

## Co-creation of an Innovation Network: Engagement and User Involvement in Digital Care Services

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**Abstract**— This work in progress paper presents a study of digital innovation in municipal care services, and we highlight collaboration and communication among various stakeholders in the process of implementing welfare technologies. We characterize innovation in municipal care services as socio-technical networks of organizations that enable innovation and we emphasize mechanisms that enable engagement and mutual learning across professional, organizational and geographical boundaries. In particular, we focus on how knowledge is mediated and how actors and resources are mobilized in the network. The study is further inspired by Action Design Research and we present ongoing activities of the creation of an innovation network.

**Keywords**- *Welfare technology; Innovation; Information Infrastructure; Socio-technical systems; Action Design Research.*

### I. INTRODUCTION

Designing information systems is one of the core areas in the interdisciplinary community of health informatics, emphasizing technological, sociological and organizational challenges as key issues in developing and maintaining effective health information systems [1]. In particular, studies of the sociotechnical tradition has highlighted the contextual nature of health information and consider design as the synergy between the specific particularities of health care work, and the informing properties of information and communication technologies (ICT) [2]. Accordingly, new methods and techniques for user involvement in the design process have emerged to bridge the design-reality gap. Several studies have applied user-centric design methods in healthcare and demonstrate the capability to translate user needs into technical requirements [3]. However, the changing nature of health care combined with evolving technological capabilities leads to new challenges to user involvement in the design process.

First and foremost, the evolving use of mobile technologies changes the information pathway in society in general and the healthcare sector in particular. The demographic change in society has led to increased pressure on the organization and performance of health care services. In particular there is a need for new models and technologies to support long-term care of the increasing population of elderly as well as people with chronic illnesses and

disabilities. Accordingly, various research fields, such as telecare, assistive technologies and Ambient Assisted Living (AAL) systems have taken part in international research efforts and have led to increased knowledge and insight into currently available solutions and enabling technologies [4]. The term welfare technology is used in Scandinavia and national initiatives in Norway highlight technological solutions that promote safety and enable people to better manage their own health [5]. Despite the promising impacts and opportunities with the use of ICT in elderly care, there is limited and inconsistent evidence about the effects of assistive technologies [6] as well as limited use beyond the pilot-study level [4]. A recent systematic review of AAL systems also argues for more participatory approaches, user feedback and collaborative efforts in the development process [4]. Innovation in mobile technologies has also increased the complexity and introduced new challenges to existing “IT silos” in the e-health field [7]. In line with the increased use of computers as an embedded part of everyday practices, the scope of healthcare technologies has moved from singular tools to networks of systems, practices, and people, i.e., digital infrastructures [7]. As ICT systems have become deeply socially embedded, we need to take into account the dynamic interplay between planned design and context of use as well as integration of new technologies in the socio-technical network. The notion of users in socio-technical networks are often characterized by diversity and the challenge is to manage heterogeneous knowledge resources that span across professional and organizational units [8]. Based on these insights, we focus on user involvement in the adoption and use of welfare technology in municipal care services, and we emphasize the innovation process in particular, i.e., to do something new in order to create value.

The study is based on a research and innovation project on adoption and use of digital surveillance in municipal care services. The opportunity for mutual learning and knowledge sharing across professional and organizational boundaries is one of the research areas in the project and in this paper we focus on user engagement and collaboration in the innovation process. In particular we are interesting in *how actors involved in the project share knowledge and how actors and resources are mobilized during the innovation process*. Furthermore, our study is inspired by user-oriented methods such as Participatory Design [9] and Action Design

Research (ADR) [10]. These methods emphasize design and development as an iterative process of mutual learning and thus enable co-design with community members in the context of their daily lives.

The rest of the paper is organized as follow: Section II provides a brief introduction to the theoretical foundation of the study. The research setting and method is presented in Section III and provides insight into the objectives of the overall research project in order to illustrate how engagement and learning are part of the innovation process. Section IV and V provides insight to the case study, as well as ongoing activities of design and development of a communication platform. Finally, in Section VI we discuss the need to establish a shared information place in the project and further design and development of a digital platform.

## II. DIGITAL INNOVATION AND ACTION DESIGN RESEARCH

An official Norwegian report on innovation in the care services has made recommendation for new innovative solutions in order to meet future challenges [11]. In particular, the report highlights the use of new technology as a resource for value creation and emphasize user influence, participation and co-creation in the development of future care services.

Innovation in health care involves interdisciplinary collaboration and is typically distributed across various organizations. Yoo, Lyytinen and Boland [8] have used the term innovation network to refer to socio-technical networks of organizations that enable innovation [8, p.1]. Moreover, they conceptualize innovation as a series of translations between ideas (either in form of physical products or services), mediated through technology artifacts [8, p. 2]). Of particular interest in our project is what they refer to as “social translation” that takes place at the boundaries of communities where individual actors negotiate and mutually adjust to other’s perspectives. Similar studies have emphasized different mechanisms for how information systems evolve as well as the capabilities to generate new services [12] [13]. Overall, these studies have illustrated the generative power of information infrastructures and emphasized knowledge sharing and learning as capabilities during innovation process.

Based on these insights, we have used an ADR approach for the formation of an innovation network across professional and organizational boundaries in our project. ADR provides an opportunity to combine basic principles of traditional Design Research (building and evaluating innovative IT artifacts) [14], while also emphasizing participation and cooperative change [15]. In contrast to traditional design that separates building from evaluating, ADR is characterized as an iterative process that addresses a problem situation encountered in a specific organizational setting by intervening and evaluating [10]. The notion of information technology in ADR is based on the ensemble view of IT artifacts and involves the interaction of design efforts and contextual factors throughout the design process. The design process consists of four stages that include; 1) Problem formulation; 2) Building, Intervention, and

Evaluation; 3) Reflection and learning; 4) Formalization and learning. Traditional design is often described as a step-by-step process in which problem formulation (user requirements) is followed by development of the artifact, which in turn is followed by an evaluation. In contrast, the ADR process is a highly iterative process and thus highlights the emergent nature of the ensemble artifact. There are some main features that we consider highly relevant for our project. Firstly, it takes into consideration the dynamic and emergent nature of socio-technical systems and the interplay between planned design and the context of use. Second, the ADR process focuses on participation among researchers, practitioners and end-users throughout the design process. Thirdly, it is strongly oriented toward collaboration and change involving both researchers and subjects [15, p.330]. Eventually the outcome of the design process is formalized and shared with practitioners and generalized as design principles for a particular type of information systems.

In addition, our research is based on previous studies on design and use of digital platforms in healthcare [16] as well as studies on knowledge management [17] and trans-situated learning [18].

## III. RESEARCH SETTING AND METOD

The study is based on an ongoing research project in the municipal care services involving partners from different professional communities and organizational units. The project originates from a health innovation cluster (Arena Health Innovation) that was formed in 2009 as a partnership between academia, public sector and academia. A key objective among partners in the innovation cluster was to identify capabilities to improve services and provide technologies to support the needs of municipal care. Based on ongoing activities in the health innovation cluster, a pilot project was initiated and carried out between June 2013 and May 2014. Moreover, experiences and findings from the pilot project have been prolonged to a larger research project lasting from 2014 to the end of 2017.

The primary research objective of the overall project is to identify factors for successful implementation of welfare technologies in municipal care services. Communication and collaboration among various stakeholders is a challenge and one of the research areas in the project is how knowledge and skills are shared among stakeholders during the innovation process. Stakeholders involved in the project include eight municipalities, two research institutions, as well as two providers who are partners in the innovation cluster. All municipalities started with the same basic technology that includes a web-based portal and sensors embedded in security blankets and door handles. In an iterative process of design and use, new features will be added and the number of service receivers will increase in line with the innovation process. Accordingly, research and innovation goes “hand in hand” and this involves adjustment of technology, identification of new services and technological capabilities. Thus, the project requires a high level of engagement from all stakeholders who have signed a consortium agreement that involves commitment to participate in all planned activities.

Data collection has been a combination of participant observations, semi-structured interviews and archival documents. A main source of data collection has been participant observation at workshops. In total, we have participated at five workshops that have gathered all the key people involved in the project, that is, nurses, nursing assistants, vendors, employees at the IT departments, and researchers. As researchers, we have had a dual role during these meetings. First, we have acted as facilitators by participating in the preparation as well as practical support during the workshops. Secondly, we have acted as observers and followed closely emerging discussions, reflections and interaction between various actors. In addition, we participated in local project meetings in the municipalities as well as informal meetings in the project. In order to get more in-depth understanding of the social context of interaction and engagement in the project, we have carried out 5 interviews with project managers in municipalities. Finally, various documents such as strategy documents, minutes of meetings, evaluations, reports and social media posts were collected. Analysis of data was based on an interpretative approach to qualitative research [19] and we have used NVivo to identify and categorize topics related to communication and interaction among stakeholders in our study.

#### IV. ORGANIZING FOR USER ENGAGEMENT

As mentioned, one of the research areas in the project is communication and collaboration, and one of the aims was to create an environment for learning and knowledge sharing. Organization of workshops has thus been an effort to strengthen collaboration and five workshops have been arranged so far in the project. On an average, 30 – 40 people from different professional fields and organizational units attended the meetings. A manager in Arena Health Innovation has played a key role in the planning and organizing the workshops and the main theme has been service innovation. Moreover, the agendas for the meetings have been based on activities described in the project plan as well as emerging issues during the meetings. The structure of the workshops has been a combination of presentations and group work. Some key people have been hired to lecture on the various topics, as well as facilitate the group work. For example, service designers have attended several workshops and provided methods and tools for the preparation of scenarios and user stories during group work. The purpose of the group work was to reflect on practice; identify actors involved, how the use of technology affects work processes as well as new service areas. Several of the methods and tools used during the workshop sessions have contributed to the identification and visualization of user needs, demands and expectations of the project and thus provided valuable knowledge for further progress. Some of the issues that have been discussed are related to communication, collaboration and organizational aspects. For example, reliable technological solutions are a primary goal and the need for guidelines and procedures have been identified. Guidelines for the assessment and mapping of the use of digital surveillance, risk and vulnerability analysis and user support

has been highlighted, and the ongoing work on these issues has been the topic of the last two workshops. Discussion of these issues has facilitated reflection and mutual learning and thereby raised awareness of the use of digital surveillance in care services. Nevertheless, several challenges have also been identified and have affected further work in the project. For example, it was pointed out that healthcare professionals and technologists speak different languages and thus makes it difficult to obtain a shared understanding of issues in everyday practice. Another challenge has been the need to co-develop procedures and guidelines and to maintain involvement in the time between workshop sessions. As mentioned, project members in the study are located in eight municipalities distributed in four different counties in southern Norway. This involves long traveling distances and limited opportunities for face-to-face meetings between the workshops. To deal with these issues we have looked at online communication as a resource for sharing knowledge and experience in the project.

#### V. CO-CREATION OF A INNOVATION NETWORK

To promote engagement and interaction among participant in the project, we have started the design and development of a digital platform. Design activities in the first phase have been inspired by similar studies in the healthcare domain [16] as well as studies on digital platforms and innovation networks in general [8] [18]. Furthermore, the identified needs to share experiences, co-development of procedures and guidelines, and interdisciplinary interaction has formed the basis of the initial user requirements. In addition, we searched for available solutions to build on what already exists. We did not find, however, any available solutions that met the requirements for safety and accessibility for all stakeholders in our study. Although several municipalities use platforms such as SharePoint, these are not available to all the users in our project and were thus not relevant solutions. We have also considered social networking sites such as Facebook as a resource in the project. Several of the project members use Facebook and we have created an account for the project. At the moment there are 33 members in the group, all participants in the project. In addition, some of the project members also participate in several other Facebook groups. Most of the posts in this and similar Facebook groups deal with general news on welfare technology, links to public documents or policies, as well as news and pictures from workshops. However, Facebook is an open network and does not meet the requirements for safety when sharing internal documents. In order to move forward, we made contact with a local partner and made an agreement with a provider who has developed similar solutions. The local provider, who has previously been involved in activities in the Arena Health Innovation cluster, wanted to participate in the project and is now involved in the ongoing work to develop a solution.

In the first stage, we (the researchers) acted as mediators between the vendors and users. Empirical data from the workshop sessions formed the basis for user needs, and we had several meetings with the vendor in order to provide input to the development of the first version of a platform

solution. As mentioned, we have identified the need to co-develop guidelines and procedures, as well as a shared awareness among stakeholders involved in the project. Thus, the main features of this first solution are the ability to share documents, coordinate activities, video meetings, messages and posts. Further development depends on feedback from users and we have invited one of the project members to a video meeting to make a brief test of basic features. In particular, the ability to video meetings was considered an important feature to maintain interaction between project managers in the municipalities. Thus it was decided to test the use of the system in a real-world environment and all project leaders in the eight municipalities were invited to participate. These ongoing activities and future development are planned as an iterative process of evaluation, re-design and intervention in the organizational context. So far, in the process we have focused on interactions between project members in the municipalities. Further in the process we will also include technologists and providers, and we will be open to emerging needs and capabilities in order to expand the innovation network.

## VI. DISCUSSION AND FURTHER WORK

In this research in progress paper we have focused on engagement and mutual learning in digital innovation in the municipal care services. In particular, we highlighted how the project participants in our study play a key role in the innovation process that is characterized by reflection in practice and mutual learning [10]. Adoption and adjustments of the socio-technical system depends on ongoing shaping by organizational use, perspectives, and participants (ibid. p. 44). Skills and knowledge that emerge in the daily use of digital surveillance are valuable contributions to the innovation process. However, articulating this kind of knowledge (situated learning) is not a straightforward matter but requires translation and transformation across domain-specific contexts [17]. The interdisciplinary environment that characterizes our study indicates the need to create a “shared design space” that enables translation of different meanings as well as negotiation of interests and making trade-offs between actors [17]. In addition, the project members are dispersed across several municipalities and this limits the face-to-face interaction. Vaast and Walsham [18] have argued that the ability of sharing resources and experiences in such an environment depends on a supportive information infrastructure. They have also proposed a model for “trans-situated” learning supported by an information infrastructure.

The project is still at an early stage and several ongoing activities will have an impact on further progression. A primary goal is to create a digital innovation network that provides user utility in the organizational context. The iterative process means that the technological solution and the organizational setting will continuously be subject to reinterpretation, reformulation and redesign [16]. Moreover, reflection and learning, and formalization and learning are important stages in the ADR method. The research process involves more than simply solving a problem. It must also contribute to knowledge that can be applied to a wider class

of problems [10]. This means that we strive to develop design principles that can be generalized to the design of innovation networks as well as insight into collective actions that shape new processes and services in innovation networks.

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