A qualitative study of user experiences from the implementation of new technology in healthcare services, Norway

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ABSTRACT

Healthcare services are facing major challenges in the years to come, due in part to demographic changes such as ageing populations. Welfare technology is one important means of meeting these challenges. However, technical problems, lack of internet access and varying capacity among service providers seem to be causing problems. Research on resistance to healthcare information technologies is multifaceted, and relatively little attention has been given to understanding it. The aim of this follow-up study was to explore, identify, and describe attitudes and beliefs among employees and patients in home-based care services during the introduction stage of a new digital alarm system in three municipalities in Norway. Through a qualitative, cross-sectional follow-up study with an explorative design, the participants (n=21), were strategically and conveniently selected. The findings show that experiencing the pros and cons of a new alarm system fosters a feeling of ambivalence among employees towards the new technology. Therefore, it is important to acknowledge the challenges posed by modern technology in healthcare settings. If the aim of new technology is to improve quality of care for the elderly, we must simultaneously improve the working environment. The findings in this study emphasize the value of focusing on the recruitment of new employees and solving psychosocial matters among employees more effectively. The focus should be on organizational processes that create social value and a culture open to innovation.

***Key words*:** Innovation, public–private, welfare technology, benefits, barriers

Introduction

This section provides a general background and knowledge base and identifies current gaps in knowledge in the field of technology innovations in healthcare services. In addition, it introduces a theoretical framework, current study and research questions.

General background and knowledge base

Healthcare services face big challenges in the years to come, partly due to demographic changes such as ageing populations. Welfare technology is one important means of meeting these challenges. Welfare technology is all technology which in one way or another improves the lives of those who need it. The technology is used to maintain or increase security, activity, participation or independence for people with a disability or the elderly (Nilsen, et al., 2016; Saborowski and Kollak, 2014).

A Norwegian government white paper (Ministry of Health and Care Services, 2013) emphasized challenges related to patients' needs for coordinated services and disease prevention. Under the Coordination Reform Act, 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, there is a need to develop competences in municipal services and conduct relevant research. The application of (new) technology and greater emphasis on service innovations will offer new opportunities (Ministry of Health and Care Services, 2013). Healthcare professionals and Information and Communications Technology- [ICT] companies have responded by presenting and introducing a range of new technical applications aimed at individual user needs to help patients in nursing homes increase their safety, self-reliance, safety, independence and self-efficacy (Hellzen and Devik, 2012).

Technical problems, lack of internet access and varying capacity among service providers seem to be problematic for end users. Studies that include service providers' perspectives on the introduction of welfare technology confirm this (Nilsen, et al., 2016; Saborowski and Kollak, 2014). The lack of technical infrastructure can place an extra burden on the actors and service providers' everyday life and is an obstacle to optimal use. Several studies on welfare technology in various contexts confirm how important it is that service providers understand the purpose of the new technology and receive training in its use (Paulsen, Vekve, Isaksen and Skarli, 2017; Saborowski and Kollak, 2014; Bossen et al., 2012). Lack of motivation and negative attitudes to technology among service providers can act as barriers when introducing technology in care services (Trondsen and Knarvik, 2017; Saborowski and Kollak, 2014; Paulsen et al., 2017).

It is well known that super users (employees with long experience and those specially trained in the specific technology) selected by management are important in the implementation phase of new technology (Halbesleben et al., 2008). They serve as bridges between the technology and colleagues who struggle to manage the new technology. Their support in the implementation process increases the likelihood that the new technology will be effectively adopted. Implementation of welfare technology involves innovation diffusion and organizational change. Rogers (2003) relates diffusion to the evaluation of adopting or not adopting new technology, and diffusion is defined as "the process in which an innovation is communicated thorough certain channels over time among the members of a social system" (p. 5). Diffusion can cause various kinds of resistance but may also have a positive impact on daily practices, routines, and tasks in healthcare settings (Nilsen et al., 2016; Batt-Rawden et al., 2017). Carlström and Olsson (2014) demonstrated that strong interpersonal ties, trust and cohesion reduced resistance to change.

The most important contribution of this paper is the empirical finding that the management team reported a lack of communication with the ICT Company involved early in the project, leading to frustration and demotivation. However, the participants had a strong belief in using modern technology in future healthcare systems, hence increasing independence for all actors involved. For some of the participants, the technology was threatening. The fear of inability to cope with it was a main source of resistance. This study emphasizes the value of super users when new technology is introduced into an organization. Overall, the study adds new empirical insight and knowledge about user experiences based on the implementation of new technology in healthcare services, and thus contributes to and extends the current body of

literature on public innovation. It also adds to the relatively scarce literature on health care and the introduction of assistive technology within the homes of elderly people as well as the use of such technology in nursing homes (Woll, 2017: 20). Moreover, it helps explain and increase understanding of IT resistance in the health care setting (Samhan and Joshi, 2015; Batt-Rawden et al., 2021). Finally, since public sector innovation is becoming more collaborative (Moore and Hartley, 2008), it provides valuable insight for understanding more open and collaborative approaches to innovation (Bekkers and Tummers, 2018).

Although innovation is an area of research that has received increased scholarly attention over the past years, there is still limited knowledge in the field about innovation in public services (Albury, 2005; Borins, 2000; Hartley, 2005, 2008; Mulgan, 2009; Mulgan and Albury, 2003). There seems to be general agreement that innovation can be understood as the adaptation of a perceived unique idea or object by a unit or organization, and the particular process involved (Rogers, 2003; Borins, 2000). The implementation process is seen to be highly dynamic, as various problems or challenges are identified, and the development of novel and creative solutions is interchangeably selected and further developed and implemented (Sørensen and Torfing, 2012). Studies on innovation in public sector studies are primarily interested in how "public value" is generated (Fuglsang, Rønning and Enquist, 2014). Public value captures the societal effects, and can include cultural, political, and environmental aspects (Bennington and Moore, 2001). Defining public value can be quite complex, as different types of stakeholders, such as the individual citizen, can view the public value differently. This makes the measurement of innovation in the public sector challenging. A conventional approach to mitigate some of these challenges has been to include the various actors in the "value creation process", or so-called value "co-creation" (Fuglsang, Rønning and Enquist, 2014). In public sector innovation, aspects such as responsiveness, trust and the actual appropriateness of the innovations that are developed are important, and balance the focus on effectiveness and efficiency (March and Olsen, 2010).

According to Stokke (2017) we can expect an increased focus on technology innovations in caring practices in the future since the pressure on the primary health care service is likely to continue to increase due to demographic and policy changes. The author describes how even simple, established technologies such as the social alarm encounter challenges when integrated into the network of actors and practices that form the home care services. Understanding which combinations of technological or non-technological resources are needed to provide sustainable new services that also exploit the capabilities of new technologies, is a fairly complex task (Stokke, 2017). Zander et al. (2019) argue that the implementation of welfare technology should be based on the needs of all categories of users, and those needs must be assessed using reliable and relevant instruments. The heterogeneity of the target group, together with the fact that assessments must consider identifying goals, obstacles, and risks as well as users' preferences, implies a person-centred approach.

According to a recent review by Samhan and Joshi (2015) the phenomenon of resistance to healthcare information technologies is still understudied. Most of the research has focused on the technology aspect of adoption and paid limited attention to explaining and understanding information technology resistance, particularly in the healthcare setting. Rotvold, Knarvik and Trondsen (2018) point to how trust and encouragement from management is necessary for successful implementation of welfare technology. Rotvold et al. (2018) argue that there is still a

lack of knowledge as to how welfare technology contributes to better quality in care, particularly in reference to ethics and privacy.

Research questions and focus

The aim of this follow-up study was to identify, describe and explore attitudes and beliefs among employees and patients in home-based care services during the introduction stage of a new digital alarm system in three municipalities in Norway. The research questions were:

1. How did the employees and end-users experience the use of the new digital alarm system?

2. How did healthcare management and employees experience the communication with the ICT Company in the project?

Theoretical framework

In healthcare services research, Rogers (2003) presents an extensively used model, which pictures the adoption of an innovation as a five-stage process: firstly, the importance of knowledge in creating awareness of an innovation and generating ideas of how it may function; secondly, the process of persuasion to form favourable or unfavourable attitudes towards the innovation, and thirdly the actors´ decisions or choices to adopt or reject the innovation. For the innovation to have a fair chance of surviving, Rogers´s fourth stage is when actors must begin to evaluate the new solution as a positive contribution to everyday life or the work environment. The practical consequences of using the product (the innovation) have 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. The level of complexity, trialability, observability, controllability, accessibility, visibility and relative advantage influences this stage.

Ulrich's (2016) co-creation typology can provide useful guidance when municipalities, public and private actors and organizations start up processes for creating new services. These initiatives place demands on the municipalities regarding role clarifications, competences, and characteristic of managers involved in or responsible for collaborative processes and interactions. Ulrich states that there are many different approaches to co-creation and the concept also covers a number of different processes (Ulrich, 2016). Research from Lapointe et al. (2005) also identifies components of resistance to the implementation of technology. The perceived threats and the resistance behaviour can be found at both individual and group level.

The shift in social demographics has forced countries to reshape how they think about elderly care services. Recently, *eldercare theory* (Schultz, André and Sjøvold, 2016) has emerged as a tool for public entities trying to manage this process. Eldercare theory breaks elderly care needs down into three main categories; first, *improving the quality of care;* being aware of the elderly as a heterogeneous group and not providing universal care for individual conditions; second, *improving the working environment* by focusing on the recruitment of new employees, managing current employees effectively, and having organizational processes that create a culture open to innovation; third, s*ocietal efficiency* to enable organizations to adapt and change quickly with the upcoming changes in the environment. This theory states that public entities need to maintain an appropriate balance between the three facets (Schultz et al., 2016).

Methodology

A qualitative, cross-sectional follow-up study with an explorative design was used to provide in-depth knowledge and insight into the participants' experiences, thoughts, and feelings. This 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. Moreover, the purpose of a qualitative approach is to seek understanding of the unknown and unexpected, which means progressing from the analysis of the empirical material to a theoretical understanding (Malterud, 2011; Ormston, Snape and Spencer, 2003).

Study background

In 2015, a rural municipality in the northeast region of Norway initiated a meeting with an ICT Company to discuss a possible collaboration. The purpose of the collaboration was to develop and test new technology solutions and to "streamline" municipal healthcare services both in nursing homes and in-home care services. Furthermore, a recommendation from the Norwegian Directorate of Health in 2017 pointed to the need to convert from old analogue alarm systems to digital solutions by 2018. Such a shift also appeared to provide an excellent opportunity for the municipality to rethink their existing health care and home-based services. Later, two more municipalities also signed up with the ICT Company for similar projects. For one of the three municipalities (Municipality 1), the present research project was a follow-up of a previous one (Batt-Rawden et al., 2017). The three municipalities will be referred to as Municipality 1, 2 and 3, respectively.

The ICT Company proposed that a solution for a new system for the municipalities should be built on their existing digital system developed for nursing homes. This existing system consists of several optional modules, including one that handles social alarm data and is fully integrated with the electronic patient record database. Social alarm devices are radio communications systems that allow reliable communication for a person in distress in a confined area to initiate a call for assistance. Typical uses of social alarm are to as sist elderly or disabled people. It facilitates documentation of both planned and acutely initiated encounters between residents and care personnel, effective communication between residents, institution and relatives, and provides administrative tools for effective resource management. One particular feature of the system is the possibility to automatically register encounters between patients and care personnel, including the location of the encounters. This is achieved through communication between the mobile devices used by the patient (the social alarm device) and the care person (a mobile phone). Through online access to the electronic patient record, the encounter is also effectively documented. Another feature of the system, made possible by the positioning module, is that triggered social alarm alerts are first sent to the nearest care worker on duty, and if 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.

These three rural municipalities in the northeast region of Norway (each with between approximately 1600 and 2500 inhabitants) cooperated with the ICT Company in a public-private innovation (PPI) (Nissen et al., 2014) initiative to develop and implement a novel system for administrating home care services. The system components differ somewhat between the

municipalities, but all of them include new digital social alarm units, directly reporting incidents to the electronic patient recording system with call-centre-free communication between the users and the health personnel. In addition, two of the municipalities are in the process of implementing electronic admission for the health personnel to their clients, and/or digital medication dispenser systems, digital key-solutions for nursing homes, all connected and integrated in the same basic system. The implementation projects have involved a number of stakeholders, including the end-users living at home (mostly elderly people) and their relatives, healthcare providers at various levels, and administrative and ICT service personnel.

Data collection

Focus group interviews as well as observations and individual interviews were chosen as the data collection method. These were carried out in October, 2018. The interaction among the participants in a focus group interview can stimulate discussion aimed at complementing, challenging and suggesting alternative ideas. This may uncover tacit knowledge and experience-based knowledge from the field. The interaction may also have an awareness-raising effect on the participants so that they can compare their own experiences with others, and thus identify factors that are relevant to the research topic (Sandelowski, 2000). Observation is also used in research for data collection (DePoy and Gitlin, 2019) in several fields and has been divided into two categories: naturalistic observation (unstructured observation) and structured observation (Clark-Wilson et al., 2014). In naturalistic or unstructured observation, the researcher develops an understanding of a person's natural occupational repertoire through their habitual performance rather than best performance in a structured environment (Wilson, Herbert and Shiel, 2003). In this study naturalistic observation was used.

The participants (n=21) were strategically and conveniently selected and recruited by the leaders of the nursing home/home service line with the researchers' recommendations for selection strategy. They were involved in services such as providing meals, managing medication, assisting patients with personal hygiene, outdoors recreation and making welfare calls by phone or in person. The participants represented diverse professional backgrounds in health care and had different prior experience in using digital technology. Five participants were end-users who used welfare technology applications in their home (all of them used social alarms and some also other technical applications).

The semi-structured interview guide was based on open-ended questions to facilitate descriptions of the participants' experiences (Kvale and Brinkmann, 2015). The focus group interviews with Municipality 1 and 2 lasted for 90 minutes each and were held in a meeting room at the municipal nursing home in question. The focus group interview with Municipality 3 lasted for 60 minutes and was held in the staffroom at the healthcare centre in the Municipality. The interviews lasted for 45 minutes and were held in the homes with employees from the healthcare centre present. (The five end-users who participated included one couple).

The authors also conducted naturalistic passive observations (Giles, 2005) during (some of) the health personnel visits to users' homes, both planned visits and alarm-activated ones. These visits took place during the same period as the interviews. During these visits, the staff demonstrated their practices and routines, especially the procedure when responding to a social alarm. The usability of the old and new technology was discussed with both the users and the staff.

Table 1: Overview of the interviews

Participants (N=21)	Location	Duration	Data collection method	Municipality
Management (1) Staff (4)	Meeting room at the nursing home	90 min	Focus group interview	1
Management (1) Staff (6)	Meeting room at the healthcare centre	90 min	Focus group interview	2
Management (1) Staff 5)	Staffroom at the healthcare centre	60 min	Focus group interview	3
Users living in their private home (5)	Private homes	45 min	Individual interviews	3

*Staff: physiotherapist, social workers, nurses, and leaders

All interviews were audio-taped and transcribed verbatim. The three authors alternated as moderators of the interviews while the two others wrote memos and field notes. They also asked further questions and observed group dynamics (DePoy and Gitlin, 2019).

Data analysis
The data analysis was conducted in accordance with Stanley's description of thematic analysis (Stanley, 2014). We started by using an inductive explorative approach (Kvale and Brinkmann; 2015; DePoy and Gitlin, 2019), and then continued with an abductive approach. Since this study employed a qualitative approach, explicit theories are not presented to underpin findings in a deductive sense. The theoretical conceptualizing were used as sensitising concepts rather than as theoretical variables, although the major findings were compared to previous research and theories that seemed appropriate.

The data sets were analyzed and coded by the first and second authors and discussed among all three authors until agreement was reached. The method consisted of four stages, starting with a holistic view of the data. Secondly the data were categorized into meaningful units with codes and sub-themes. The third step of analysis entailed a systematic abstraction of meaningful units within each of the code groups established in the second step of analysis. In the fourth step of analysis, the data were re-conceptualized, and synthesized – from condensation to descriptions and concepts. Identifying themes were linked with significant units, such as text containing opinions, illustrated through quotations.

This analytical strategy is developed from traditions shared by most of the methods used for qualitative data analysis. The method offers the researcher a process of intersubjectivity, reflexivity, and feasibility while maintaining a responsible level of methodological rigour (Kvale and Brinkmann, 2015). The themes relate to the issues covered in the interview guide and are added to the analytical text in the various categories. Intersubjectivity implies that our analysis is conducted and presented in such a way that others may follow the procedure and validate the conclusions.

During the process of analysis, the interviews were transcribed in Norwegian. To maintain the coherence of the participants' statements, the authors chose to stay close to the participants' own words when determining the final stage of the analysis – naming the themes. After the themes were determined, both themes and the respective quotations were translated into English by the researchers.

Ethics

The participants received written information about the project prior to data collection and all participants were required to provide written consent. It was emphasized that participation was voluntary and the interviews were recorded and transcribed verbatim. The study was accepted by the Data Protection Official for Research, NSD in Norway. Full anonymity was ensured so that individuals would not be recognized in any publications resulting from the project. All personal information, audio files and other materials were stored according to the privacy policy of the Data Protection Official for Research, NSD and deleted at the end of the project.

Methodological limitations of the study

Together with observations and individual interviews, focus group interviews were chosen as the data collection method in this study. The disadvantage of using focus group interviews is that the researcher has less control over which data are 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). A reflexive attitude on the part of the researchers is important when the data are interpreted and presented. Focus group interviews require an even greater level of attention from the interviewer because there are several interviewees participating. In addition, interviewers conducting focus groups must also be aware of the relationships developing between the group members. In focus groups, interviewers should be unobtrusive, draw all interviewees into the discussion by encouraging interaction, and use strategic summaries of the discussion to help the group refine their thoughts or explanations. All three researchers in this study participated in encouraging interaction among the participants.

Good fieldwork is usually a matter of putting together multiple data collection techniques so as to converge on a holistic picture of a setting. Observation is rarely conducted in isolation as the sole method of data collection. Naturalistic observation is a technique that involves studying the spontaneous behaviour of participants in natural surroundings. The researchers simply record what they see in whatever way they can. By being able to observe the flow of behaviour in its own setting, studies have greater ecological validity (Fangen, 2010). One disadvantage of using natural observation is that the researcher needs to be trained to recognize aspects of a situation that are psychologically significant and worth further attention. In this study all three researchers had experience from performing observation studies in similar environments

Validity and reliability

Threats to validity were reduced by the research team participating in all phases of the research project, which ensured an open discussion as well as deep knowledge of the context. The reliability of the study was strengthened by describing the research approach in detail and the triangulation of methods for data collection. In assessing the validity or credibility of this research, we acknowledge the possible limitation of having a small sample of informants from

three relatively small municipalities, all situated in the northeast region of Norway. However, there are a substantial number of these small municipalities in Norway that have similar cultural and demographic contexts. In this respect, it is likely that our findings may be transferable to similar regions that encounter the challenges of public-private cooperation in relation to the implementation of new technology. Likewise, we believe we have contributed to the development of a new knowledge base that could lead to fresh discussions and further development of cooperation, thematization and organization when introducing new technology (Andersen, 2015).

Moreover, as data were collected and analysed, the co-authors were involved in the process of checking our interpretations of the data shared with the participants. In this respect, we had the opportunity to discuss and clarify the interpretation, which seemingly contributed to additional perspectives on the issue under study. A possible strength is how data were also collected through observation of practice. The opportunity to join the staff while they were performing their tasks and caring for the patients/users in their private homes, gave us valuable insight into care practices, communication and social interaction. In accordance with the findings of Silverman (2011), we found that passive observation helped us to learn from each other, and analysis was facilitated by our using the same observational format for documenting field notes.

Findings

Three main themes emerged from the analysis: frustration due to lack of communication, a top-down process; conflicting views on the new technology; and increased employee and patient independence and safety. The quotations given in this section were chosen to illustrate these three main themes and were drawn from the participants´ own statements in the interviews.

Frustration due to lack of communication - a top-down process
The participants and the management team reported a lack of communication with the ICT Company early in the project and little active presence. There was discontent among the staff that the ICT Company seemed to have "forgotten them" or left them in the lurch. Municipality 1 in particular, the first of the three municipalities to implement the digital social alarm system, was of this opinion:

> They [the ICT Company] need to be more present if we are to put this into practice. In fact, their presence has declined, and it seems as if they have forgotten us. Actually we feel that they are not interested in us anymore..... (Municipality 1)

Concern was also expressed about the lack of training in the use of the new technology. The health personnel felt that they did not receive good enough training in how to prepare and use the technology, and the majority only heard about the project through information presented in staff meetings.

> We did not hear so much from the management, just some information at our staff meetings… A man came from the ICT Company one day to talk about the mobile

phones and the social alarm system. He showed us Power Point slides of how it worked. (Municipality 3)

Most of the participants referred to a top-down process where they were facing problems or time-consuming challenges with the technology from one day to another. Almost all issues were decided at the political level, and the staff had minor impact or influence on the process and end results. These issues were phrased as an "us–them" situation:

Almost everything was decided at the political level, and this happened before we knew so much about the process. The way it was done was from top down, a lot was decided from the top…. (Municipality 1)

The health personnel also reported a lack of information on how the new social alarm units would intervene and change established routines, and how this might represent a threat to the safety of patients. The participants also reported that the ICT Company had not as yet delivered all components of the joint agreement (digital key solution, medicine dispenser) and that it was sometimes difficult to get the technical support required. This was more of a problem in Municipality 1. They felt to some degree neglected by the ICT Company, which caused frustration. The lack of communication between the ICT Company and the healthcare providers went deeper than language issues only. The cultural differences between health personnel and the ICT Company employees seemed major and extensive, particularly relating to technological solutions vs care for vulnerable people.

They do not quite grab or understand what we want to talk about, and they also continue in their technical language - and we do not fully understand, so it has resulted in misunderstandings. They think that we are sitting in front of the computer – that is not how we work here… (Municipality 1)

The healthcare employees found that there seemed to be some challenges in information and communication related to the implementation process in relation to practical issues and tasks during their working day. This notion seemed to result in a slight resistance to entering a process of cooperation and co-creation with the ICT Company:

I think it [the social alarm system] will be very good, but there must be total openness in the communication, -- but the technical people must get an understanding of the job that is done at the lower levels, which I think has been missing in this project. With their technical language, they make us feel "stupid", since we don't understand what they are talking about… (Municipality 1)

For some of the participants, the technology was threatening. Technical problems, lack of internet access and struggles and frustration among service providers were reported as challenges. The new technology challenged their sense of predictability, professionalism and competence, which negatively influenced their motivation to use it. A main source of resistance was fear of not coping. For some, this was due to lack of familiarity with digital communication devices, and for others it was due to negative experiences with new technology in the past. The municipal IT infrastructure itself was in its infancy, which also made it more difficult to get the necessary in-

house support. The lack of bilateral co-creation in the implementation of this technology was reflected in negligible and distant cooperation with the central IT department.

The healthcare personnel described a noticeable and marked difference in the language used by the technology developers and the healthcare personnel, leading to misconceptions and misunderstandings. Two participants stated:

> We have learned a lot during this process, received a lot of information, but communication with, and the absence of the ICT Company have not worked well… (Municipality 2)

Conflicting views on the new technology

The participants had strong, but conflicting views on using modern technology in future healthcare systems. As might be expected, there is a generational gap in user adoption and enthusiasm for the inevitable technology. Despite the various conflicting views on new technology, the majority agreed on the importance of the combination of personal care and technical solutions. It was pointed out that new technology was a necessity for the improvement and enhancement of welfare for the elderly:

> One just has to follow new developments - more elderly, fewer caregivers. However, although it certainly increases safety, there must be a minimum level of personal contact too. Quality of caring must still be a priority. . . The technology is so expensive, well, I don't know…. I still experience irritation - sometimes oh, I was so frustrated when it didn't work. (Municipality 3)

Another aspect of new technology was the issue of saving time. Several actors involved had great expectations as to how technology could have magical powers. Most of the employees reported that the new digital alarms had not yet saved any time that could subsequently be used to increase quality of care and time with patients. There will be fewer health personnel to handle the new burden of a growing number of elderly in need of care in the future, and there was concern about how new technology might be used to meet these future challenges in the health care service.

> It's the way it goes, if the technology can release more spare time, it's a good thing but it hasn't given us so much available time yet. We need to work smarter, since we are getting fewer people who can perform the services and more and more who are going to use the services… (Municipality 2)

Instead of saving time, most participants experienced that the new digital social alarm system had only provided them with more tasks since handling the technology itself was time consuming and sometimes laborious.

> I don't think so, we spend more time on technology, charging batteries and so on. There are not so many patients we can call and ask to charge batteries themselves. Then they get upset, and then we have to visit them. Not everyone who has a social alarm has homecare services (Municipality 3).

Increased employee and patient independence and safety

All the healthcare personnel in the study who were also in direct daily contact with clients living in their homes reported that they felt more secure with the new digital social alarm system. They were able to reach the patients more effectively through the two-way communications capability integrated in the new system as compared to the old one, which did not support two-way communication. It was reported that the patients felt more independent and safer as it was also easy for them to reach the staff if needed, and they could move more freely even outdoors. Overall, the staff said that the new digital social alarm system was less vulnerable and more stable than the old analogue alarm system. As the following quotation illustrates, patients seemed more content and less sceptical to the new digital alarm system:

> I think it works well, yes, I like this system, because I can see who is at work, and the alarm responds immediately and is easier to administrate. We know what is happening much quicker, and it is safer in a way. I think some patients were sceptical at first, but not so much anymore. (Municipality 3)

The fact that patients need to remember to charge the devices and pick them up after charging, and/or sometimes forget where they have placed the alarm for charging, represents a severe problem and one that needs to be solved through a better technical solution. Safety can create an ambivalent situation for the staff and patients. The patients do feel free to move, entailing a risk of accidents happening:

> Charging the alarms could be easier. The patients seem to forget to fetch the alarm devices after charging, and they do not know where they (the devices) are. We should have had an alarm that sounds when someone goes out without their alarm device (sensor). For example, we had somebody who fell on the floor the other night. At the same time, it is difficult not to give the patients freedom, or not permit them to move, and to monitor everything is not a good solution either. Safety still represents an ambivalent situation - there is the conflict. (Municipality 2)

The research data also indicated that the young employees had fewer problems with the new technology than their older colleagues. To illustrate this issue, the younger employees, often super users, believed it had something to do with what they were used to – i.e. the younger generation having the advantage of being socialized into a rapid, changing and developing world of technology, as opposed to the older generation:

> Mostly, we do not have any problems using the digital equipment, so it seems to be a matter of what we are used to, really… (Municipality 3).

The super users were employees with interest and knowledge in technology who took a special responsibility for assisting colleagues in how to use these new devices. The super users were described as of great significance and importance for the staff since they seemed to fill the knowledge and information gap that the ICT Company and the management did not address:

> We need super users, we meet them every day, I think it's good thing. Having super users is a good resource, it feels safe that someone is available when you struggle with

the technology, - unfortunately they are not present at night. It's a challenge for the new system…. I believe that people would feel more confident if they knew that a super user was available (Municipality 3).

Discussion

The three main themes presented in the findings were divided analytically into two sub-themes, which are discussed in this section. The two sub-themes are: the pros and cons – an ambivalent situation with new technology, and: modern technology in health care settings – a future to embrace?

The pros and cons – an ambivalent situation with new technology
At the time of the interviews, the three municipalities were in different periods of the implementation process. One of them started in mid-2015, while the two others followed in 2016 and 2017 respectively. As the municipalities collaborate regionally on a range of areas and levels, this implies that the "late-comers" might avoid some of the pitfalls that the frontrunner experienced and that conditions might be more favourable for the introduction of the new technology. However, "technical" incidents happened at unforeseen and unfortunate times. Therefore, also of importance to our findings is the fact that all three municipalities had experienced such "technical" incidents, although of differing severity, shortly before the interviews started, and this will inevitably influence the opinions and statements given during the interviews.

As we have noted, ambivalence in the pros and cons of new technology still existed. There seemed to be several aspects which could be described as top-down processes from the municipalities with little participation and influence from the employees, as well as challenges in communication between the staff and the ICT Company. Interdisciplinary collaboration is an essential element of any environmental intervention and innovation also in welfare services (Salanova et al., 2014; Grudinschi et al., 2014; Fuglesang et al.; 2015; Abrahamson 1991; Powell and DiMaggio, 2012; Hartley, 2005; Van de Ven et al., 1989). A recent study of explored resistance to the implementation of welfare technology in municipal healthcare services highlighted issues such as threats to stability and predictability, fear of change, threats to role and group identity, fear of losing power or control, and threats to basic healthcare values (Batt-Rawden et al., 2017). Our research supports these findings in terms of challenges, changes in daily routines, and barriers related to top down, co-creation processes (Nilsen et al., 2016; Batt-Rawden and Storlien, 2019).

The description by Ulrich (2017) fits well with our findings, as some of the municipalities appeared to have a desire to control the process of communication and cooperation with the ICT Company. As we have noted in our findings, new initiatives which place demands on the municipalities might lead to challenges regarding role clarifications, competences, and a need for managers to be in control of the collaborative processes and interactions (Ulrich, 2017). This amounted to kind of *controlled creation* where the staff had minimal impact on the decision-making processes. This type of co-creation with a top-down view from the municipality also seemed to be opposite to Ulrich's *equitable co-operation* where the municipality has a central

role in problem-solving leading to implementation from a bottom-up strategy. At this stage, problems in communication may often lead to misunderstanding and misconceptions, as illustrated in our data. By minimizing language barriers, frustration, cultural differences and role confusion, the municipality could have facilitated co-operation through a supportive and encouraging bottom-up strategy. To reduce the levels of frustration and criticism among co-actors (here, the staff), a heightened level of trust, understanding and communication is needed among all actors involved. Trained in different professional fields and focusing delivery of quite different welfare services, for example technological solutions vs care for vulnerable people, the cultural differences were major and extensive (Ulrich, 2017). This was also observed during our previous study on human factors in the implementation and adoption of innovations in healthcare services (Batt-Rawden et al., 2019).

As we have shown in this study, the lack of information on how the new social alarm units would intervene and change established routines was one of the important challenges reported. Our data is similar to Grudinschi et al. (2014) who examined challenges in the management of cross-actor collaboration in elderly care in Finland. Challenges related to decision-making were mainly at management level. As reported by the authors, these challenges were strongly related to the participants' strategic ability to create social value while solving social challenges.

Previous research has also stated that feelings of being left out or left behind are common among both private and public actors (Abrahamson, 1991; Powell and DiMaggio, 2012). Some of our participants said that they felt that the ICT Company had forgotten them, while problems with the technology still existed. If organizational culture supports open and transparent communication, based on trust, this might positively influence the promotion of creativity and innovation (Barret, 1998; Robbins, 2016). At the same time, personnel must feel emotionally safe to be able to act creatively and innovatively and should therefore be able to trust one another. This in turn is promoted by open communication (Martin and Terblanche, 2003; Curtis et al., 2010).

Open communication and "open-mindedness" seem to be essential factors for gaining new perceptions and common understanding for all actors. These factors may be necessary in creating a culture supportive of creativity and innovation (Filipczak, 1997; Frohman and Pascarella, 1990; Samaha, 1996). In this sense, to be successful in implementing new technology through co-creation, sufficient learning ought to take place to engage in a later attempt at improvement – with benefits from the earlier attempt (Newman et al., 2001; Hartley and Allison 2002; Rashman et al., 2005: Albury, 2005). As shown here, some actors have learnt and experienced both success and failure during the periods of implementation.

As Brændhaugen (2018) asserts, co-creation is a form of collaboration that invites resources in a community to solve problems through new alternative solutions. Co-creation is a way of working to solve local community challenges and welfare problems. The goal of collaboration is to find common solutions that benefit all actors involved. This represents a social value and significant aspect of successful co-creation, which was absent in our study. If the participants had been equal actors, it could have resulted in stronger co-creative networks, thereby increasing quality in the welfare service. The burden of ambivalence experienced by

actors regarding the pros and cons of using the new technology, also over time, seemed to be frustrating and stressful.

A major finding was how the new digital social alarms actually seemed to increase the independence and feelings of safety of both staff and end-users. The staff could reach the patients more effectively through the two-way communication capability integrated in the new system as compared to the old analogue system, which did not support two-way communication. Overall, the staff stated that the new digital social alarm system was less vulnerable and more stable than the old system. Frennert et al. (2019) found that the people who make decisions about welfare technology in municipal organizations for elderly care services were generally very positive about the deployment and use of such technology, but there appear to be problems at times within municipal elderly care organizations putting this experience into practice. Frennert et al. (2019) also argue that the lack of structured implementation processes and coherent evaluation models indicates inequality of access to welfare technology.

An interesting finding also previously reported (Batt-Rawden et al., 2017) was the existence of a generation gap; i.e. young employees had less problems with the new technology than their older colleagues. The fact that younger employees adopt new information faster than their older colleagues, and thereby possibly create a shift in the informal balance of power among the employees, is also pointed out by Salanova et al., (2014). To support this view, an interesting finding in our previous study (Batt-Rawden et al., 2017) was how younger employees did most of the questioning at information meetings with the ICT Company, and very few of the older staff asked questions. The younger generation's wish to acquire knowledge of new technology might be in conflict with the older generation, hence a desire to create venues for learning might be difficult (Paulsson et al., 2005). Continuous creation of both sharing tacit and explicit knowledge is vital for progress in communication, and lack of it might be a hindrance for successfully developing the spiral of knowledge (Glor, 2014). If tacit knowledge can be converted into explicit knowledge, continuous information sharing is needed by all actors as equal partners. This was not identified in our study. These findings are in line with research on resistance to healthcare information technologies (Nielsen et al., 2016; Batt- Rawden et al., 2017). Such resistance deserves more attention to help us understand the underlying mechanisms of these attitudes (Samhan and Joshi, 2015; Batt-Rawden et al., 2021).

Modern technology in health care settings – a future to embrace?
The participants in our study pointed out that new technology was an *inevitable* solution for the improvement and enhancement of welfare for the elderly. As previous research also indicates, there are pros and cons in implementing new technology in health care settings (Nilsen, 2016). The participants also reported that the ICT Company had not as yet delivered all components agreed upon in the joint agreement (digital key solution, medicine dispenser), and that it was sometimes difficult to get the technical support required. As we know from previous studies, it is anticipated that super users will play a vital role in any system implementation, upgrading, issue reporting or problem solving (McNeive, 2009). In our study, the super users may have contributed to solving a few technological problems, hence reducing some frustration and levels of stress among the staff.

This is in line with Rogers' (2003) statement 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). In our study, the super users were quite young, and with their open-mindedness and curiosity actually dared to ask questions to increase knowledge. In this sense, the younger employees are not as rooted in established roles and routines as their older colleagues. Older employees may choose to resist change, or show a lack of motivation to adopt and generate new ideas.

According to Rogers (2003), a relative advantage is "the degree to which an innovation is perceived as being better than the idea it supersedes". The actors´ decisions or choices to adopt or reject the innovation is very much dependent on this variable. In accordance with Rogers, most of the participants in our study agreed that the digital social alarm system was safer and more effective than the old one. Compatibility, which is another of Rogers predictors for successful adoption, is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. In our study, the new social alarm system was not in accordance with the past experience or existing values of the older employees, thus causing insecurity and frustrations. As we noted in our previous study (Batt-Rawden et al., 2017), remembering to recharge the alarm device is still a challenge for some users. Furthermore, Rogers also states that in contrast to the other attributes, complexity is negatively correlated with the rate of adoption. Participants who did not understand the technology or misunderstood "the technical language", rejected its adoption. The more an innovation is tested, the faster its adoption, therefore increased reinvention may create faster adoption of the innovation. According to Rogers (2003), vicarious trial is especially helpful for later adopters.

However, it is also stated that early adopters see the trialability and attributes of innovations as less important than later adopters do. This notion is mirrored in our study and might be explained by the fact that some employees struggled to take on board the relative advantage and compatibility of the social alarms. These factors are correlated with the rate of adoption of an innovation (Rogers, 2003). In our study, real advantages were identified but the requirements for simplicity, compatibility and trialability of the new system were not successfully met.

Conclusion

The aim of this follow-up study was to identify, describe and explore attitudes and beliefs among employees and patients in home-based care services during the introduction stage of a new digital alarm system in three municipalities in Norway. This study has explored how the employees and end-users experienced the use of the new digital alarm system. Moreover, how the healthcare management and employees experienced the communication with the ICT Company in the project.

The first theme labelled "frustration due to lack of communication – a top-down process," shows how the participants and the management team reported lack of communication with the ICT Company early in the project. The staff expressed discontent that the ICT Company seemed to have forgotten or neglected them. This strengthened frustration and demotivation. The second

theme focused on "conflicting views on the new technology". For some of the participants, the technology was threatening in itself. Technical problems challenged their sense of predictability, professionalism, and competence, which negatively influenced their motivation to use the technology. A main source of resistance was fear of not coping. New technology was a necessity for the improvement and enhancement of welfare for the elderly. In relation to the third theme, "increased employee and patient independence and safety", the healthcare personnel and patients in the study reported that they felt more secure with the new digital social alarm, hence increasing independence. The employees were able to reach patients more effectively through the two-way communications capability integrated in the new system as compared to the old one, which did not support two-way communication.

In accordance with previous research, this study emphasizes the value of super users when new technology is introduced into an organization. Super users may have a strong influence on the implementation process, increasing the likelihood of new technology being effectively adopted and developed. As indicated, implementation of welfare technology also implies innovation and organizational change, which also seemed to cause various kinds of resistance (Nielsen et al., 2016; Batt Rawden et al., 2017). If new technology is to improve quality of care among the elderly, the working environment must be improved through focusing on the recruitment of new employees, solving psycho-social issues among employees more effectively, and focusing more on organizational processes that create a social value and culture open to innovation.

As pointed out by (Schultz et al., 2016) public entities in elderly care services need to improve the working environment by focusing on the recruitment of new employees, managing current employees effectively, and having organizational processes that create a culture open to innovation. If societal efficiency could enable organizations to adapt and change quickly with the upcoming changes in the environment, it would benefit all actors involved, also those using care welfare technology. This requires co-creation in terms of role clarifications, competences and characteristics of leaders responsible for collaborative processes. Research from Lapointe et al., (2005) also identified components of resistance to the implementation of technology. The perceived threats and the resistance behaviour can be found at both individual and group level. In order to produce a constructive and positive outcome for implementation of new welfare technology, the process of collaboration and co-creation ought to focus on how to proceed and engage in active roles to produce a beneficial result. To reduce the levels of frustration and criticism of co-actors (here, the staff), the levels of trust, understanding and communication among all actors involved must be enhanced.

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