers: The companies are looking for profit and the users want to solve their problems, gain status in their community or - in most cases - just want to have fun (Edery and Mollick, 2009).

But over the years, game companies have learned to align the needs of user communities with their own needs by offering awards and incentives that make it entertaining and interesting to focus on user involvement (Edery and Mollick, 2009). The game companies provide the users with toolkits and support, which makes it easier for the community to get involved and to share the results. But the key factor is that most of the companies have staff focussing only on the support of the community. So called 'community managers' know the gaming community's own language and rules, are able to support the users and, even more important, guide the user participation into a positive direction for business and innovation to avoid e.g. piracy issues (Wera, 2008).

More than any other industry, video game companies have succeeded in channeling the positive aspects of user involvement not only to extend lifecycles of products but also to create valuable sources of innovation for the industry (Kücklich, 2005). How this was achieved and to what extent today's user involvement in games evolved will be explained in this article.

History of User Involvement in Digital Games

User-generated content and user participation in the context of digital games exist as long as the games itself but the possible degree of participation changed a lot over the years. Back in 1962 computer science students enhanced the original 'Space War'[2] game by adding new features and brought it back to the community afterwards, making it one of the first digital game modifications. Adding new features to a game in 1962 meant to reprogram specific parts of the original game which was reserved to a small group of skilled hobby programmers and computer science students. At that time, modifying commercial games was often connected with the use of hex editors to manipulate binary game files. While some people just 'cheated' by changing the binary code e.g. to make their avatar invulnerable, others created additional content by doing a great job of reverse-engineering.

[2] 'Space War' is one of the first computer games and was created by Steve Russell at a PDP-1 computer in 1961 at the MIT.

Years later, the first games with GUI-based toolkits[3] emerged, offering non-programmers the opportunity of generating content for games. With the release of 'Doom'[4] in 1993 gamers started not only to record their own movies based on game engine technology (called 'machinima'), but they also created more than 12.000 modifications of the game (Kushner, 2004). Although more and more people got involved in creating or modifying game content, they still remained as a small community without an access to a broader audience.

But this all changed when the internet became a mass medium. People could now share their own thoughts and creations with a continuously growing community. The user interaction via different web platforms, wikis and boards made it possible to work collaboratively on larger projects. One of these collaborations changed the game industry's view on user participation. Started as a small community project the modification 'Counter-Strike' for the game 'Half-Life' got so popular that Valve, the publisher of Half-Life, offered the community team contracts and made 'Counter-Strike' a part of the Half-Life franchise in 1999. Until now, 10 million products under the 'Counter-Strike' label were sold[5] and, in addition, extended the lifecycle of 'Half-Life' a lot. Impressed by the success of 'Counter-Strike' a lot of game publishers and development teams put more resources in offering better toolkits to the community or started releasing their engine source code to the public[6].

State of the Art

Nowadays, several online and offline games have huge fanbases which gather around single products or whole franchises and series. In most cases, web-based platforms work as a basis for the online communities which are established by the game's publisher or developer[7], by online and print magazines[8], or by individuals. In addition, games like 'Little Big Planet'[9] provide a first impression of the potential of integrating community platforms or features directly into the game, creating a smooth transition between the game and the user involvement. All community platforms have different focuses (or a combination of them): Some discuss game ratings, other provide users with helpful guides and walkthroughs or provide users with self-made addons and content.

[3] Lode Runner offered one of the first level toolkits in 1983 (Amiga 800, Broderbund Software).

[4] First-person shooter game by id Software.

[5] Not included are downloaded versions of the franchise which were sold over Valve's internet platform 'Steam'.

[6] As one of the most popular 3d gaming engines at this time, the 'Quake' engine by id Software, was published under the GPL in 1999.

[7] The official 'World of Warcraft' community was established by the developer 'Blizzard Entertainment': http://www.wow-europe.com/de/community/ Last visit: 01/12/09

[8] An example for a popular game magazine community is www.gamespot.com Last visit: 01/12/09

[9] Jump'n Run game for the Playstation 3, developed by Media Molecule. Released in 2008.

Table I. Different types and degrees of user involvement in games.

Degree of Part.	Type of User Involvement	Preconditions of Users	Tools	Examples	Future Tools & Technologies
High	Creating own digital games	-Experienced Users -High skills in programming and 3d modelling tools	-Microsoft XNA -Visual Studio C++ -Maya, 3DS Max -Game-Engines	-Alien Hominid -Braid -Ragdoll KungFu -Crayon Physics	-MS Kodu -Programming by learning -Silverlight
High	Creating mods & total conversions	-Programming and scripting skills -Able to create own textures and models	-Engines, Toolkits -Visual Studio C++ -3DS Max, Blender -Photoshop	-Counter-Strike -WC3 DotA -Insect Infestation -Tower Defense	-Genetic algorithms -MS Popfly
Medium	Building content and assets	-Good understanding of game mechanics and / or design -Toolkit knowledge	-Level toolkits -Object editors -Photoshop	-Little Big Planet -The Sims 1 & 2 -Forza Motorsport -Spore	-Content creation will be part of the game
Medium	Writing fan fiction or creating fan art	-Talent for writing or arts	-Pen & Paper -Office applications -Photoshop -Web platforms	-Red vs. Blue (Machinima) -Blizzard.com/ Inblizz//Fanart/	-Extended video authoring tools
Low	Writing reviews & walkthroughs	-Basic understanding of game design, basic writing skills	-Office applications -Webpages -Blogs	-Gamespy.com -Gamefaqs.com -Supercheats.com	-Future community platforms
Low	Playing the game	-Interest in the genre and game world	No tools required	-Data Mining -Logfile Analysis	-Evaluation algorithms

Table I shows my proposal of a categorization of different types and degrees of user involvement in the gaming industry. For most of the higher degrees of participation additional tools and software are needed, and moreover, inside knowledge and experience of using the given tools.

By playing a game the 'user involvement' is limited to logfile analysis of player data or behaviour which is supported passively by the user. Several companies do research about their games and evaluate data of e.g. online gaming sessions in order to find bugs or resolve balancing issues.

The active participation starts with gamers giving feedback about their gaming experience e.g. in official boards or questionnaires of the developer. Gamers also write reviews, give recommendations how to solve technical issues or write whole walkthroughs for their favorite games. An economic study discovered that gamers reduce supporting costs of companies by helping each other to solve technical problems, to the extent that they solved 1.300% more problems than the support staff of the companies (Jeppesen, 2005).

A more creative extension of the writing skills are the generation of stories going beyond the game‘s plot (fan fiction) or creating own fan art works or machinima movies with characters or settings of the game world. The web platform 'Mod the

Sims 2'[10] has 670.000 active members who wrote more than 123.000 stories, many of them illustrated with movies taken in the game.

Even more ambitious and time-consuming is the process of creating own content which can be implemented in a game. This does not only imply knowledge about the game world and - if applicable - the game mechanics, but also in how to use the tools in order to create appropriate content. While some games extend their lifespan by level editor tools allowing the community to create endless levels and stages, other editors allow players to create characters or costumes (e.g. for the game 'Spore'[11] people created more than 2.5 million different creatures) to broaden the variety of the scenarios. While some tools give the users all the options they need to create content, some need additional support of scripting languages like LUA or texture painting tools. Game community members also release their own patches in order to clear bugs[12] or build interface modifications[13] to optimize their gaming experience through additional functionality and better usability.

Modifications often base upon the engine technology and the system of rules of one specific game but change the visual appearance or the gameplay so that the experience of playing the modifications differs slightly or significantly[14] from the original game. Creating a professional modification often needs a whole team of hobby programmers and artists, e.g. to program new game mechanics and model new graphical content. Current editor tools for games offer a lot of possibilities of participation in the creation of additional game content or complete games. The most powerful editors in terms of degrees of freedom and state of the art technology are toolkits of first-person games like 'Crysis'[15] and 'Half-Life 2'[16]. These tools offer physics engines, complex lighting and shader systems, AI scripts and a lot more. But only high skilled users can access and use all the tools to reach a product that matches commercial game standards. In most cases, it takes at least a basic knowledge of additional 3D modelling tools like 'Maya' or '3D Studio Max' and a scripting or programming language to use the full power of these tools.

The highest level of user involvement is the creation of own original games by using tools or engines from available games. Creating a new game challenges not only the technical knowledge of the participants but sets also high demands for the creativity needed to build a game world with working systems of rules and logics, believable characters, interesting plot and so on.

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10 http://www.modthesims2.com/ Last visit: 01/12/09

11 'Spore' was released 2008 by Electronic Arts and lets the player create creatures at different evolutionary stages of the game.

12 So called 'community patches' often emerge when the development studio cancels the official support for a popular game.

13 On the platform www.curse.com community members are sharing more than 4.500 self-written interface modifications for the game 'World of Warcraft'. Last visit: 01/12/09

14 Modifications with significant changes in gameplay and visual appearance of a game are called 'total conversions'.

15 Awarded first-person shooter released 2007 by Electronic Arts.

16 Released 2004 by Vivendi Universal but still popular due to modifications and extensions.

Implications for Publishers and Users

Gamers decide to what degree they want to get involved. They can spend both time and creativitiy for a product they like, or lean back and consume the content created by others. Community members no longer have to wait until their idea will be implemented - they can grab the provided tools and create additional content for a game on their own. Futhermore, they do it not only for themselves, but for thousands of players. The attention of the other community members, playing their level, using the interface modification or just giving positive feedback and recommending it to others is one of the highest rewards for a 'modder'. An even higher but much more uncommon award is the feedback of the developers, by showing interest for the gamers work or even integrating it into the next version of the game.

Publishers and developers get a lot of relevant feedback through user involvement, not only in terms of questionnaires, board postings or reviews (Niesenhaus and Lohmann, 2009) but also in form of e.g. game modifications. With each modification of his game the developer learns something about the gamer‘s needs and wishes and can integrate well-received ideas into his future products. A survey of modders (Prügl and Schreier, 2006) of 'The Sims' revealed that over half of all active modders spent more than six hours a week developing new content for free, and a smaller group of 12% spending more than 20 hours a week. Given this enormous potential of motivated users participating in the creation of content or support of a product, the possibilities for game companies saving money and generating additional benefits are obvious (Postigo, 2007). As a matter of fact, the investment for a web platform and the tools to support the user participation is comparatively small-sized, seeing the potential of benefits like extending the lifecycle of products, getting free viral marketing campaigns and higher sales numbers.

There are also some downsides of user involvement for the game companies, though. Well-done game modifications can not only increase the value of a game, but may also distract customers from the publisher‘s own official expansion products (Edery and Mollick, 2009). Moreover, communities are not only able to increase the gamer‘s loyalty for a product but can also work as an amplifier when things are not working as intended. Another problem game companies are facing are copyright violations, and moral or ethnic offences caused by user-generated content.

Benefit and Cost Calculations for the Participating Users, Publishers and the Community

Given the fact that some *participating users* spend more than 20 hours a week creating content for their favorite game without the perspective of a monetary benefit (Prügl and Schreier, 2006), the calculation of costs and benefits becomes obvious for them. Of course, some developers offer incentives for the outstanding community members but - from an economic perspective - these incentives still are out of proportion to the hours of work contributed by the gamers. This leads to the as-

sumption that most users do not judge the incentives by their monetary value but by emotional factors or prestige.

Table II shows various game-related incentives with their user-perceived value in comparison to the real costs for the publisher or developer providing these incentives. Although it may be easy to understand that incentives with high monetary value are perceived as high-valued by the users, it is not general necessary to spend a lot of money in order to create appealing incentives for the community as the examples illustrate.

Table II. Relation between user-perceived and real value of game-related incentives.

Incentives in the area of games	User-perceived value	Costs	Examples
Trips to trade fairs or meet and greets	High	High	Ticket and trip to game show
Product-related merchandise	Medium	Medium	Action figure of game character
Product-related virtual goods	High	Low	Ingame items with special abilities in multiplayer games
Access to beta versions	Medium	Low	Earlier access to closed beta
Fame & reputation	Medium	Low	Special discussion board ranks

An interesting factor is the perception of special game world-related items (also called 'ingame items') in multiplayer games or special ranks for discussion boards. Whereas the creation of a special version of an existing virtual item or the creation of a new board rank is only a small investment for the developer, the prestige in the community will be orientied on the availability of the item or title and the effort involved to achieve it. Another prestigious incentive for gamers is an earlier access to the beta version of an upcoming game because some developers and publishers give away 'beta codes' only to the most successful or 'hard-playing' users of previous games. Codes which are given away randomly or via contests do not have this prestige, of course.

Some platforms like Microsoft's 'XBox Live Marketplace' or Apple's 'App Store' show also first possibilites of how to sell user-generated games. While the Xbox Live Marketplace will sell only products evaluated extensively by Microsoft, the App Store allows hobby developers to sell their own applications and games with very few restrictions, making it possible to generate monetary benefits out of self-made games.[17]

[17] Both platforms cost a fee for developers. In case of Microsoft's 'Xbox Live Marketplace' developers can keep up to 70 percent of the revenue generated by their games.

The benefit and cost calculations for *publishers and developers* may seem easier to manifest at first glance. Some studies estimate the amount of work users contribute to a certain product and try to determine the value by comparing the amount of user work to company standards (Jeppesen, 2005). These estimations are appropriate in order to get a rough impression of the overall investment of all users involved in a game product but they often fail to provide an accurate estimation of the contribution‘s value. The following factors are often disbanded when it comes to estimations of the value of user involvement:

(1) *Quality of user involvement.* Based on the fact that there is often no gatekeeper mechanism controlling the quality of user-generated content before it goes online, the quality of user-generated content is mostly very heterogenous. Keeping the high numbers of content creations of the games 'Spore' (2.5 million creatures) or 'Little Big Planet' (300,000 level designs) in mind, it is not possible to evaluate every piece of content unless there is the possibility to establish an automatic review process. Hence, it is not possible to imply an average level of quality when calculating the value of the user involvement.

(2) *Viral marketing effects.* It is very difficult to calculate the value of viral marketing for a game generated by its user involvement, because the impact of the different communication channels is nearly impossible to measure. Users often promote their own creations via Youtube videos, blog entries, board postings, or tell friends via instant messager systems or ingame messages about their creations. From time to time, user creations are featured by gaming magazines and portals, again amplifying the marketing effects for the content and the related game.

(3) *Effect on sales numbers.* Even more difficult to put in numbers are the effects of the user involvement of a specific product on its sales numbers. A purchase decision of a user is a complex and multi-facetted process with not only rational but also emotional factors having an influence on the final decision to buy a product or not. User involvement, especially user-generated content, is often supposed to have an influence on sales numbers, especially regarding long-term sales, but there are no sufficient studies proving these assumptions, yet.

Despite this criticism on the estimated calculations of the value of user-generated content, some of these calculations help to get a better idea of the effort contributed by the involved users, e.g. by trying to compare the overall development costs for a game to the value of the user-generated content of this specific game. The following example estimates the costs and the value of the user-generated content of the successful game 'Little Big Planet' released for Sony‘s 'Playstation 3' platform in 2008:

A game developer costs an U.S. company around 90,000 dollars a year including all taxes and supporting costs (Siwek, 2007). A creation of a basic and runnable level design may cost a high-skilled developer one day, which makes about 350 dollars of the companies costs. More complex and high-quality designs may lead

up to one week or more, but in comparison to the quality of the user-created designs only one day per level design is calculated. Now, take 300.000 level designs created by the users of 'Little Big Planet' and multiply them with the costs of a basic level design done by a developer. This ends up with a total content value of more than 100 million dollars.

The developer of the game has about 25 employees[18] and the development of 'Little Big Planet' took about 2,5 years. This leads to estimated development costs of approximetly 5 million dollars including hardware and software licenses[19].

This roughly estimated example shows that the development costs of 'Little Big Planet' are considerable lower than the value added by the users. The example also shows impressively, that the participation of users allowed the developers to create a game with a higher content value than they could have done on their own.

Regarding this example from the perspective of the *community*, it is clearly a best-case scenario: The community members pay the same amount of money for a game with user-generated content support as for other games but get far more content to play through (even if it is unlikely that there are users who will play through all available levels). Everyone who wants to participate in the creation of content actively is able to but he or she can also just benefit from the additional content by consuming it. A downside of the user involvement for the community can be the already mentioned heterogenous quality of e.g. user-generated content in combination with a lack of feedback or rating systems. Community members may have to download several content units until they find something they are looking for.

Lessons for Other Application Areas

A lot of lessons learned by the games industry are also well-established in other application areas. Sharing code resources and modification tools is not a unique feature of the games industry but it is not being used to a comparable extent in other commercial application areas. Electronic Arts, the worldwide second biggest game publisher released toolkits allowing users to create the avatars for the game 'Spore'. Can you imagine Microsoft handing out tools to users in order to develop the next 'Karl Klammer'[20] for MS Office? It is comprehensible that some companies fear negative consequences of the user involvement: Having their product not under full control might lead to unintended results like inconsistencies in the overall product appearance or - when it comes to code modifications - errors in the system functionality or the logical structure.

The area of games shows that these problems can be limited to a minimum by setting up boundaries for the influence of the user creations. A successful example for establishing clear boundaries is the game 'World of Warcraft' which allows

[18] Due to the fact that developers start often with a small core team at the beginning of the development, the first year of development was calculated with 10 employees

[19] The estimated calculation consists of employee salaries, taxes, hardware, software licenses and office rental

[20] Well-known but often critizised avatar which shall support users of Microsoft Office.

players to write their own interface modifications by using XML and LUA. These modifications do not only change the appearance of the interface but, even more important, enable also the creation of shortcuts and macro functions.

In contrast, artistic content creations cannot be controlled by code boundaries or algorithms but there are other possibilities of rejecting flawed content. Electronic Arts lets the users of 'Spore' sort out the avatars which do not meet their overall expectations. Other games like 'Little Big Planet' use rating, tagging and review functions to ensure that gamers can search for high-quality content. These methods introduce a kind of subsequent gatekeeper mechanism and help users to orientate theirselves in the mass of content.

When it comes to the motivation of users not every gratification model in the context of games is transferable to other application areas. Product-related merchandise incentives like action figures, posters or virtual goods do not work for other application areas due to the absence of strong characters, storytelling and a persistent game world one can relate to. But other incentives, like user reputation work also in a social context in other application areas.

Another important lesson from the games industry is to recognize and to know your users in order to create a mutually beneficial situation in which both the community and the developers are happy (Edery and Mollick, 2009). Game developers and publishers often provide boards or even regular chats where gamers can meet the game developers or community managers to discuss current issues or improvements of the product and new ideas. A study about the motives of 'user innovators' showed that they are highly motivated by feedback from the company that created the product which serves as the basis for their innovation (Jeppesen and Frederiksen, 2006). In contrast to these positive experiences, some application areas stay very anonymous e.g. when asking for user feedback. A good example are the bug report systems of several operating systems or office applications which ask the user to comment on an error. After sending the message, the user neither has the chance to get any feedback from a developer related to his comment nor to be aware of the overall status of the specific error.

These examples show how the application area of digital games creates ways to channel the user involvement and innovation into positive directions for both the developers and the users. This relationship is strengthened by the communication between the developers and the gamers and the experience and knowledge that both sides can benefit from it.

Future Development of User Involvement in the Area of Digital Games

Nowadays, the degree of user involvement does not only depend on the motivation of the audience of gamers. The degree of involvement and the quality of the results relate a lot to the tools and interfaces the gamers are using. Seeing the commercial success and the positive media coverage of games like 'Spore' or 'Little Big

Planet', future games will see more and more tools and platforms supporting user involvement and the creation of user content. In addition, to make toolkits more usable and accessible for a broader audience, there are tendencies which try to give the interested users even more degrees of freedom in creating content.

Microsoft already did a good job with the release of the XNA framework[21] and is now going one step further with the game creation tool 'Kodu'[22]. This hybrid form of tool and game will run on the Microsoft gaming console XBox360 and Windows-based PCs and allows kids and adults to create their very own games. 'Kodu' goes beyond creating visual content or stages and levels for games: With a visual programming language gamers will be able to set up rulesets or behaviours of characters and objects and, given this fact, having a major influence on the game design. The interface of 'Kodu' can be controlled completely via the standard console game pad, making it not necessary to type in code commands. Although, visual programming is not new to the academic community - similar approaches were made by e.g. Squeak (Ingalls et al., 1997) and Alice (Pausch et al., 1993) - Microsoft's 'Kodu' looks like an interesting opportunity to teach programming in a creative and motivating way.

Another approach for user-generated games, also in development by Microsoft, is 'Popfly'[23] which currently has beta status. It describes itself as the 'Youtube of applications' and combines the strengths of Microsoft's 'Silverlight' and JavaScript to give users the opportunity to create custom web-applications, multimedia mashups and games. The Silverlight technology is comparable to 'Adobe Flash' which is often used to create browser games or multiplatform titles. These technologies give users the possibilites to develop platform-independent games which can be played in the browser or on mobile phones.

Another interesting future development will be the growing online distribution of user-generated games or content. As mentioned earlier, Apple and Microsoft are already giving users the chance to publish their self-made games on their online platforms and share the revenues with them. As internet connectivity becomes a basic feature for most of the gaming consoles and the mobile phones and handhelds, we will not only see new types of user involvement in the nearby future but also new types of distribution channels and business models for user creations.

[21] XNA is a set of tools with a managed runtime environment that facilitates computer game development.

[22] Kodu was shown at the CES keynote 2009 in Las Vegas and will be available in Spring 2009.

[23] More information: http://www.popfly.com/ Last visit: 02/23/09

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