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USER KNOWLEDGE IN A CONCEPT DEVELOPMENT PROJECT OF A BUSINESS-TO-BUSINESS DIRECTORY SERVICE

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1. Introduction

Concept development and design is usually defined as an early stage product development phase aiming at new and innovative product ideas, e.g. [Ulrich and Eppinger 2004]. The result of concept development should be a detailed enough description of the new product to enable decision-making about whether to start the actual product development or to abandon the product idea.
User-centred design (UCD) is a field of design that aims at producing a holistic understanding of potential users of designed service or product and utilising the gathered knowledge in design, e.g. [International Organization for Standardization 1999]. As a result a product or service whose design takes into account the needs, context, and insights of users should emerge. In other words, the aim is to design products that are easy, learnable, efficient, effective, and satisfactory to use, i.e. usable [International Organization for Standardization 1999]. Thus user-centred concept development bases new product ideas on understanding of the potential users and the context in which they act [Nieminen and Mannonen 2006].
There are many process models for user-centred concept development, which all have the same basic structure. The process starts with information gathering during which a holistic view of the core variables (e.g. users, context of use, technological possibilities and constraints) relating to the concept to be developed is formed. Idea generation follows the information gathering. After the idea generation the ideas are evaluated and best ones are developed further. The project usually ends with documenting phase during which all relevant aspects of the concept are described and continuation proposal is made [Nieminen and Mannonen 2006].

1.1 User Knowledge

From the point of view of user related knowledge, user-centred concept development can be seen to consist of two separated tasks: 1) gathering the information (or building the knowledge) and 2) using the knowledge. The first phase, gathering the information, is quite clear and well studied. There are several methods of user research and dozens of descriptions of experiences where different methods have been applied. Please refer to for example [Kuniavsky 2003] for good introductions to user research.
The second phase, which is the most critical from the project's results' point of view, namely using the knowledge in design, is less understood and studied. The main contributions in this area seem to come from the field of requirements engineering. Requirements engineering is the process of discovering the purpose for which the system is intended by identifying stakeholders and their needs, and documenting these needs in a form that is amenable to communication and implementation [Nuseibeh and Easterbrook 2000]. These stakeholders include users, customers, business analysts, developers,

and testers [Wiegers 1999]. Writing requirements and for example use cases for the product are good examples of using the gathered understanding of users. Writing of the requirements has however usually only a minor role in concept development. Aiming at sufficient amount of details to enable the making of a continuation decision means that there is usually no need to specify all the details of the product or service, i.e. to write specific requirements.
The complexity of designing is recognized widely. It even affects on the information gathering phase since the aim of the user research method development has often been either to hasten the processes (e.g. [Bauersfeld and Halgren 1996, Millen 2000]) or to enhance the value of the information with better representation techniques (e.g. [Kankainen and Parkkinen 2001]). Since even the academics have recognized the problems related to actually applying the gathered user information, it is interesting that there is a lack of evidence about the actual usage of user knowledge during design projects.
The question about the role and impact of user knowledge in design is many-sided since there usually exists many kinds of information about the users and possible usage of the developed products. In addition to user research results, i.e. user tasks and needs descriptions, user related information can be found from for example user interface guidelines, customer feedback, and market analysis

1.2 Research questions and methods

The aim of the study was to understand how user related knowledge is used during concept design and what kind of impact it has.
The main research questions were:

1. How much user related knowledge is used during concept design?
2. What kind of user related knowledge is used during concept design?

The research was qualitative by nature. We used interviews, (participative) observations, and artefact gathering in order to acquire deep understanding of the studied concept development project. All the main design meetings were observed and recorded during the concept development. The interviews were mainly used to gather information about events prior the concept development project and about events that occurred outside the observed design meetings during the concept development project. Artefact gathering focused on design artefacts produced by the core design team, namely text and PowerPoint documents and drawings. The analysis based on tracking down made design decisions and reasoning behind them with the use of meeting recordings and artefacts.

2. Case: Online business-to-business directory service

The studied concept development project was carried out during spring and summer 2007. The studied company does not implement all the parts of its products on its own but uses a wide network of technology and service providers. As a consequence the core team in the studied concept development project was small, consisting of only two persons. The team members however possessed knowledge from multiple fields central to the developed concept, namely marketing, IT system development, and sales. They had also extensive understanding about the business domain of both users and customers. In addition the team utilized a large personal and professional network of colleagues and customers to gain input concerning developed ideas. The concept development project was not full-time work for either of the team members, whereupon the intensity of the concept development and amount of work put into different tasks of the project varied. Even though the development team was fairly modest in size, the stakeholders were the same as in any general product development project [Ulrich and Eppinger 2004], namely marketing, design, and manufacturing (implementation). It is notable that one of the developers held such a high position in the company that even revolutionary ideas could have gotten acceptance.
The studied company operates in a heavily competed business area. Thus, producing services that have high utility for their users and are easier to use than the competing products and services is a clear competitive advantage. Consequently also the concept development is heavily customer and user-oriented. However, the concept development did not follow any identifiable user-centred process model. The concept under development aimed at expanding a previous service of the company, a business-to-business directory. The concept development included also a broader goal of developing a

product roadmap, and thus the resulted concept can be seen as a first step of a larger redesigning process. Although the previous service set some sort of starting points to the concept development project, there were only few actual constraints. The main restrictions were the current contracts with advertisers. Other constraint was a company policy of making changes as easy as possible to the current users. This resulted in designing a product roadmap that introduces new ideas to users gradually.

The concept development process consisted of two phases: 1) active innovation, which sought to find potential ideas for concepts, and 2) crystallisation of concept candidates, which further developed and, if needed, redefined the concept candidates to final concepts.

2.1 Active Innovation

The actual starting point of the concept development project is quite hard to define. The team members utilize a continuous and active innovation process. This means following different media and using professional and personal contact networks to gather and test new ideas, concept candidates. In addition to this the team members see each other frequently and develop the gathered ideas and information further.

The continuous, active innovation process gets its input, what the developers call signals, from both inside and outside the company. External signals include among others marketing research and events reported by various types of media. Internal signals are e.g. feedback from customer service and informal meetings with customers. The following sources of information (signals) were identified affecting the innovation process in the studied project:

Internal signal sources

- Consolidated company's policies and guidelines
- Customer research
- Feedback from customer service
- Feedback from sales department
- Marketing research
- Researches funded or conducted by the consolidated company

External signal sources

- Competition analysis
- Customer visits
- Direct feedback from customers
- Findings of an academic research project the company participated in
- Legislation covering the business area of the company and its customers
- Media
- Meetings with user and customer group representatives

Signals concerning technology were not deemed important by the concept developers in the studied project but further analysis showed that technologies were indeed taken into consideration and they played a part in developing the service. Even though the developers dubbed feedback from customers and marketing only as signal sources, there were also deeper discussions about possible service ideas.

The academic research project the company participated in studied and developed web-based collaboration in industrial settings using methods and processes of user-centred design. The project produced a user research of small and medium sized enterprises (SMEs) and high-level concept ideas of service possibilities for SMEs. Consequently it had a major impact on concept development.

As signals accumulate, the innovation process started to produce syntheses. In interviews one of the developers told that he synthesises the signals and follows for example trends on how users' online behaviour and attitude changes. When signals and syntheses reach a certain threshold, concept crystallisation starts. When the crystallisation phase begins, the signal accumulation does not end but slows down. Though, if new interesting information comes up it is of course taken into account.

As the first step after reaching a concept crystallisation threshold a vision that bases on the signals and syntheses is generated. Visions depict the core features and possibilities of a service or product idea. Some of the visions fade away, but some of them evolve to a level where an actual concept

development can take place. Thus, there are similarities with the beginning of crystallisation phase and ending of the whole concept development. The concept crystallisation starts when there is enough evidence and ideas to convince the developers that there is a "concept candidate to be crystallized" and ends when the concept is mature enough to be presented to management team for product development consideration, i.e. there is a "potential product to be developed".

2.2 Concept Crystallisation

The events during the concept crystallisation can be seen as two interconnected processes. In design meetings the characteristics of the concept are developed into such state that the management will be able to make a decision to start product development or to abandon the concept. Between the design meetings the core group starts an assembly of a subcontractor network by activating old subcontractors and finding new ones. The active phase, i.e. concept crystallisation, of studied concept development project lasted 2 months. However summer holidays and company's other activities postponed the finalization of the concept and the decision making of the management team.

2.2.1 Assembling the Subcontractor Network

As a part of concept development potential subcontractors were met and possibilities for cooperation were discussed. The subcontractors will be responsible for parts of the information content, the appearance of the service and the system code. Since the meetings were not about finding the cheapest or fastest subcontractor for a certain part of the potential product development and implementation, but more open discussions about mutual interests and potential cooperation, the would-be-subcontractors gave also input to the concept crystallisation. These input signals concerned the user and the system from the subcontractors' point of view.

2.2.2 Design Meetings

The designing of the concept consisted of meetings of the core group and of individual work done between the meetings. There were a total of six meetings, which varied in duration from one hour to two and a half hours. The subject of the meetings was defined by the upcoming user interface, which was roughly divided into three parts. These parts represented the separate areas of the service that the user will experience. In between meetings the members made tentative visualisations of the previously closed parts of the user interface and service, and investigated implementation possibilities.

A typical meeting started with a fast run-through of earlier major decisions and of reasoning behind them. If there had been a meeting with a potential subcontractor between the design meetings, possibilities and limitations of cooperation were discussed. After this, the agenda for the current meeting was agreed on.

The goal for each meeting was to close a certain part of the service (or of the user interface). The decisions made during the meetings were based on discussion and mutual agreement. Overall, decisions were made on a fast pace and delays or postponements occurred only if the part in question was particularly difficult to design and needed, for example, further investigation of different technologies. As a result of the concept development a proposal for product development was made to the management team of the company. The proposal was accepted.

3. Results

During the analysis a total number of 127 design decisions were recognized from meeting recordings. Altogether 90 of the design decisions were given reasons for in design meetings and 37 were decided without explanations. Some of the unexplained decisions were related to other decisions and design policies and thus can be clarified. However, 14 decisions remained unexplained. Figure 1 illustrates the proportions of the rationalized and unrationalized design decisions.

From the 127 design decisions 51 were explained with user related knowledge. The remaining 76 reasons concerned for example scheduling and technical issues and are left with lesser interest in this study. The user related arguments were categorized according to how closely they related to the focus users (decision makers of SMEs). Categorization produced four main groups:

- Decision makers of SMEs (7 decisions)
  These arguments handled actual decision makers of SMEs. For example, how the entrepreneur could also be one of the workmen, simultaneously doing both management and project work.
- Business people in general (12 decisions)
  The team members had a lot of information about business life in general. For example about the means of communication and manners between companies.
- Users of online services (24 decisions)
  The service is web-based and thus there were a lot of considerations about common ways of doing things in web-services, e.g. using of (more…) links when all information could not be fitted in one place or page.
- Designers' opinions about the users (8 decisions)
  In some cases the design team members based their decisions on their personal opinions about what sort of solutions would be the most usable and suitable for the potential users.

Figure 2 depicts the proportions of the different kind of user related explanations.

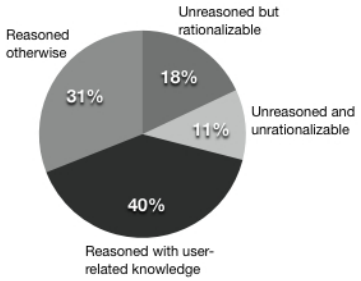

Figure 1. Proportions of reasoned and unreasoned decisions, all decisions

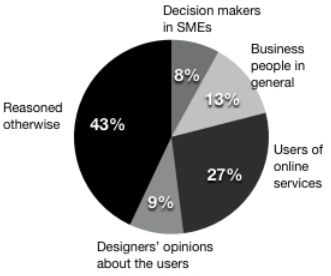

Figure 2. Proportions of reasoned decisions

Further analysis of design decisions revealed four ways about how user related knowledge was used:

- to give acceptance to a design decision based on users' needs and working habits
- to prevent a design decision based on user needs and working habits
- to give acceptance to a design decisions based on users' know-how and capabilities
- to prevent a design decision based on users' know-how and capabilities

There were more accepting than preventing arguments related to both the needs and habits and, to know-how and capabilities of users. There were however significantly more preventing decisions related to users' know-how than to their needs. Figure 3 shows the amounts of each type of arguments. The type of user information in different signals affecting the innovation phase and concept development was also analysed. Four types of signals were identified:

- Feedback from current services
- Users' needs and wishes
- Users' know-how and capabilities

- Users' context (including business environment)

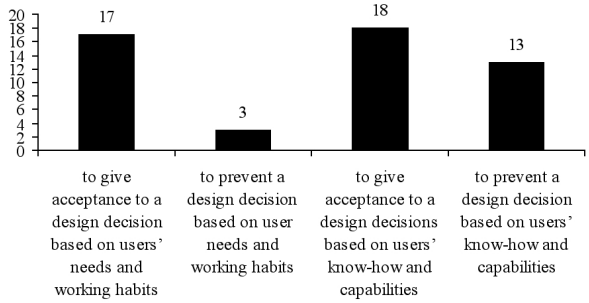

Figure 3. Proportions of user-related knowledge

Each type can include both positive and negative information. Table 1 shows the user information types of internal signals and Table 2 of external signals. The research method focused on using of the information and did not enable us to identify all the actual information that had been available during the user information gathering i.e. active innovation phase. Thus analysis about the amounts of positive and negative information during user information gathering could not be conducted.

Table 1. User information types of internal signals affecting to concept development. If a signal source has predominant type(s) and side type(s), the side types are marked with (X)

	Feedback from current services	Users' needs and wishes	Users' know-how and capabilities	Users' context
Consolidated company				X
Customer research	X	(X)		
Customer service	X		(X)	
Marketing research		X		(X)
Researches of the consolidated company		(X)		(X)
Sales	X	X		

Table 2.User information types of external signals affecting to concept development. If a signal source has predominant type(s) and side type(s), the side types are marked with (X)

	Feedback from current services	Users' needs and wishes	Users' know-how and capabilities	Users' context
Academic research project		X	(X)	X
Competition	(X)			X
Customer visits	X	X	(X)	X
Direct contacts from customers	X	(X)		
Legislation				X
Media	(X)	(X)		(X)
User and customer group representatives	X	X	(X)	

4. Conclusions

Our data show that user related knowledge had important and central role in the studied concept development project. The user related reasons are the biggest group of reason types in design decisions

made during the concept development project. As figure 1 shows they outnumber unexplained reasons and all other reasons (business, technological, etc.).
The results are interesting since the concept development project did not follow any specified user-centred design processes or methodologies but was based on the company's own user and customer oriented way of developing products and services. On the other hand the company's area of business, online directory services, can be seen as leaning towards the field of user experience and usability, since user experience and usability are a hot topic in online services at the moment. As the study concerns only one case, the results can not be easily generalized. However, our results suggest that user related information is more versatile than what is traditionally understood.
Although the service is designed for a specific user group, three different user groups can be identified from the user related information used during the concept development. The user groups are: 1) Business people of small and medium-sized enterprises (SMEs), 2) Business people in general, and 3) Users of online services. The user groups are somewhat overlapping but there also are contradictions between their characteristics.

4.1 Research question 1: How much user related knowledge was used during concept design?

As mentioned before the user related knowledge was in heavy use during the concept development. 40% of all design decisions and 57% of explicitly explained decisions were based on user related knowledge (see figures 1 and 2).
On the other hand only 8% of the reasoned design decisions were based on the focus users. In user-centred design the aim is to collect and use information about the actual or potential users, i.e. the focus users. Thus the amount of user knowledge comparable to user-centred design's user knowledge is quite low. One explanation for this is that only few information input signals affecting the creation and development of concept (academic research and customer visits) produced same kind of information as traditional user research.

4.2 Research question 2: What kind of user related knowledge was used during the concept design?

In addition to user research based knowledge, the concept development team utilized also many other kinds of user related information and knowledge. The team members capitalized both weak and strong signals originated from various parts of their business and personal contact networks. All the utilized user information was not however tightly related with the focus users, i.e. business people of SMEs.
The user related knowledge was used to both support new features and to hinder too radical ideas. It seems that the more personal the knowledge about the users was, the more it was used to prevent new and innovative designs (see figure 3).
The majority of user related design decisions handled users and usability of web-based services (see figure 3). There were only a couple of decisions based on information about the focus users. One could argue that the business people of SMEs are a subgroup of web-users. The information about small and medium sized enterprises' business people were however almost contradictory to the information about web users. While web-users followed the current trends of web-services, the business people of SMEs were seen as not interested about the World Wide Web and sometimes even not very competent with computers.
The user knowledge utilized in design does not seem to form coherent picture but remains a bit fragmented. Fragmentation can be explained with the numerous information sources used in concept development. Each source produced information from its own perspective and thus the designers were left with a challenge of combining the information and interpreting it from their own point of view.
From the user knowledge's point of view the information could be divided as lessons learned from current products and services, information about users' tasks and needs, information about users' opinions and know-how, and contextual information. The relationship to the focus users forms another categorization. As a result a template (Table 3.) in which the user related information could be fitted by combining the two categorizations can be formed.

Table 3. Breadth of user related information collected and applied during concept development project

	Feed-back from current services	Users' needs and wishes	Users' know-how and capabilities	Users' context
Decision makers in SMEs				
Business people in general				
Users of online services				

The design team managed to collect and employ information from each of the template's areas. The comprehensiveness of user related information is remarkable. The extensiveness of information seems to be a lot larger than described in user-centred design literature as a result of a good user research.

5. Future work

We are continuing our study. Next step is to study and analyze the implementation phase and after that the publication of the service. Our courageous aim is to describe the genealogy of user knowledge of one service. In addition to user knowledge we are looking into what kind of effect the business strategies have had in design and how that compares to user knowledge.

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