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Creativity in requirement identification

Lene Sørensen and Henning Olesen[1]

***Abstract*—Traditional requirements engineering focuses mainly on analysis and elicitation. However, current trends in new system, device and software are towards involving all stakeholders in the early stages of the engineering process to define the user requirements. Creativity is here seen as a major keystone in this process in order to open up stakeholder's mind to new technologies, which do not yet exist. This paper discusses the application of creativity in the requirements process and illustrate through cases from the MAGNET and MAGNET Beyond projects.**

***Index Terms*—Creativity, cultural probes, MAGNET, requirements**

I. INTRODUCTION

Development of new systems, products and services based on ICT (Information and Communication Technologies) is often initiated through an idea of what the system or product could do. But before the actual development, a full specification is needed to build the basis for the development process. Traditionally, this specification is based on a thorough analysis of user needs and system features. However, over the last decade, it has become clear that this traditional approach is not a guarantee for a successful product or system. It is furthermore obvious, that this initial step in the engineering process is one of the most challenging: Users do not know what their requirements are to new systems or products – and if they know something about their current preferences, it is rather certain that these will be changed over time (and therefore will be different, when the product or system is developed). The requirement specification must be identified again and again, whenever a new system or product shall be developed.

Identification of requirements demands a certain insight and visioning about future uses and demands. Therefore, it has been proposed [1],[2] to apply creativity to encourage creative thinking in the requirement process. The hope of doing this is of course to gain more profound and rich user requirements that are more robust or flexible to time changes.

This paper presents different creativity techniques that have been applied in the MAGNET[2] and MAGNET Beyond projects. The creativity techniques have been applied with the purpose to identify and elicit user requirements as part of the system specification process. Different approaches have been applied in the projects: creative workshops and use of cultural probes to address different types of users.

The paper is organized as follows: Section II gives a broad overview of different scopes of requirements identification and the factors that must be considered when defining and optimizing the requirement specification. Section III describes the requirement process as derived in the MAGNET project. Furthermore, the section includes an introduction to the two IST-EU projects MAGNET and MAGNET Beyond, to the design process of these projects as well as the creativity methods used. Section IV describes how creative workshops have been applied in the MAGNET project to identify user requirements of chronically diseased patients Section V includes the application of a cultural probing technique for identification of user requirements for mobile business users. The two cases are discussed in section VI. Finally, the section VII includes the conclusions of the paper.

II. SCOPE OF THE REQUIREMENTS SPECIFICATION

In the process of identifying requirements for ICT solutions and services, different scenarios exist. In some cases new technologies are being developed, which potentially can have a very broad range of applications and are not directed at solving a specific user need, while in other cases we are addressing specific user needs and want to optimize the requirement specification in a more well-defined setting.

In general, the following factors should be considered:

- **Users:** The usage scenarios and contexts, field studies, surveys, benefits for the users, target users and user groups, …
- **Technology:** Technical know-how, feasibility, potential for realization, compatibility with existing solutions, target devices and networks, other practical challenges, …
- **Market and stakeholders:** Stakeholder interests, possible business and revenues sharing models, existing (complementary or competing) solutions and services, …
- **Legal restrictions, ethics, environment, …**
- **Pool of existing know-how and experience:** Avoid making the same mistakes or inventing the wheel again.

In the end, it is a question of putting technology to work and providing the maximum value for the end users, in other words: optimizing the user experience. Hence, it is necessary to involve users as much as possible during the whole process and to stimulate users to express their– explicit or less conscious – needs to the maximum extent. On the other hand, it is clear that users can never fully define the requirements, and the requirement specification has be a compromise between the factors listed above. One of the research challenges is therefore to identify suitable approaches for collecting user requirements and making users express their needs, feelings and hidden attitude towards the solution or

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service.

In this paper we focus on the use of creativity to enhance the user participation in the process and push the boundary for what developers can "extract" from users in the design process. Fig. 1 illustrates the user-centric approach of the MAGNET project, which is discussed in the following section.

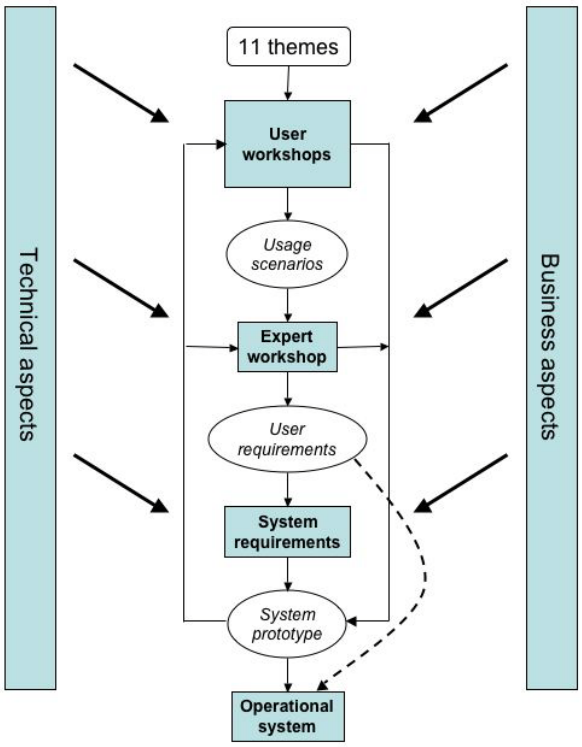

Fig. 1. "Flowchart" showing the process from collection of user inputs to an operational system in the MAGNET project [3].

III. Determining Requirements for the MAGNET Project

A. MAGNET – the idea

The MAGNET (2004-2005) [4] and MAGNET Beyond (2006-2008) [5] projects are both part of the IST EU program. MAGNET Beyond continues the work carried out in MAGNET and will be finalized in June 2008. The overall purpose of the projects has been to enable commercially viable personal networks that are affordable, user-friendly and beneficial for all kinds of users in all aspects of their everyday lives [2]. Overall, the project aims at implementing pilots to illustrate the personal networks concept (which can be defined as a category of distributed systems with special characteristics [6]).

The concept of personal networks is associated with the personal communication networks, working across a large number of devices that can interconnect independently of time and place.

MAGNET and MAGNET Beyond have always had a special user-centricity perspective, both in terms of offering users interesting, affordable attractive solutions, and through the direct inclusion of users in the engineering requirement process. One of the key concepts used here have been participatory design and creativity.

B. Participatory design and creativity elements

It was decided to include real users as part of the design and development process out of two reasons [7]: User participation increases the potential of visions produced in a design project to reflect the user's true situation and needs; and later in a design process, the involvement of users increases the potentials of the systems to be used according to their intentions. In MAGNET and MAGNET Beyond the user involvement was realized according to theories within participatory design [8]. Users may be involved at different levels in a design process. In these projects, focus was on the beginning of the design process dealing with scenario construction, low-fidelity prototyping, and simple mock-ups with the overall goal of capturing and exploring user needs and requirements.

Different types of users were addressed in the projects. One group consisted of users with special interests in managing their daily health, such as for example diabetics, having a need for highly reliable communication between medical sensors and devices in the user's immediate vicinity and remote locations of doctors, hospital teams etc., but mainly using lower data rates. Another user group consisted of nomadic business users with high demands on networks and devices in terms of processing capabilities, data speed, availability etc. As a result of the diverse user types, the technology that was still to come, and the need to get user visions, it was decided to apply a number of creativity techniques to raise the potential outcome of the exercise.

Creativity is not something, which is traditionally linked with requirements engineering. However, over the last years, more and more reportings are being made to the inclusion of creativity into this process (for example [1], [2]). There exist a large number of different creativity techniques (see for example [9]). Here we have focused on the following techniques to fit to the user types and technology to be developed:

- *Creativity workshops* [2]: Workshops where users are present to share and develop ideas about the use and their needs of a certain technology. The creativity workshop can be based on brainstorming [10] alone or on a combination of scenario construction and other elements. In the following section, one example of how a creativity workshop has been applied in the MAGNET project is given.
- *Picture stimulation* [11]: This is a technique that encourages participants to think in completely different terms. A particular problem or idea can be reinvented using different angles – motivated from pictures. Picture stimulation is to break away from the normal thinking paradigm. Picture stimulation can be used also in association with a creativity workshop.
- *Cultural probing* [12]: Finding ideas and user requirements for a technology that is aimed at mobile users, the traditional laboratory test room cannot be applied. Cultural probing is a technique, which allows the user to carry around a probe designed to provoke inspirational responses in different circumstances. A special sort of cultural probe was developed in

MAGNET Beyond, the Idea MAGNET [13]. This will be outlined more in the following section.

IV. Creative Workshops

One of the application areas of the MAGNET and MAGNET Beyond technologies was within health care and in particular in management of chronic diseases such as diabetes. A group of diabetes patients (6 persons), doctors (2 persons) and nurses (2 persons) were invited to a creative workshop in order to create visions about the technology and how they could be helped in their daily management of the disease. The creative workshop had the overall purpose to create a conceptual text-based scenario landscape relating to the participants' common situation or problems. The landscape is a concept-based physical paper landscape that shows different situations, pictures and text of how users think about the future – wishes and high-level requirements.

The creativity of the participants was, during the workshop, stimulated by: a guided fantasy journey where the participants mentally were brought to think about their situation and problems; picture stimulation and brainstorming techniques; and modelling wax to support the solution oriented participants (to create mock-ups). Details in the creativity workshop (participants, techniques, the set-up and results) can be found in [2].

V. Cultural probing: the Idea MAGNET

One of the key challenges in MAGNET Beyond was to obtain realistic requirements from users towards a technology, which was not yet developed. Furthermore, the technology would support the user mobility trends, which have been seen for years – the technology should be able to support users anywhere and any time. A methodology addressing these issues was therefore developed: the Idea MAGNET (a mobile probing kit). The Idea MAGNET was a pocket size notebook, which participants were instructed to carry around as much as possible for a period of time. They were asked to use the Idea MAGNET, when they encountered a problem during their working day with respect to technology or a situation, where new technology could have helped them, or to simply make notes of whenever they could envision the use of technologies, services or applications that are not available today.

The Idea MAGNET was constructed as a mobile probing kit to support the users' creative thinking and to remind them of being creative, when they were on their own. The users were a group of knowledge workers (8-12 persons) with some IT experience and with a strong influence on their everyday and everyday work situation. They were carrying around the Idea MAGNET alone for a period of time. Before they started the idea collection, a workshop was held to inform them about the task and to initiate the creative thinking. Part of this workshop used the picture stimulation technique to create new ideas and to motive the participants. When the participants were on their own, they had the probing kit to stimulate the creativity. This was followed by a series of text messages sent to the participants' mobile phones with small reminders. The text messages were sent every second day.

Ending the session, the participants again gathered for a workshop to exchange ideas and to build more ideas. More details about the probing kit and the intervention can be found in [13].

VI. Discussion

Within the MAGNET and MAGNET Beyond projects creativity elements were used to express wishes and needs in the requirements identification. The creativity techniques worked well in both situations. However, in retrospect, it seems as if the project mainly has been able to apply the identified requirements derived from the mobile probing intervention compared with the requirements from the creative workshops. Comparing the premises for the requirements identification in the two situations, it is clear that the projects in themselves have been at various levels with respect to having a clear technology definition and understanding of the technology solutions to be made. When the creative workshop was used, the users were presented with a relatively open task to do brainstorming on any type of solutions, which could improve their life situations. The users, therefore, found several types of ideas and requirements, which were relatively far from the Personal Network concept and how it (later) was perceived in the projects. When the mobile probing kit was applied, the MAGNET project was already finished and the MAGNET Beyond project was well underway. The users were in this situation asked to identify ideas and needs within a much more defined and clear project. The information given to the users in this situation was also clearer and addressed more specific guidelines to the sphere of possibilities or needs that would be interesting for the project. As a result the users came back (after carrying the mobile probe for a period of time) with a large number of ideas and needs, where around 60% of these were useful directly for the project.

There are with these examples indications that creativity techniques are relevant and helpful within requirements identification. With respect to getting useful and specific requirements, the premises for and idea behind the technology development must be relatively clear for the users – otherwise there is a risk that the users provide needs that are less usable for the project.

Fundamentally, the creativity techniques were applied into a relatively traditional engineering project. That has given some challenges in the projects with respect to the usefulness of the intervention and the data produced. With the MAGNET project (where the creative workshop was applied), the project partners were sceptical and reluctant to take part in the work being carried out. They are not used to working with creativity elements like that. In the MAGNET Beyond project (where the probing kit was applied), the partners had experienced that kind of work already and the intervention in itself was not questioned to the same extent.

VII. Conclusion

This paper argues for the use of creativity techniques to requirements identification processes. Involvement of users often demands a creative angle if the users shall be able to understand the technology idea and vision and at the same time envision their use of this at an undefined time in the future. The application of the creative techniques in the

MAGNET and MAGNET Beyond projects was successful with respect to the getting user ideas and needs expressed. However, the two cases also show that the definition of the project and providing a clear specific guideline to the paradigm in which the user can be creative is fundamental for how useful the requirements are for the project.

Still there are challenges with accepting the use of creativity elements in the requirements identification, since it deviates from the traditional way of thinking. Creativity can enrich technology development processes – if efforts are made in defining the project idea to the user so the creativity can take place under the right premises.

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MAGNET Beyond is a continuation of the MAGNET project. MAGNET Beyond is a worldwide R&D project within Mobile and Wireless Systems and Platforms Beyond 3G. MAGNET Beyond will introduce new technologies, systems, and applications that are at the same time user-centric and secure. MAGNET Beyond will develop user-centric business model concepts for secure Personal Networks in multi-network, multi-device, and multi-user environments. MAGNET Beyond has 30 partners from 15 countries, among these highly influential Industrial Partners, Universities, Research Centers, and SMEs.

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