

**Human factors in implementation and  
adoption of innovations in health care services:  
A longitudinal case study on the introduction of new  
technology**

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### **ABSTRACT**

There is limited research on the adoption phase of the implementation process in human service organizations relating to innovations in the public sector. This study focuses on human factors involved in adoption and implementation and of innovations in health care intended to improve the quality of public health service delivery by introducing new technology. A longitudinal case study from Norway in 2015 with a qualitative and explorative approach consisting of individual interviews, focus group interviews and observation was conducted. The participants (n=26) were strategically and conveniently selected. Data was collected two months before the introduction of the first six digital alarm devices and three months after. The adoption phase was characterized by a period of chaos and instability. Some employees claimed that they had difficulties operating the mobile device equally. New concerns about patients' security resulted in feelings of dissatisfaction and disempowerment with their working conditions. The early adoption phase turned from great expectations to dampened apprehension. Several of the nurses stated that they were in need of training and extra supervision. Variations in expectations among staff seemed connected to their attitudes, and for some, their ability or competence to adopt new technology. The study provides new insights and understanding of the transition from old to new technologies, thus creating a new need for knowledge about innovation and implementation of new technologies in health care services. Good communication and interaction at all levels in organizations will probably limit possibilities for failure and strengthen probabilities of success of public sector innovation.

**Key words:** welfare technology, adoption, implementation, health care service, innovation

### **Introduction**

Reorganization of health care services by utilizing new technology is among several initiatives a way to ensure sustainable development in the public health sector. In particular, systems ought to be capable of providing older person-centred and integrated care, and a focus on maintaining capacities and occupational performance as people age (WHO, 2006).

#### ***General background and knowledge base***

The Norwegian governmental white paper (Ministry of Health and Care Services, 2009) emphasized challenges related to patients' needs for coordinated services and disease prevention. Under the Coordination Reform Act, the municipalities were given new responsibilities, such as early assessment of needs for health services, and follow-up services closer to people's homes. Due to these new responsibilities and demographic changes, it suggested that there is a need to

develop competences as well as research on municipal services (Ministry of Health and Care Services, 2013).

A Ministry of Health and Care Services' (2013) white paper also pointed to how new opportunities should relate to the application of (new) technology and greater emphasis on service innovations. Welfare technology is a common Nordic term for a whole range of technologies with possibilities and promises to meet the steadily increasing demand for more health care and welfare services. New technology should provide help and well-being to those in need, reduce costs, free resources, and be an area of research, development, and innovation (Hofmann, 2013). Such technology should be an important integrated part of future health care services, and was clearly underlined in the referred Norwegian government white papers. In Norway, the term *welfare technology* was introduced in the Official Norwegian Report (NOU, 2011). The origin of the term welfare technology is Danish. In Norway, the term *care technology* is also used, whereas in Europe it is in general referred to as *Active and Assisted Living* [<http://www.aal-europe.eu/>].

Health care professionals and ICT companies have responded to this health policy by presenting and introducing a range of new applications aimed at the individual user needs to help, for example patients in nursing homes to increase their security, self-reliance, safety, independence and self-efficacy (Devik & Hellzen, 2012). Although mobile IT solutions have been around for several years, there has been less focus on ICT-supported workflow systems in field environments, such as home nursing care (Breitschwerdt et al., 2013), hence there are fewer studies that show how technology actually is used in the everyday practices of health personnel (Pols, 2012). Carlström & Olsson (2014) demonstrated that strong interpersonal ties, trust and cohesion reduced resistance to change. It is also well known that super-users are valuable when new technology is introduced into an organization by increasing the likelihood that the innovation will be effectively adopted and developed (Rogers, 2003). Super-users (Halbesleben et al., 2009) are selected by management to assist in implementation of new technology; in this study, the new digital alarm system. Superusers are anticipated to have a vital role in any system implementation, upgrading, issue reporting or problem solving (McNeive, 2009).

Several studies have shown that implementation of electronic support tools requires a focus on quality at all levels (Torsvik & Eltvik, 2013; Bach & Bergland, 2013; Cucciniello et al., 2015). Electronic solutions must be followed up after the implementation phase. Ivergård (2000) assumes that the balance between human knowledge and the use of technology affects employee motivation and is a key factor in continued knowledge formation.

### ***Current knowledge gaps in the field of innovation adoption in health care services***

There is general agreement that research into public service innovation is relatively limited (Albury, 2005; Borins, 2001c, b, a; Hartley, 2005, 2008; Mulgan, 2009; Mulgan & Albury, 2003). Innovation as an area of study, including both theoretical and empirical aspects, has been mainly linked to the private sector (Windrum, 2008; Hartley, 2008).

Some research has investigated the specificities of public sector innovation (Albury, 2005; Borins, 2001c, b, a; Hartley, 2005, 2008; Higdem, 2007; Mulgan, 2009; Mulgan & Albury, 2003; Rønning & Teigen, 2007; Teigen et al., 2010; Windrum, 2008). Borins' (2001b) study of

innovations in public enterprises in the US found that innovations were holistic, resulted from collaboration between a number of actors, incorporated several kinds of services for clients, used new information technology, included process improvements, led to the empowerment of the clients/users, and were conducted in partnership with the private sector. As a rule, innovations were responses to internal problems and made it possible to improve performance rather than being responses to public (visible) crises. According to Glor (1998), the best settings for innovation are not top-down management, nor bottom-up management, but middle-up-down management, where middle managers are at the very centre of knowledge management. The initiative for innovations usually came from middle management and the front line, instead of from the political level and senior management. Also, a large number of the innovation processes in the public sector were initiated within the organizations themselves (Borins, 2001c). A study of innovation in the municipal sector in Norway confirms the main findings in Borins' study (Teigen et al., 2010).

Adoption can be understood as part of a process that includes progression from a pre-adoption stage, when staff within an organization become aware of an innovation; they then access information and approach a decision concerning implementation and eventually the resolution regarding procedure and commitment to the innovation (Frambach & Schillewaert, 2002; Greenhalgh et al., 2004). Users of public services may be actively engaged in raising demands and providing feedback. User involvement acts as an important driving force for public sector innovation (Sørensen & Torfing, 2011). Research continually produces new findings that can contribute to effective and efficient health care (Magnussen, 2016). Such research cannot change outcomes, however unless health services and health care professionals adopt the findings into practice. There is limited research on the impacts of innovation in the public sector, and the impacts of innovation on people (Glor, 2014).

### ***Theoretical approach***

In health care services research, one may utilise Rogers' (2003) extensively used model, which pictures the adoption of an innovation as a five stage process. Firstly, knowledge is important in creating awareness of an innovation and generating some idea of how it functions. Secondly, the process of persuasion to form favourable or unfavourable attitudes towards the innovation, and thirdly the actors make a decision or choice to adopt or reject the innovation. The fourth stage is vital for the process of implementation. For the product to have a fair chance of surviving, actors must begin to evaluate the new product as a positive contribution to everyday life or work environment. The practical consequences of using the product (the innovation) had a strong influence on the fifth and final stage of the model, the confirmation or adoption stage, where the actors decide to confirm and evaluate the new product according to its compatibility with the existing environment. This is influenced by its level of complexity, trialability, observability, controllability, accessibility, visibility and relative advantages. In other words, how does it work in real life, how does it function, for whom, to whom, with what effects? Rogers (2003), however, also seemed to admit that this is not necessarily a linear process, but rather more complex. The users in fact mediate, translate and re-invent the innovation. He also argued that such re-invention may be more widespread in professionalized organizations.

Innovation adoption research involves implementation research that is considered here as methods to promote the systematic uptake of research findings and other evidence-based

practices into routine practice, hence with the intention of improving the quality and effectiveness of health services and care (Eccles & Mittman, 2006). However, implementing evidence-based practice is one of the greatest challenges facing the global health community. WHO (2006) has identified the importance of implementation science in scaling up evidence-based interventions. There is limited research on the adoption phase of the implementation process in human service organizations (Panzano & Roth, 2006; Horwitz et al., 2010), and the complex social intervention of innovation adoption research is conducted primarily from the organizational perspective, not from a consumer perspective (Wisdom et al., 2014). Stakeholders' perspectives and experiences in service delivery (Aarons et al., 2009) and the increasing importance of patient perspectives in health care (Sox, 2010), could strengthen the process of adoption (Wisdom et al., 2014). Future research on innovation adoption and implementation is likely to yield advances that can directly improve the quality of health service delivery.

### ***Research objectives and focus***

1. To explore, describe and identify expectations, attitudes and beliefs among employees and patients at a nursing home and in home based care services, throughout the introduction and adoption phase of a new digital alarm system.
2. To explore and describe experiences with new digital alarm system six months after the adoption and implementation phase, and its effects in daily practices and services.
3. To explore and describe actors' involvement in the project, and the impact of new organizational skills or beneficial tools in their work.

## **Methodology**

This longitudinal case study takes an exploratory approach, examining the innovation practice and highlighting the key elements when adopting new technologies in local settings. A case study is relevant when there is limited knowledge of phenomena and one seeks to understand the unknown and unexpected, thus going from the analysis of empirical material to a theoretical understanding (Malterud, 2011; Snape & Spencer, 2003). A qualitative method approach is well suited in this case study to gain insight into the participants' experiences, thoughts and feelings. It enables the researchers to answer *how* and *why* type questions, while taking into consideration how a phenomenon is influenced by the context within which it is situated (Neumann & Neumann, 2012). A case study also has relevance beyond those individuals studied. The study may have relevance and maybe transferable (Andersen, 1997; Silverman, 2011). This approach to other cases provides greater understanding, knowledge and insight into the nuances of the innovation adoption processes, its implications and challenges in the field of public-private cooperation (Andersen et al., 2015; Sørensen & Torfing, 2011; Eggers & Singh, 2009).

Since this study employed a qualitative approach, explicit theories are not presented to underpin findings. How users adopted innovations over time was the focus of this study, Rogers' Diffusion of Innovation Theory (Rogers, 2003) was used, as his model is transferable to health care services and contexts (Fitzgerald et al., 2002). Rogers' theoretical conceptualisations were used as sensitising concepts rather than as theoretical variables, although the results and major

findings were compared to previous research and theories that seemed appropriate. Rogers' (2003) definition of innovation as an idea, practice or object that is perceived as new by an individual or unit of adoption, was used in this study. Rogers (2003) explained how the perceived newness of the idea for the individual determines his/hers reaction to it. If an idea seems new to the individual, it is an innovation.

### ***Challenges with new technology and digital safety alarms***

In 2015, a municipality in the southeast region of Norway (further called The Municipality) initiated a partnership with an ICT company (further called The Company) and an electronic patient journal vendor (no active part in this research project). The purpose of the collaboration was to develop and test new technology solutions, and streamline municipal health care services both in nursing homes and in home care services. A recommendation from the Norwegian Directory of Health in 2017 pointed to the need to convert from old analogue alarm systems to a digital one by 2018. Such a shift would also provide an excellent opportunity to rethink the Municipality's existing health care and home service operations.

The Company's proposed solution for a new system for the Municipality was built on its existing digital system developed for nursing homes. This existing system consists of several optional modules, including one that handles safety alarm data, a full integration with the electronic patient record database, documentation of both planned and acutely initiated encounters between residents and care personnel, effective communication between residents, institution and relatives, as well as administrative tools for effective resource management. One particular feature of the system is the possibility of automatically registering encounters between patients and care personnel, including the location of the encounters. This is achieved through communication between, and registration of the physical locations of, the mobile devices used by the patient (the safety alarm device) and the care giver (a mobile phone). Through online access to the electronic patient record, the encounter is also effectively documented by the care giver. Another feature of the system, made possible by the positioning module, is that triggered safety alerts are first sent to the nearest care worker on duty, and in the event that he/she rejects the assignment, the alert is forwarded to the next person on the worklist. In this way, the system does not require a designated call centre, as traffic is distributed among the personnel on duty.

This existing system, however, was developed to be used in indoor areas only, i.e. inside the four walls of the nursing and care homes, and uses Wi-Fi networks for communication between devices, and ultrasound technology to locate the devices. The new system is designed to be able to operate both indoors and outdoors without Wi-Fi access. Thus, the technical challenge for The Company was to transfer the functionality of the existing solution, based on Wi-Fi and ultrasound technology, to a system that could utilize cellular networks and satellite positioning services (GPS).

Although the project in this first phase consisted of only six new digital safety alarm devices, it resembled the characteristics of an innovation project as described by Rogers (2003). According to Rogers (2003) adoption of an innovation by individuals within a fixed social system follows a consistent pattern described as a five stage process, as discussed in this paper. "Newness" in an innovation need not just involve new knowledge; that is, "newness" of an innovation may be expressed in terms of knowledge, persuasion or a decision to adopt.

### Data collection

This longitudinal study consisted of individual interviews, focus group interviews and researcher observation. The leaders from the nursing home recruited the participants (n=26), in line with the researchers' recommendations for selection strategy. In this respect, the participants' were strategically and conveniently selected among those who had been involved and participated in the planning and introductory phase of the new digital safety alarm devices with The Company. The participants represented diverse socio-economic backgrounds and characteristics. The data was collected at two specific times: Firstly in May 2015, two months before the introduction of the first six new digital alarm devices and secondly in November 2015, three months after the implementation. The focus group interviews and individual interviews with the staff at the nursing home were conducted with the same participants both times. Users living at home were interviewed individually in their homes. The individual interviews lasted 45 - 60 minutes, while the focus group interviews lasted for two hours. All interviews were conducted by the first and second author, except the one with The Company where all authors participated. A general overview of the interviews is shown in Table 1.

**Table 1: Overview of the Interviews**

Participants (N=26)		Location of the interviews	Time	Type of interview
Nursing home employees	Management (2), staff* (12), all females	Meeting room at the nursing home	1 and 2	Focus groups + individual interviews
Users living in nursing homes, including care homes at the venue	1 male, 3 females	Nursing home and care home at the venue	1 and 2	Individual Interviews
Users in their private homes	1 male, 4 females	Private homes	1 and 2	Individual Interviews
Representatives from the Company **	3 (all male)	Company's premises	2	Focus group

\* Staff: Physiotherapist, Occupational therapists, social workers, nurses and leaders

\*\* The Company: Board chairman, CEO, and project manager

In addition to the interviews, first and second authors conducted passive observations during some health personnel visits to their users, both planned visits and alarm-activated ones. These visits took place during the same period as the interviews, two months before and three months after implementation of the new digital alarm devices. During these visits the staff demonstrated their practices and routines, especially the performance when answering an alarm. The practicality of the old and new technology was discussed with both the users and the staff.

### Data analysis

We chose to use both systematic text condensation and elements from grounded theory in approaching our analysis. The systematic text condensation is a descriptive and explorative method for thematic cross-case analysis of different types of qualitative data, such as interview studies, observational studies and analysis of written texts. The method is a pragmatic approach, although inspired by phenomenological ideas (Malterud, 2011; Giorgi, 2009). Giorgi's systematic text condensation looks at objects from the perspective of how they are experienced. The four-stage method starts with a holistic view of the data, and second divides the data up into

meaningful units with codes and sub-topics. The third step of analysis implies systematic abstraction of meaning units within each of the code groups established in the second step of analysis. In the fourth step of analysis, data are reconceptualized, putting the pieces together again and synthesizing from condensation to descriptions and concepts. Similarities and differences comparing systematic text condensation with other frequently applied qualitative methods regarding thematic analysis, theoretical methodological framework, analysis procedures, and taxonomy are discussed. As such, systematic text condensation is a strategy for analysis developed from traditions shared by most of the methods for analysis of qualitative data. However, the method offers the researcher a process of intersubjectivity, reflexivity, and feasibility while maintaining a responsible level of methodological rigour. Intersubjectivity implies that our analysis is conducted and presented so that others can follow the procedure and progress, and validate the conclusions.

Thereafter in line with this, identifying themes link up with significant units like text containing opinion knowledge. The topics relate to the interview guide and issues, and are added to analytical text accompanying the various categories. Firstly, we developed knowledge from the participants' experiences by interpreting and summarizing the organized empirical data. That is, our interpretations were guided by preconceptions when we interpreted data co-constructed by the participants and researcher.

In addition, inspired by grounded theory, the research questions attempted to explore and describe the impact of social processes on human factors in implementation and adoption of innovations in health care as they emerged from the ethnographic data (Glaser, 1978; Charmaz, 2000, 2003). The inductive nature of grounded theory methods assumes an open, flexible approach, shaping methodological strategies while engaged in the research, rather than having them planned before beginning the data collection. Grounded theory seems to be the approach most suited to the study of informants' own meanings and practices by using an open-ended interview guide. This notion of flexibility is important to let themes emerge from the informants' own accounts (Charmaz, 2000, 2003). Recurrent themes can be described as themes that both occur several times within one participant and/or among the sample as a whole. The first major analytic phase of the research consisted of coding the data with open coding in order to identify descriptions of thoughts and ideas related to the interview questions. To generate categories and subcategories, focused coding was used to compare between incidents, contexts and situations, and connections between incidents, situation and categories were explored.

Qualitative researchers vary considerably in their attitudes to the issue of the *representativeness* of their material and are sometimes accused of failing to satisfactorily demonstrate the reliability and objective validity of their data and findings (Glaser, 1978; Charmaz, 2003). In qualitative research, reliability and validity are discussed in terms of *adequacy of evidence* and *trustworthiness*. Reliability, or *adequacy of evidence*, is reached when similar relationships between phenomena or themes frequently emerge from the data. Validation or *trustworthiness* of the developing theory is based on constant comparison. From this viewpoint, the rationale of this approach is to fully exploit one of the principal merits of qualitative meaning in depth and in and through different phases, events and situations, here illustrated through the participants' own voices. Another aspect of more than one-off interviews is the ability to check certain accounts or repeat questions, helping to clarify and identify

emerging and recurrent themes, issues and topics. The impression was that the participants' beliefs and opinions were genuine and real, though their verbal expressions did vary (Hammersley & Atkinson, 2007; Ritchie et al., 2013).

### ***Ethics***

All participants were given written information about the project prior to data collection. All participants had to sign a written consent. It was emphasized that participation was voluntary, with the right to also withdraw from participation during the study. They willingly consented to participate, and there were no problems of access to the field of study. The interviews were recorded and transcribed verbatim. All personal information, audio files and other materials have been stored according to the privacy policy and deleted at the end of the project. The study was accepted by the Data Protection Officer, NSD in Norway. It has ensured full anonymity in such a way that individuals are not recognizable in publications from the project.

The study follows the guidelines of the Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects (General Assembly of the World Medical Association, 2014).

## **Findings**

The results are structured and presented according to the two main data acquisition phases, the early adoption phase, and the adoption and implementation phase.

### ***The early adoption phase - a period of optimism, and some frustration***

The majority of the participants from the homecare services agreed that the impact of new welfare technology from The Company would benefit the staff in fulfilling their daily tasks more effectively. This would be related to the quality of the services and the patients' security and safety would be better taken care of, coordinated and organized through the new digital alarms. A few from the staff expected that «everything would be safer and better with new digital alarm system». A few had no expectations as to what miracles the new digital alarm system could achieve. A major concern was the risks of reduced social interaction and human contact, thus an increase in the feelings of loneliness. We noticed a variety in expectations and attitudes from great expectations to dampened apprehension:

We need to be aware of the fact that technology can never replace social interaction and human contact, but it can fill the gap to a certain extent. These notions are especially vital in the first early adoption phase.

Mostly, the staff expected that they could increase the time available to have a qualitatively improved relationship with the residents, patients and the users of home-based care services. The staff's variation between expectations and apprehension can to some extent be explained by the age of the staff members, their attitude, and for some, the ability or even (un-) willingness to adopt new technology. As one participant says «technology makes us feel in safe hands, but it is a bit scary if it fails». However, if technology does function, one of the nurses' states:

Then the users can get help much quicker, and I think that this is the most important issue, and I think they don't care about what type of technology it is, and they don't understand it either.

The information and knowledge about the new digital alarm system and the design of the alarm devices was unequally disseminated, and unevenly adopted. In this respect, there seems to be a connection between age of the staff, type of information given and type of expectations as to how the new alarm system could produce effectiveness, safety and security. Several of the nurses stated that they were in «need of training», and if «new routines» were to be introduced, they should always be given extra supervision:

I think it's a very unfamiliar situation in the beginning, but I think it is important that I keep myself posted and updated, but we ought to be given repeated training, lest we forget, then it will be all right. However, I have not actually considered the use of technology in the home care service at all, but, I will possibly get used to it when we are ready to start.

Some participants admitted that they were sceptical and nearly demotivated to use or adopt to new technology, saying:

We actually do not have enough knowledge about this, and I feel that I even don't like the thought of it. I am not so technical. I know there are others here who do not like to be pushed, and they dread the thought of learning this, so the need for continuous training is massive, I believe, particularly during the process of implementation.

Several participants were particularly concerned about how the «saved time» would be redistributed into «more time directly with the user», or «using more time on administrative tasks», or even «increase our knowledge or competence» of how evidence of best practices could be incorporated or used in the home-based care services:

We have often many job tasks that we have problems with fulfilling, often due to lack of time and resources, so if we can transfer saved time to more qualitative time with the patient, just even be able to talk and be sociable... so many of our elderly never get a visitor.

Overall, the staff expected that the new digital alarm system would be less vulnerable and unstable than the old alarm system, and considerably easier to operate:

I think it is a good thing that we actually will be given new digital alarms, because the old ones do not function at all. We have discussed the need for doing something different, and get something new.

Nevertheless, the staff gave several examples of how the old safety alarm system challenged patients' security and safety.

I have noticed that many of us do hesitate, or even dare to say that our technological equipment does not always function. Then, I think, what about the elderly [users], will they understand this at all? Well, I don't know.

### ***The users (patients) point of view with their new digital alarm devices***

Most users of the home based care service had no clear expectations themselves of the new alarm system. Only a few had received some brief information as to the appearance of the safety alarm devices. Almost everybody said that they had not been given any information at all concerning the design of the new digital alarms.

In general, the users termed their expectations of the new design as something that «could be hung around the neck» or «looked like a jewel». Some of the users, particularly women, were disappointed by the design, size and weight of these devices. They had envisioned «something they could have around the neck or wrist» and looked «nice and smart». There were also users who were concerned about the capacity of the batteries with a constant need for recharging. The devices also felt heavy and tended to interfere with everyday tasks, - as one of the users said: «It is heavy, but you have to get used to it... I have it on the nightstand yes, and I have to recharge every night». Another user expressed how charging the battery had become a habit and that he had the alarm device by the bed: «I only hope that it is fully charged if I need to use it ... then ... I have it everywhere».

The same user said that he would leave it in his bedroom until «it is fully charged, which takes about half an hour». He also expressed some concerns and worries about not being able to make contact with home care service when the device was charging: «It would be terrible if something happened in that particular time, I would have maximum of bad luck». He said that if he had moved in zones without coverage he depicts he had been «panicking» if he were unable to make contact. It appears that the new alarm devices then could result in a form of «false safety».

### ***The adoption and the implementation phase - from great expectations to apprehension***

When The Company introduced the first six digital alarm devices for the users, they thought everything had worked out «smoothly» and «all had been good all the time». For example, they were surprised to find a working climate of discontent and an increasing frustration among staff. Some nurses disliked being «seen by the management» since the GPS system could «observe» them, feeding attitudes from trust to mistrust. Others expressed positive attitudes to the fact that «being seen» while doing their home visits, they felt less mistrusted «in doing something else». Staff also gave several examples of how a new kind of insecurity followed the new alarm system, which in turn could affect users' experience of security - such as concern about mobile coverage or not.

The new alarm devices were constructed such as to submit positioning data from the device using the regular available GPS system. This was both advantageous and disadvantageous regarding the need for safety and security for the users. In the period shortly after the new alarm system was introduced, the most challenging issue for the staff was precise information about how the alarm devices actually worked or were supposed to function. The employees were

informed twice by The Company about the project and the fact that it was in development, and therefore not all the technical details were in place.

However, as we noticed, several indicated their concern as to how the management communicated the fact that the system actually was in development. In consequence, some of the employees and users expressed they felt like “test subjects”. The demand for training and more information was put forward by the nurses, but they experienced limited feedback from the management. The nurses claimed that the management had not given them sufficient information about the project. The management stated that some employees probably lacked interest or motivation to acquire sufficient knowledge about the project:

If someone does not understand [the use of the new safety alarm devices] they have to ask for more information. There is something that is not right, because I know that the information is given, and they [some of the staff] are still questioning it.

Some employees claimed that they had vast difficulties at the onset, and that they often struggled to operate the mobile device. Sometimes it was also problematic to contact colleagues in remote areas when they were doing home visits to their patients. It was stated that this could create new concerns about patient’s security, resulting in feelings of dissatisfaction and disempowerment over their working conditions: «There is no good feeling when you realize that they [colleagues] do not get hold of me». It became clear that the staff had some of the same concerns as the users regarding the new safety alarm devices, for example forgetting to charge the battery at night. Here described by one of the nurses:

Several users complain that it [the alarm device] is so heavy to wear, or there are some that just put it on the table or on the walker, saying they cannot bear to wear it because it is so heavy, and this is not safe at all, it is completely wrong.

In order to secure a rapid and smooth process from early adoption to implementation of the new digital safety alarm system, to reduce problems, frustration and technological barriers among both staff and patients, some from the nursing and care staff were appointed to act as super-users. Super-users are meant to have training and knowledge beyond the regular end user for any given computer software application. In this case, it was employees with interest and knowledge in technology who took a special responsibility in assisting colleagues in how to use these new devices.

Lack of preparation, however, among the staff as to how new alarms could intervene and disrupt established routines can also be seen as a threat to security and safety for patients (the users). This aspect seemed to be related to the degree of information and communication between the employees, those who were selected as super-users and between staff, management and The Company. The management thought the communication with The Company was relatively smooth, while several among the staff wanted thorough information about the new digital alarm system, its application and impact on everyday routines and practices. Some complained that they were not «allowed» to ask critical questions about the project, its impact, solutions and/or consequences.

## Discussion

By framing the whole context of the process of introducing new technology in a health care service, this case study can be described as a synthesis of an exploratory and a descriptive part.

### *Methodological limitations of the study*

This study describes phenomena in the real-life context in which they occurred (Yin, 2003). Social scientists have noted advantages, disadvantages and limitations to participant interviews (Snow & Anderson, 1987). Interviews can thoroughly tap actor's sense making, which has a value. Yet, a key limitation of interviews is that it includes post hoc rationalizations of choices and decisions, and, in fact, all sense making is retrospective (Weick, 1995). The questions and topics that came up during the interviews could be coloured by the preunderstanding of the field (Brinkmann & Kvale, 2015), however the authors strove to be open and curious as to the participants' experiences and responses. An action-research approach would possibly have given more solid and rich data to the processes and changes during the project (Whyte, 1984). On the other hand, the time span from the start to completion of this study was about six months, which has given the participants' opportunities to reflect and re-think their participation in the project. It may be right to consider how attitudes may have changed from critical to a more positive attitude due to the long time span. However, this has not been possible to document here.

Regarding the one-to-one relationship between an interviewer and the participants, the individual's experiences in qualitative interviews are a dialogue, which formulates the interviewee's own life world. Group interviews also provides this type of information, however, through the participants shared experiences, both among themselves and with us, the group may exert a pressure that inhibits the individual's opportunities to speak freely. The disadvantage of using focus group interviews is that the researcher has less control over which data is displayed in relation to individual interviews. Another limitation is that a participant may have strong personal opinions, and thereby control the other participants who may not speak freely or open their minds to the topic (Litosseliti, 2003; Wibeck, 2000). A reflexive attitude as researchers is important when the data is interpreted and presented. Through individual interviews with the participants' we believe we have collected knowledge of the individual's unique experience and understanding of this topic. In addition, the group members may have stimulated each other on topics and issues not necessarily explored in the individual interviews. Regarding the use of focus group interviews, the interaction among the participants also stimulated discussions to complement, challenge and suggest alternative ideas. The interaction in the focus group may uncover tacit knowledge and experience-based knowledge from the field, giving awareness-raising effect on the participants. In this sense, they could compare their own experiences with others, and thus identify factors that seems relevant to the research topic (Wibeck, 2000).

Perhaps of greater concern is that participation in the study was voluntary. Since the sample was recruited and selected among those who partook in this study, they could have been more emotional about feelings of not succeeding or facing unknown barriers at the onset, as the data illustrates. However, by gathering data in situ about the participant's involvement in the study, we believe the participants' narratives reveal plausible and genuine explanations related to this study and its implications and inferences.

### ***Validity and reliability***

To assess the validity or credibility of the work, we acknowledge the limitations of a small sample in a relatively small municipality situated in a mountain region in the south-east part of Norway. Norway, however, consists of several small municipalities with similar cultural and demographic contexts comparable to the region of The Municipality, as illustrated in recent public health surveys from the Norwegian county of Oppland (Johansen & Batt-Rawden, 2014a, b). In this respect, it is likely that these results are transferable to similar regions encountering the implications of public - private cooperation and implementation of new technology.

Due to the recruitment process, the study sample is not statistically representative; some tentative general conclusions may nevertheless be proposed; that is, similar related projects in the health sector elsewhere might explore similar implications and inferences. A feature of a typical cross-sectional study is the fact that it may be difficult to elicit data about a complex topic in one-off interviews at one point in time, producing fewer possibilities to establishing «deep» rapports and «thick» descriptions (Morse, 1995). A strength of this study is its longitudinal design, which enabled comparison of participants' experience and practices at one point in time with another point in time, thereby linking these findings to context, situation and meaning. Comparing processes and changes to how participants related to the adoption process, revealed how practices, expectations, and attitudes changed over time.

Moreover, as data was collected and analysed, we discussed our interpretations of the data. In this respect, we had the opportunity to clarify interpretations, and seemingly contributed to additional perspectives on the issue under study. Another possible strength is how data was collected both through interviews and through observation of practice. The opportunity to join the nurses while they were fulfilling their tasks and executing their care service with the patients/users, both at the nursing home and in private homes, gave us valuable insight into the processes of practices, communication and social interaction. According to Silverman (2011), passive observation helps people learn from each other, and facilitates mutual analysis by sharing observational format for documenting field notes.

### ***The adoption and implementation phase – roads to success and failure***

The study indicates how attitudes and expectations of the process of implementation of new technology changed from being positive to levels of negativism among several of the staff. These attitudes and expectations were rooted in the experiences from daily practices resulting in a clear change from optimism to aloofness and criticism as the project progressed. The staff fully acknowledged that the analogue alarm system had to be replaced, but the experiences of the early usage phase led to disappointment for several. One reason for this was lack of solid information and briefings about the project from the top leaders, resulting in a type of gatekeeping. Similarly, as described by Lundvall et al. (2013), an implementation phase involving many actors in problem solving needs to be an open communicative process, as to avoid complications and barriers like *gatekeeping*. In this study, the employees' readiness to introduce new welfare technology applications and devices was influenced by their personal appreciation of welfare technology, the expectations of The Company, their colleagues and supervisors, as well as their own perceptions of their capacity to learn to use the applications.

The information did not diffuse or trickle down to all of the staff, and it may be that this form of hierarchical dissemination did not secure proper understanding and learning in practice, hence the information did not flow through the whole network of the staff. It could well be that lack of trust and absence of social capital influenced the flow of communication among the staff. Social capital and trust seems to be vital factors in innovation studies (Zaltman et al., 1973; Andersen et al., 2015) and in the literature on social entrepreneurship. According to (Curtis et al., 2010), trust is an essential resource at the onset of a project, a twofold issue that needs to be treated carefully and analytically. While reorganization is proceeding, mutual trust between employees can come under threat. The ability to trust one another is vital to promote open communication mistrust (Martins & Terblanche, 2003; Curtis et al., 2010), something that was called for in this study. It seems the staff did not communicate well enough with the employees about the project's implications and possible challenges in the process of adopting and implementing a new product. In consequence, the staff could not create and share information with one another to reach a mutual understanding (Rogers, 2003). Our results support previous findings that some actors seemed to lack sufficient face-to-face contact in the initial steps of the project. Face - to - face interaction in public-private cooperation is highly valued (Gallié & Guichard, 2005), and proximity enriches informal interaction and recognition (Nardi & Whittaker, 2002). The fact that some nurses needed more information from The Company, resulted in increased accumulated scepticism, frustration and feelings of not succeeding in dealing with the new technology. According to Berg (1999), it is only when technology meets practices that staff can form a picture of its consequences. A greater understanding of the possible outcomes would possibly have reduced levels of frustration.

According to Rogers (2003), a core principle is that the adoption of an innovation by individuals within a fixed social system follows a consistent pattern. The willingness to try out an innovation depends on five factors. In this study management and The Company did succeed in explaining the *relative advantages* with the new system, but the nurses varied in motivation and enthusiasm. *Compatibility* was partly successful as several of the employees struggled with their attitudes and beliefs in relation to the new technology, a solid trust that is needed was absent here. In accordance with the notion of *complexity*, it was slightly difficult for many employees to understand and comprehend the new technology. To be able to adopt a new innovation, one needs to take into account its unreliability and difficult steps in usage. In relation to this issue, the staff required more information from management and The Company than were delivered. However, the concept of *trialability* was partly successful as six units were introduced as a kind of pilot, hence it was possible to test the set up and process before making a more permanent commitment. *Observability* was problematic as no other reference objects were available or possible for purposes of comparison. An important issue here was that the project was in development, and this fact was known to management, but not to many of the staff or users. They were treated like test subjects.

Excluding staff from vital information may have increased psychosocial problems, making the working climate unhealthy and unpleasant. This may have led to an increase in absence due to sickness and have promoted feelings of being disempowered and of losing control of their own working situation (Batt-Rawden & Tellnes, 2012). Both Karasek et al. (1992) and Rothausen et al. (2015) highlight how individuals in a job situation experience surpluses of resources when they experience well-being. When this is threatened, for example through the

introduction of new technology, people may experience inability to gain these resources, resulting in stress and lack of well-being. This research relates to findings that turnover is related to self-identity and well-being at work. Similar phenomena may have been reflected in our data. Discussions among staff, which arose as a by-product of adoption and implementation, gave rise to new insights about their own working situation in general. Variations in expectations among the staff seemed connected to their attitudes, and for some, the ability or competence to adopt the new technology.

It is difficult to describe the staff as a homogeneous group in terms of skills, attitudes and expectations. Employees were concerned about how new technologies could give better health services. This gave room to discussions about what a better service could mean: more qualitative time spent with patients or more time spent of administrative tasks. A recent study of explored resistance to implementation of welfare technology in municipal health care services (Nilsen et al., 2016), highlighted issues like threats to stability and predictability or fear of change, threats to role and group identity, fear of losing power or control, and threats to basic health care values. The authors indicate that organizational translation between professional cultures should not be underestimated. Our research supports this emphasis on the initial phases of adoption and implementation may help prevent further resistance in complex co-creation processes (Nilsen et al., 2016), and reduce levels of frustration and criticism of co-actors.

Managers, from their point of view, felt they had given clear and sufficient information about the project, expressing how the staff could ask for more information if needed. It seems that the information about the new alarm devices was understood and adopted in different ways at different speed, based on levels of experience, competence and previous knowledge (Rogers, 2003). It may well be that here lies the key to the dissatisfaction and discontent among some employees. In the process of communication, lack of trust and confidence unfolds in the vulnerable relationship between leaders and employees (Curtis et al., 2010), a well-known problem acknowledged in many job related situations (Karasek & Theorell, 1992).

From this perspective, it is also worth remembering that the implementation of new technologies may upset established roles, procedures and cooperative relationships and create uncertainty and insecurity in everyday work, beyond the psycho-social working environment (Salanova Soria et al., 2014). Another possible source of distress environment might be how younger employees adopted new information faster than their older colleagues, and thereby possibly created a shift in the informal balance of power among the employees.

### ***Learning from the adoption and implementation phase***

The Company admits that they did not have «the resources to dedicate a person to be physically present at The Municipality the whole time». In connection with the implementation of the first six units, technical problems arose which resulted in that employees began to experience uncertainty. In this way, the management failed to break the notion of discontent that seemed to disseminate at high speed. It appeared that the employees' cell phones were equipped with a power saving application, which under specific conditions, in order to save power, turned off key features for the alarm system. The error was so unexpected, even for the system developers, that it took some time to discover and correct it. The management did not give time and space to listen to comments on the new features on the phones and network. This may relate

to how the power of individual action in one part of the process may be a problem in another (Meijer, 2014). Thus, the transition from old to new technologies is vital for the possibilities of sharing knowledge and to create venues for learning (Paulsson et al., 2005), which in this study seemed to be a shortcoming. Glor (1998) discusses the knowledge spiral, and how continuous creation of both sharing tacit and explicit knowledge at both intra-and inter-organizational levels, can be identifiers for innovation. In this respect, learning from the adoption and the implementation phases seem to comprise how tacit knowledge can be converted into explicit knowledge through continuous information sharing. These aspects were not identified in our study.

The Company was also aware that there had been some weaknesses in communication directly between them and the employees of The Municipality, but believed the information was taken care of by The Municipality management. It came as a surprise to them that The Municipality project encountered so many problems and barriers as has been revealed through this study. The Company felt they had a good relationship and dialogue with both the staff, management and The Municipality in general. The Company did not receive many questions at the information meetings, only some younger employee did some questioning. Others noted that The Company were «quite kind to us». These findings are similar to Magnussen's study (2016), showing how unresolved collaborative relationships encompass an opportunity for enthusiastic individuals to produce a power base strong enough to overcome resistance and to steer the direction in innovative processes. This notion is also in line with previous findings showing an uneven distribution of enthusiasm concerning new projects (Magnussen, 2016). Some individuals, in innovation processes, may be more enthusiastic than others may, thereby building a power base to increase their chances of defining and finding solutions in a way they see fit (Roberts, 2000).

## **Conclusion**

This study considered human factors in adoption and implementation of innovations in health care services by introducing digital alarm systems in nursing homes and home care. Twenty-six participants partook in the study. The majority of the participants examined in this study agreed that the impact of new welfare technology benefited the staff. Quality of service, security and safety were better taken care of, coordinated and organized with a new digital alarm system. However, there were concerns related to weak mobile signals and lack of preparation of staff as to how this new alarm system could intervene and disrupt established routines. There was concern that these risks could manifest themselves as threats to security and safety for patients (the users).

Mistrust was identified in the information shared and communication between the Municipality employees, super-users, staff, management, and The Company. Municipal management thought communication with The Company was relatively smooth, whereas several staff wanted more detailed instructions about the new digital alarm system, its application and impact on everyday routines and practices. Staff expressed positive attitudes however towards the fact that they were more visible while doing home visits, and possibly less mistrusted to do something else. This was identified as a positive effect.

The early adoption phase of the trials, however, also provided greater understanding of positive and negative potential and how the new system could be compared with the old. It is known that those who encounter difficulties developing useful health information systems often point to the importance of organizational problems, and that getting such technologies to work well in practice appears to be a politically structured process with organizational change, and require putting users in the centre. The discussions that followed adoption provided new insights, benefits and understanding of employees' work in general.

If health care professionals and ICT companies are to respond effectively to new demands created as the result of new health policies, our findings might be appreciated by personnel who plan and deliver the services. Empowerment enables people's power to change their social reality. In current case we refer to new technology. Skilled practice involving continuous creation of both tacit and explicit knowledge may create conscious awareness of the importance of adopting new technology, despite its newness. A focus on the initial phases of adoption and ultimately on implementation may help prevent the various forms of resistance and reduce levels of frustration and criticism within the organization.

If welfare technology aims to help patients in nursing homes to increase their security, safety, self-reliance, independence and self-efficacy, it is vital to identify expectations, attitudes and beliefs among those who are involved. In particular, learning new organizational skills and adopting beneficial tools to sustain a healthy and productive work environment for all actors involved seem important. In sum, the transition from old to new technologies has provoked a new need and call for learning about innovation, adoption and implementation of new technologies in health care services by focusing on implications and inferences of these processes and phases. Our results might be comparable to similar projects facing the challenges and trials of public - private cooperation in implementation and adoption of new technology. We believe our case study has relevance and is transferable to similar issues in other innovation adoption processes.

Consequently, this case study contributes' to the area of innovation practice and it highlights the key elements of introduction, adoption and implementation of the six digital alarms in health care service. Good communication and interaction at all levels in the organizations will probably reduce failure and strengthen probabilities of success of public sector innovation.

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## References:

- Aarons, Gregory A., Rebecca S. Wells, Karen Zagursky, Danielle L. Fettes & Lawrence A. Palinkas. 2009. Implementing evidence-based practice in community mental health agencies: A multiple stakeholder analysis. *American journal of public health*, 99(11): 2087-95.
- Albury, D. 2005. Fostering innovation in public services. *Public Money & Management*, 25(1): 51-56.
- Andersen, Mikkel Hvidtfeldt, Lars Fuglsang, Lars Hulgård & Luise Li Langergaard. 2015. *An updated list of Municipal Public-Private Innovation studies in Europe, especially Nordic studies*. Roskilde, Denmark: Roskilde University.
- Andersen, Svein S. 1997. *Case-studier og generalisering: forskningsstrategi og design*. Oslo, Norway: Fagbokforlaget.
- Bach, Bodil & Anne Bergland. 2013. *Det nøtte itj å vårrå flink ålein: innføring av telemedisinsk samhandling i norske kommuner*. Kristiansand, Norway: University of Agder.
- Batt-Rawden, Kari Bjerke & Gunnar Tellnes. 2012. Social factors of sickness absences and ways of coping: A qualitative study of men and women with mental and musculoskeletal diagnoses, Norway. *International Journal of Mental Health Promotion*, 14(2): 83-95.
- Berg, Marc. 1999. Patient care information systems and health care work: a sociotechnical approach. *International journal of medical informatics*, 55(2): 87-101.

- Borins, S. 2001a. Innovation, success and failure in public management research. Some methodological reflections. *Public Management Review*, 3(1): 3-17.
- Borins, S. 2001b. Public management innovation - Toward a global perspective. *American Review of Public Administration*, 31(1): 5-21.
- Borins, S. 2001c. Public management innovation in economically advanced and developing countries. *International Review of Administrative Sciences*, 67(4): 715-31.
- Breitschwerdt, Rüdiger, Aileen Collier, Rick Iedema & Oliver Thomas. 2013. *Collaborative Design of Process-Aware Information Systems on Handheld Devices for Mobile Health Workers*. Living Lab Business Process Management Research Report 7. Osnabrück, Germany: Universität Osnabrück.
- Brinkmann, Svend & Steinar Kvale. 2015. *Interviews. Learning the Craft of the Qualitative Research Interviewing. Third Edition*. Thousand Oaks, CA: Sage Publications.
- Carlström, Erik & Lars-Eric Olsson. 2014. The association between subcultures and resistance to change – in a Swedish hospital clinic. *Journal of Health Organization and Management*, 28(4): 458-76. doi: <https://doi.org/10.1108/JHOM-09-2012-0184>.
- Charmaz, Kathy. 2000. "Grounded theory: Objectivist and constructivist methods." Pp. 509-535 in N. K. Denzin and Y. S. Lincoln (eds). *Handbook of qualitative research. Second Edition*. Thousand Oaks, CA: Sage Publications.
- Charmaz, Kathy. 2003. "Grounded theory." Pp 81-110 in J. A. Smith (Ed.), *Qualitative psychology: A practical guide to research methods*. London, UK: Sage Publications.
- Cucciniello, Maria, Irvine Lapsley, Greta Nasi & Claudia Pagliari. 2015. Understanding key factors affecting electronic medical record implementation: a sociotechnical approach. *BMC health services research*, 15(1): 268-87.
- Curtis, Timothy, Jan Herbst & Marta Gumkovska. 2010. The social economy of trust: social entrepreneurship experiences in Poland. *Social Enterprise Journal*, 6(3): 194-209.
- Devik, Siri Andreassen & Ove Hellzen. 2012. *Velferdsteknologi og hjemmeboende eldre: hvilke gevinster er oppnådd med velferdsteknologi som kommunikasjonsstøtte for hjemmeboende eldre i kommunehelsetjenesten? - Og hva kan påvirke utbyttet? En systematisk litteraturstudie*. Rapport 79. Steinkjer, Norway: Nord-Trøndelag University College.
- Eccles, Martin P. & Brian S. Mittman. 2006. Welcome to implementation science. *Implementation Science*, 1(1): 1-3.
- Eggers, William D. & Shalabh Kumar Singh. 2009. *The Public Innovator's Playbook: Nurturing bold ideas in government*. Cambridge, MA: Ash Institute, Kennedy School of Government, Harvard University.

Fitzgerald, Louise, Ewan Ferlie, Martin Wood & Chris Hawkins. 2002. Interlocking interactions, the diffusion of innovations in health care. *Human relations*, 55(12): 1429-49.

Frambach, Ruud T. & Niels Schillewaert. 2002. Organizational innovation adoption: A multi-level framework of determinants and opportunities for future research. *Journal of business research*, 55(2): 163-76.

Gallié, Emilie-Pauline & Renelle Guichard. 2005. Do laboratories mean the end of face-to-face interactions? An evidence from the ISEE project. *Economics of Innovation and New Technology*, 14(6): 517-32.

General Assembly of the World Medical Association. 2014. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *The Journal of the American College of Dentists*, 81(3): 14-18.

Giorgi, Amedeo. 2009. *The descriptive phenomenological method in psychology: A modified Husserlian approach*. Pittsburgh, PA: Duquesne University Press.

Glaser, Barney G. 1978. *Theoretical sensitivity: Advances in the methodology of grounded theory*. Mill Valley, CA: Sociology Press.

Glor, Eleanor D. 1998. What do we know about enhancing creativity and innovation? A review of literature. *The Innovation Journal: The Public Sector Innovation Journal*, 3(1): 1-11. Collected December 31, 2017 at: <http://www.innovation.cc/volumes-issues/vol3-iss1.htm>

Glor, Eleanor D. 2014. Studying the impact of innovation on organizations, organizational populations and organizational communities: a framework for research. *The Innovation Journal: The Public Sector Innovation Journal*, 19(3): 1-20. Collected December 31, 2017 at: <http://www.innovation.cc/volumes-issues/vol19-no3.htm>

Greenhalgh, Trisha, Glenn Robert, Fraser Macfarlane, Paul Bate & Olivia Kyriakidou. 2004. Diffusion of innovations in service organizations: systematic review and recommendations. *The Milbank Quarterly*, 82(4): 581-629.

Halbesleben, Jonathon RB, Douglas S Wakefield, Marcia M Ward, Jane Brokel & Donald Crandall. 2009. The relationship between superusers' attitudes and employee experiences with clinical information systems. *Medical care research and review*, 66(1): 82-96.

Hammersley, Martyn & Paul Atkinson. 2007. *Principles in practice. Third Edition*. London, UK: Routledge.

Hartley, Jean. 2005. Innovation in governance and public services: Past and present. *Public Money & Management*, 25(1): 27-34.

Hartley, Jean. 2008. "The Innovation landscape for public service organizations." Pp. 197-216 in J. Hartley, C. Donaldson, C. Skelcher and M. Wallace (eds.), *Managing to improve public services*. Cambridge, UK: Cambridge University Press.

Higdem, U. 2007. "Regionale partnerskap : en innovasjon med staten som partner?" Pp. 175-210 in Rolf Rønning and Håvard Teigen (eds.), *En innovativ forvaltning?* Bergen, Norway: Fagbokforlaget.

Hofmann, Bjørn. 2013. Ethical challenges with welfare technology: a review of the literature. *Science and engineering ethics*, 19(2): 389-406.

Horwitz, Sarah McCue, Patricia Chamberlain, John Landsverk & Charlotte Mullican. 2010. Improving the mental health of children in child welfare through the implementation of evidence-based parenting interventions. *Administration and Policy in Mental Health and Mental Health Services Research*, 37(1-2): 27-39.

Ivergård, Toni. 2000. An ergonomics approach for work in the next millennium in an IT world. *Behaviour & Information Technology*, 19(2): 139-48.

Johansen, Vegard, & Kari Bjerke Batt-Rawden. 2014a. *Folkehelse og levekår i Oppland - Resultater på fylkesnivå*. ØF-rapport 9/2014. Lillehammer, Norway: Eastern Norway Research Institute (Østlandsforskning).

Johansen, Vegard, & Kari Bjerke Batt-Rawden. 2014b. *Folkehelse og levekår i Oppland - Resultater for kommunene i Valdres*. ØF-rapport 14/2014. Lillehammer, Norway: Eastern Norway Research Institute (Østlandsforskning).

Karasek, Robert & Tores Theorell. 1992. *Healthy work: stress, productivity, and the reconstruction of working life*. New York, NY: Basic books.

Litosseliti, Lia. 2003. *Using focus groups in research*. London, UK: A&C Black.

Lundvall, Bengt-Åke. 2013. "An agenda for future research." Pp. 202-209 in Jan Fagerberg, Ben R. Martin, and Esben Sloth (eds.), *Innovation Studies: Evolution and Future Challenges*. Oxford, UK: Oxford University Press.

Magnussen, Siv. 2016. The power of enthusiasm in collaborative innovation: a case study of the power of individual action in the establishment of a local medical centre in Norway. *Nordic Journal of Social Research*, 7: 31-45.

Malterud, Kjersti. 2011. *Kvalitative metoder i medisinsk forskning. En innføring. (Qualitative Methods in Medical Research. An introduction.)*. Oslo, Norway: Universitetsforlaget.

Martins, Ellen C. & Fransie Terblanche. 2003. Building organisational culture that stimulates creativity and innovation. *European journal of innovation management*, 6(1): 64-74.

- McNeive, Jane E. 2009. Superusers have great value in your organization. *CIN: Computers, Informatics, Nursing*, 27(3): 136-9.
- Meijer, Albert J. 2014. From Hero-Innovators to Distributed Heroism: An in-depth analysis of the role of individuals in public sector innovation. *Public Management Review*, 16(2): 199-216.
- Ministry of Health and Care Services. 2009. Meld. St nr. 47 (2008-2009). Oslo, Norway: Helse- og omsorgsdepartementet.
- Ministry of Health and Care Services. 2013. Meld St nr. 29 (2012–2013). Oslo, Norway: Helse og omsorgsdepartementet.
- Morse, Janice M. 1995. The significance of saturation. *Qualitative Health Research*, 5(2): 147-9.
- Mulgan, G. 2009. *The Art of Public Strategy: Mobilizing Power and Knowledge for the Common Good*. Oxford, UK: Oxford University Press.
- Mulgan, Geoff & David Albury. 2003. *Innovation in the Public Sector*. London, UK: Strategy Unit, Cabinet Office.
- Nardi, Bonnie A. & Steve Whittaker. 2002. "The place of face-to-face communication in distributed work." Pp. 83-110 in Pamela Hinds and Sara Kiesler (eds.), *Distributed work* Cambridge, MA: MIT Press.
- Neumann, Cecilie Basberg & Iver B. Neumann. 2012. *Forskeren i forskningsprosessen: en metodebok om situering*: Oslo, Norway: Cappelen Damm Akademisk.
- Nilsen, Eddy R, Janne Dugstad, Hilde Eide, Monika Knudsen Gullslett & Tom Eide. 2016. Exploring resistance to implementation of welfare technology in municipal healthcare services—a longitudinal case study. *BMC health services research*, 16(1): 657ff.
- NOU 2011:11. *Innovasjon i omsorg*. Oslo, Norway: Helse og omsorgsdepartementet.
- Panzano, Phyllis C. & Dee Roth. 2006. The decision to adopt evidence-based and other innovative mental health practices: Risky business? *Psychiatric Services*, 57(8): 1153-61.
- Paulsson, Katarina, Toni Ivergård & Brian Hunt. 2005. Learning at work: competence development or competence-stress. *Applied Ergonomics*, 36(2): 135-44.
- Pols, Jeannette. 2012. *Care at a distance: On the closeness of technology*. Amsterdam, Netherlands: Amsterdam University Press.
- Ritchie, Jane, Jane Lewis, Carol McNaughton Nicholls & Rachel Ormston. 2013. *Qualitative research practice: A guide for social science students and researchers*. London, UK: Sage Publications.

Roberts, Nancy. 2000. Wicked problems and network approaches to resolution. *International public management review*, 1(1): 1-19.

Rogers, Everett M. 2003. *Diffusion of innovations. Fifth Edition*. New York, NY: Simon and Schuster.

Rothausen, Teresa J., Kevin E. Henderson, James K. Arnold & Avinash Malshe. 2015. Should I stay or should I go? Identity and well-being in sensemaking about retention and turnover. *Journal of Management*, 43(7): 2357–85.

Rønning, Rolf & Håvard Teigen (eds.). 2007. *En Innovativ forvaltning?* Bergen, Norway: Fagbokforlaget.

Salanova Soria, Marisa, Susana Llorens Gumbau & Mercedes Ventura. 2014. "Technostress: The Dark Side of Technologies." Pp. 87-104 in Christian Korunka and Peter Hoonakker (eds.), *The Impact of ICT on Quality of Working Life*. Dordrecht, Heidelberg, New York, London: Springer.

Silverman, David. 2011. *Interpreting qualitative data: A guide to the principles of qualitative research. Fourth Edition*. London, UK: Sage Publications Limited.

Snape, Dawn & Liz Spencer. 2003. "The Foundations of Qualitative Research." Pp. 1-23 in Jane Ritchie and Jane Lewis (eds.), *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. London, UK: Sage Publications.

Snow, David A. & Leon Anderson. 1987. Identity work among the homeless: The verbal construction and avowal of personal identities. *American Journal of Sociology*, 92(6): 1336-71.

Sox, Harold C. 2010. Comparative effectiveness research: A progress report. *Annals of internal medicine*, 153(7): 469-72.

Sørensen, Eva & Jacob Torfing. 2011. Enhancing collaborative innovation in the public sector. *Administration & Society*, 43(8): 842-68.

Teigen, Håvard, Terje Skjeggedal & Asgeir Skålholt. 2010. *Kommunesektorens innovasjonsarbeid: ein analyse av verkemidlar og verkemiddelaktørar*. ØF-rapport 11/2010. Lillehammer, Norway: Østlandsforskning.

Torsvik, Malene & Nina Elisabeth Eltvik. 2013. *Implementering av elektroniske støtteverktøy i helsetjenesten: Faktorer som er viktige for å styrke implementering, basert på funn fra case i maritim spesialisthelsetjeneste*. Trondheim, Norway: NTNU Institutt for datateknikk og informasjonsvitenskap.

Weick, Karl E. 1995. *Sensemaking in organizations*. Thousand Oaks, London, New Dehli: Sage Publications.

WHO. 2006. Convention on the Rights of Persons with Disabilities (CRPD).

<https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html>.

Whyte, William Foote. 1984. *Learning from the field: A guide from experience*. Beverly Hills, CA: Sage Publications.

Wibeck, Victoria. 2000. *Fokusgrupper. Om fokuserade gruppintervjuer som undersökningsmetod*. Lund, Sweden: Studentlitteratur AB.

Windrum, Paul. 2008. Innovation and entrepreneurship in public services. Pp. 3-20 in Paul Windrum and Per Koch (eds.), *Innovation In Public Sector Services: Entrepreneurship, Creativity and Management*. Cheltenham and Northampton, MA: Edward Elgar.

Wisdom, Jennifer P, Ka Ho Brian Chor, Kimberly E Hoagwood & Sarah M Horwitz. 2014. Innovation adoption: a review of theories and constructs. *Administration and Policy in Mental Health and Mental Health Services Research*, 41(4): 480-502.

Yin, RK. 2003. *Case study research: design and methods. Third Edition*. Thousand Oaks, CA: Sage Publications.

Zaltman, Gerald, Robert Duncan, & Jonny Holbek. 1973. *Innovations and organizations*. New York, NY: Wiley.