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NEEDS AS A BASIS FOR DESIGN RATIONALE

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1. Introduction

'Customer orientation' and *'listening to your customers'* are statements that have come to dominate company strategies in the last decade, but the concrete practise of those strategies are not as straightforward as it sounds. Traditional market research, including, for example, surveys and interviews in focus groups are apt to capture those aspects of needs that customers can articulate. However, customers, it is becoming clear, cannot always express their needs adequately [Leonard & Rayport, 1997]. Further, lead-users [von Hippel, 2005], people that are ahead on market and innovate products themselves, is another approach to guide the development of new products. But, all people are not lead-users, either by not devoting resources to solve their own problem or, simply by not holding such competences.

The study presented in this paper is based on the work in a European Union (EU) funded project called NeedInn (an abbreviation of Needs and Innovations) [Larsson & Larsson, 2007]. A main objective for the NeedInn project was to contribute to need oriented product development processes within e-health care for elderly. Those who benefits from the project are care givers, care takers and solution providers. The motivation for the project is the recognition of the potential benefits of a need driven process to identify unexpressed needs. Though, methods to identify and communicate needs into the development of products aimed for healthcare were perceived as missing. Hence, *the purpose in this paper is to present and reflect on methods used in a running industrial product development project to identify needs. This is done to contribute to the advancement of a need driven product development process.* The disposition of this paper is as follows. First, our methodology for this study is presented. Second, a theoretical frame for need identification is presented, i.e., Needfinding [Patnaik & Becker, 1999]. Third, the practice of finding needs as it has been conducted in the product development project is outlined. Fourth, this way of embarking in product development is discussed to contribute to a need driven process.

2. Methodology

In general, background and empirical data for the study has been generated during the daily work within the NeedInn project. Observations (e.g., shadowing), participative observations and interviews have been performed. The context for the data generation has been participation in staff meetings, everyday work, scheduled focus groups and workshops. In particular, principles for contextual inquiry [Holtzblatt & Jones, 1991], has been applied. In short, these are, context is important, the users are recognized as experts of their work situation and the interviewer/observer should be aware of focusing a combination of assumptions, beliefs and concerns of a particular situation [ibid.]. For this paper, participation in three workshops with the design team and users, as well as follow-up interviews with representatives from the development company provide the empirical base.

The form of data generated by participative observations, participation in workshops and interviews is mainly qualitative, e.g., an interpretation of something in the context where it occurs. Qualitative data are aimed at producing a 'rich' and 'contextual' understanding of experiences, rather than scientifically verifiable results. The justification for such an approach is that it provides a rich understanding of rationale in a way that would otherwise be impossible using conventional methods.

3. Needfinding

Needfinding [Faste, 1987; Patnaik & Becker, 1999] is not a new phenomena, it is almost forty years ago since the process was adopted at Stanford University's product design program. Needfinding have been implemented in a limited number of cases. IDEO, a leading design firm in the US is one of them [Kelley, 2001]. A basic principle for Needfinding is that product developers should interact directly with users in their own 'natural' environment to get direct insight into user's normal, everyday routines. In our view, this is an opposite of participatory design approaches where the involvement of users can take place in 'artificial' environments, for instance in a usability laboratory.

As the name, *Need* and *finding*, implies, this is an intertwined approach to find needs which are not readily articulated by users. In fact, the process has become more interesting during recent time, since qualitative methods have gained more acceptance outside the academic realm [ibid.]. The word qualitative indicates that what are sought for are qualities such as people's experiences, what they perceive or interpret into a situation [Miles & Huberman, 1994; Patton, 2002]. Such data is contextually dependent, i.e., it must be generated in the context in which the phenomena occur.

The objective, for applying Needfinding, is to make the identification of needs and design a seamless effort. Thereby, Needfinding is a task for a multidisciplinary design team involved in both studying people and conceptualizing new products. Needs are grounded in people's activities and the solutions that meet the needs change over time, thus needs are more stable than the solutions, as well as provide opportunities for innovations [Patnaik & Becker, 1999].

Needfinding is a process that is intended to be flexible and adaptable to the task at hand [Kelley, 2001], and the principles are manifested in a four-stage process for studying people [Patnaik & Becker, 1999]:

1. frame & prepare, involves decisions about, e.g., the scope or coverage of the project, the goal of the study and the definition of the people to be studied,
2. watch & record, include observations and documentation,
3. ask & record, include interviews, or simply asking questions, and documentation,
4. interpret & reframe activities to interpret and analyze data to identify needs, which in turn, reframe the project scope or coverage.

There is a range of methods and techniques for observations and interviews. Hence, the performance of the activities depends on the design teams' familiarity with a number of methods and techniques, as well as an aptitude for socio-technical skills. The observations are better understood when visually documented, e.g., photos, drawings, video. The importance to use a combined effort of observations and interviews is because observing people alone cannot convey everything, asking people adds information. It is recommended to go through many quick passes to study people, rather than one long effort. Doing so, design work is allowed to advance in parallel with the Needfinding activities [Patnaik & Becker, 1999].

4. The elderly-care home case

Since the application area for the NeedInn project is elderly care studies has been performed, for instance, at elderly-care homes, home-care services, physiotherapists, general practitioners and local authorities responsible for those services. One person has been engaged as both a project leader and, initially, as the main Needfinder. After performing shadowing, observations and interviews at an elderly-care home, a number of interesting need areas were found. One of these areas was expressed by the nurses in terms of a perceived problematic situation of sharing everyday information related to the care of the elderly. Therefore, to gain insight into the identified problematic situation, a focus on such information was framed in order to perform an iteration of observations and interviews.

It was found that, information about the elderly person's daily situation was written down by hand in a case book. This information was mainly concerning the medical state. Information that had to do with the wellbeing of the elderly, but with little medical relevance was in general not documented. Thereby, not easily available. However, this information is of substantial value particularly for the care givers, i.e., nurses, but, also for relatives. Relatives find this information important because it tells them something about how their elderly relative is getting on. This information cannot always be provided by the elderly themselves due to, for instance, poor memory or difficulties to communicate. The relatives become dependent on the nurses' observations and time to tell them something about the elderly person's day.

A staff information meeting was held every day between shifts to exchange information about these issues, e.g., if a care taker has been unusually worried during the night or if somebody is unusually talkative, thus needs special care additional to medical treatment. These staff meetings lasted up to one hour, time that the nurses perceived valuable to spend giving care instead. Information from these meetings was sometimes written down; however the nurses thought that these notes were difficult to read. Coming back after a time off or vacation, the nurses had limited possibilities to catch up information. Further, providing information for substitutes was found time consuming, but also difficult. The nurses said that this was because they have to rely on their memory. Some written documentation was stored in binders, specific information was, according to the nurses, difficult to find there.

Framed by the theme information, the Needfinding iteration yielded a list of need statements:

- Everything at the same place
- Readily available and easily accessible
- Indications of new information
- Brief up to date information
- Catch-up information

Besides a need statement list, the Needfinding activities identified a number of key persons to invite into a series of workshops. These key persons were nurses and management from elderly care homes.

The goal for the workshops was to make a number of quick iterations to identify and refine needs and to find solutions to the problematic situation.

4.1 Workshop I

In this workshop, the information sharing area was in focus. However, to avoid focusing on problems, the participants were encouraged to focus on advantages, benefits and usefulness. During this workshop and in relation to the need area, a documentation system evolved as a solution space. Thus, an issue which was discussed in the workshop was how information was put into and extracted from documentation systems. It was found that technological devices was used, i.e., computers, but also paper card systems.

After this workshop, when a solution space was apparent and the needs became more visible. It was decided to assign a design team. Two designers were contacted by the project leader, these joined the project. Having two newcomers, it became important to set them up to speed with the insight already generated in the need identification activities. In an informal meeting, the design team discussed these issues, as well as the generated need statement list. Also, introducing the designers to the user context was utterly vital.

4.2 Workshop II

After introducing the designers, they were assigned the task to present the results from the earlier performed need identification activities. Besides assuring that the communication between the project leader and the two designers had been successful, the presentation was done to evaluate if the findings were in line with the participants view of the problematic situations. In this way, the participants could comment the findings, but also add thoughts which had been triggered since the first workshop.

In general, the second workshop was designed as a future workshop [Kensing & Madsen, 1991]. The basic principle to interact directly with people and/or users is prevalent in future workshops. That is, a

future workshop should include people who will get in direct contact with the product that is going to be developed. A future workshop runs in three phases. First, a critique phase, to highlight specific problems about the practice, 'as-is'. This phase generates a view of things to change. Second, a fantasy phase takes place to imagine a number of 'to-be' scenarios. This phase turns the result from the critique phase into positive ideas and generates preferred changes. Third, an implementation phase sorts out what changes that are feasible and realistic [Kensing & Madsen, 1991]. To get the most out of a future workshop a clear topic or theme is recommended. The themes were set by the project leader; they were information, documentation and dissemination. The workshop generated rich and deep data about the chosen need area, its context and perceived constraints. The critique phase, rendered in a list of need statements, this time more focused towards a technological solution:

- Not an additional device to carry around.
- Enter information vocally and/or by other input devices.
- Extract the information individually or in groups.
- A portable, mobile, discrete, small, ergonomic device.
- Compatible with clothes (pockets etc).
- High security-level – confidential information.
- An input-information-reminder.
- Snooze functionality for the input-information-reminder.

At this point, several quick iterations had been done. Firstly, iterations were done by the project leader in the initial observation and interview studies. Secondly, new iterations were done within the, so far, conducted workshops. Each iteration makes the design space converge towards possible solutions. The result from this workshop was analyzed by the design team and rendered up into an idea for a solution based on verbal input. The decision for verbal input was made because it was in line with how the nurses actually did share information today. The project leader contacted a company specialized on speech technology to join the design team. Again, it became important to interact with potential users in their context. A third workshop was performed. This time the objective for the workshop was to create ideas and concepts for a product, therefore the third workshop was performed as a creative session.

4.3 Workshop III

The themes for this creative workshop were decided by the design team as verbal information, documentation and audible dissemination. The workshop started with a word association exercise. Such an exercise is fairly comfortable to perform even for people not feeling at ease with creative methods. Association exercises can be done in a number of ways, but in this workshop the participants was provided with post-it notes and pens. Every participant wrote down words which they associated to information sharing, the notes was posted on a whiteboard. This generated a map conveying issues related to the topic, spanning up a design space. After this, the participants could spend two votes (i.e., colored stickers), on what they perceived was the most important issue. The chosen issue was compiled and clustered into a new topic for a brainstorming session.

The topic for the sessions was broadly set to 'documentation support'. The participants were reminded of the rules for brainstorming – defer judgment, build on the ideas of others, aim for as many ideas as possible and there are no stupid ideas. To support the brainstorming session the participants were encouraged to make sketches and write down the ideas on sticky notes, these were posted on the wall. The participants were told to explain their ideas to the group when they posted it on the wall. 73 ideas came up, and these were clustered into categories. The categories were functionality, interaction, interface, dissemination, organization and artefacts.

The participants were asked to make a quick and dirty screening of the categories, to find issues they thought of as essential and useful. This was discussed in terms of how they fitted into the daily work at the elderly care home. The issues, to 'not have an additional device' and that the 'device should fit into pockets' on the work uniforms were emphasized by the participants.

4.4 A Dictaphone device

The concept for a Dictaphone device appeared in the analysis of the identified needs. The contacted company could provide voice recognition software as a basis. Usually, such software is installed on a computer or a laptop. At first, this was also the idea. However, the software was integrated into a cell phone based on the need statements *'not an additional device to carry around'* and *'fit into pockets'*. A cell phone is part of the nurses' standard work equipment, and had the functionality needed. Thus, the device is used like this. At the beginning of a shift, the nurse is prompted by the software to log in to the system. This is also an identification tag for who is entering what information, as well as bringing up relevant information for that nurse. Relevant information is based on at what place in the elderly care home that the nurse is currently working, but also on when the nurse was previously logged in. When logged in, both input of new information and checking up stored information is possible. When a nurse want to input information into the system, the cell phone is picked up from the pocket and the nurse speak directly into the phone. The information is transferred to a central server, indexed and stored. The Dictaphone device allows users to make verbal information input. The software translates the input into text while indexing it into categories, thus making it searchable. The indexed information can be retrieved as desired, either in form of text or as the original vocal information.

5. Discussing a need driven process

The task in need identification activities is to make needs visible and possible to communicate within a design team. It is our experience that need statements does not convey the need in terms of the chosen words. For example, *'everything at the same place'* might be, when interpreting the words literary, a solution. By putting the statement into a context, needs can be discerned; nurses running into all staff rooms in an elderly home looking in binders searching for a particular document, getting more and more stressed and feeling uncomfortable with not spending time providing good care as they are trained and hired to do, ending up scribbling down information on a note. Such observed context made the statement comprehensible for the design team. On one hand, to be manageable in a product development process, an expression has to be decided upon. On the other hand, this makes it difficult to communicate the need statements to others; the context has to be told, too. Therefore, participation and interaction in either need interpretation discussions or direct interaction with users is necessary.

Need identification activities, as described here, is not commonly used by product developers. It can be discussed that a lack of understanding for qualitative methods contributes to that. As a product developer a weight, a size or a degree of something are important measurements to initialise problem-solving activities. However, need identification is not a problem-solving activity, rather an exploration driven by curiosity and an interest for human activities, as well as their worldviews, goals, efforts and means. An invaluable tool is questions like: Why? What? When? Who? With whom? A product developer is more trained to focus things.

The two activities of Needfinding, i.e. identifying needs and finding solutions, became apparent in the need identification activities in this project. One track focuses on the identifying activities and is performed in the potential users' context, the other track focuses on finding solutions and these activities are performed away from the users' context, see Figure 1. In this project, some interpretation and categorization has been done in the user context, especially in the workshops. But, the major part of the interpretation and categorisation had been done in the collaborative analysis away from users. During this analysis the solutions has evolved over time. A number of iterations are done during activities in the user context. Each providing a base for decisions on the next step, as well as providing insights into new potential users and new contexts. Analysis is done away from the user context, i.e., when the generated material is processed and communicated within the design team. This can be done by discussing the material in relation to a context, as in the example above with *'everything at the same place'*.

The zigzagged shaded line, in the middle of Figure 1, represents the interface between these two kinds of activities, at left, identifying needs in the user context and, at the right side, the analysis away from user which is the base for finding solutions. The Assessing box in the middle represent that need

statements and need areas has to be grounded in the user context, but also communicated in a design situation away from the user context. The principle to make the identification activities and design 'seamless' [Patnaik & Becker, 1999], makes it difficult to draw an exact boundary between what is done in the user context and away from it. Still, solutions have to be suppressed and not exposed in the user context until a number of iterations have been done.

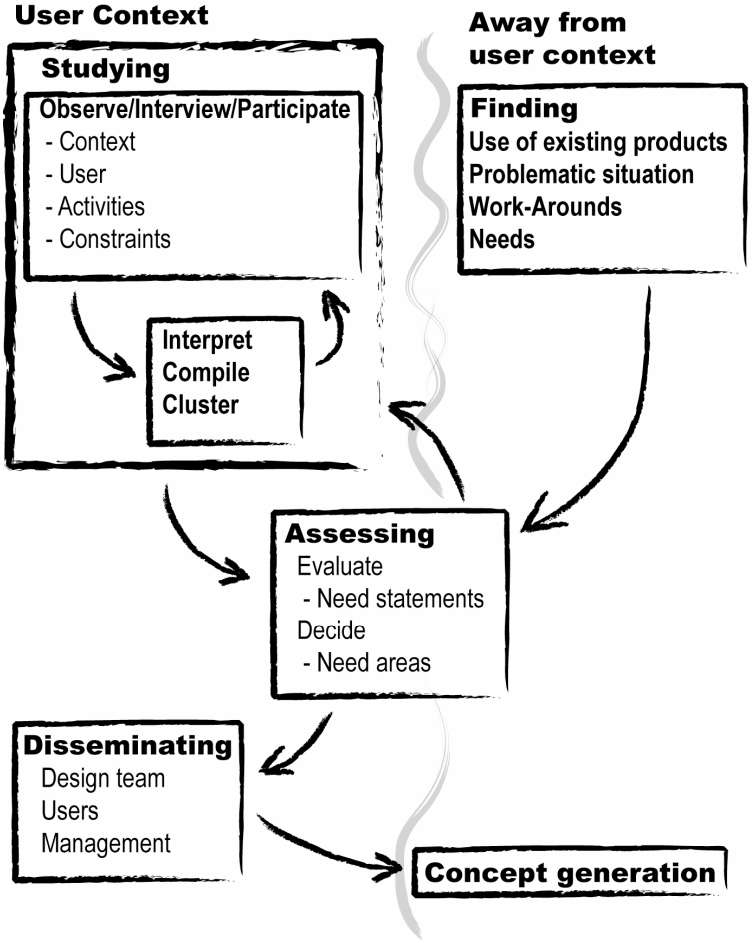

Figure 1. An overview of the duality in Needfinding

Of course, there is a client for product development projects. The NeedInn project also had a client having a particular interest, i.e., e-health, which frames the need identification activities towards information and communication based products. Though, if the aim is new products, it is important to not introduce a solution or trying to solve the problematic situation until it is fully understood. If so, no difficult-to-articulate needs can be found, rather requirements which can be expressed in relation to the suggested solution. For example, in this project the speech technology company was engaged when a need area had been decided on after workshop II. In this case and due to limitations in time, one company was engaged, but it could have been possible to engage several companies which could have suggested different solutions on the same problem. In turn, such joint effort might lead to truly innovative products.

It is important to frame and reframe [Patnaik & Becker, 1999] the need identification activities until a satisfying focus for the development tasks can be decided on. In this project, these frame and reframe activities was done after each workshop. Feedback to the users and into the user context is important to keep needs in focus. After each iteration, the needs and solutions become more and more focused towards a product. It is also our experience that a traditional approach to product development becomes a primary process in the latter part of a project. In order to reach a need driven product development process 'needs' still has to be prevalent in the process. For example, trade-offs have to be based on what has been found in the need identification activities and potential users should be given opportunities to evaluate the product, e.g., in similarities to a participative design approach.
Access to key persons, i.e., those who are thought of as directly affected by the potential product, is an issue which is important. Further, it is important that the person/s being observed or interviewed perceive that they are really providing valuable input. This is achieved by the design teams' honest interest in what the users are doing and there truly interest to learn something from the users. When you, as a skilled problem-solver, think that you have the right solution on another person's problematic situation, it is easy to say; "–this is not a problem, you just… ", and suggest a solution. Besides the fact that you as a product developer are not learning something from the users, this approach spoils any identification of needs. It might be possible to argue that a Needfinder is a role which facilitates the design team to engage in understanding of users based on their core competencies. A need identifying facilitative role can coordinate competencies in a multidisciplinary team towards identifying and communicating needs. This role seems to be separated from the role of a project leader, since one main task for the Needfinder is to direct communication in the team to focus on needs areas and needs statements.
Traditionally, in product development ambiguity has to be minimized as early as possible. This is not the case when performing need identification activities; instead there is an intrinsic value in diversity. The objective is to increase the design space and open up for innovation opportunities. Thus, it can be argued that a need-based approach is particularly useful for innovative or new product development. But, also useful for improvement of existing products, since it provide insight into what improvements that are required by the users and, probing for needs gives a rationale for those requirements.
The potential users become 'alive' and understandable due to the approach to strive for a visual documentation of needs. Also, this makes it easier to communicate needs to new members of the design team. Furthermore, a unified view of what to develop is likely to occur due to a collaborative effort in identifying needs and visualizing idea concepts. A shared view and understanding of what to develop is important within the design team, so that the diverse competences contribute to the potential product. It is our experience that a need-based approach provides such a shared view, since all ideas, solutions, concepts etc are connected to needs. This shared view built on understanding of users and their needs raises the possibilities for the product to be accepted and wanted before launch. In turn, reach the market faster.

6. Conclusion

In this paper, practical activities of Needfinding – an intertwined approach to identifying needs and to visualizing idea concepts – are the focus. These have been described based on an e-health project, where a Dictaphone device has been developed. This is done to contribute to a need driven product development process. The presented methods are strongly depending on a familiarity with managing qualitative data. This kind of approach is not straightforward to implement, due to sparse guidance, e.g., rough method descriptions. By practically dealing with identifying needs which are difficult to express and analyzing generated material to find solutions, the product developers become experienced, i.e., learning by doing.

In the case presented in this paper, the process was driven by user needs, showing possibilities for implementation of a need-based approach into product development. One benefit that has been identified is that probing into needs provide a rational for requirements, i.e., those statements that users express. Another benefit of the study is indication of the role of a Needfinder as important to facilitate the communication of needs within the design team.

Need identification activities make the design team truly committed to needs and give needs high fidelity throughout the whole process. However, in our study we have experienced that needs are difficult to capture into statements. Thus, studies on how to compile need statements into same level of abstraction has started. Further research concerning the use of creative methods in workshops, to encourage users to participate in need identification activities seems interesting.

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