Scandinavian Journal of Information Systems

Volume 31 | Issue 1 Article 2

8-11-2019

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Cover Page Footnote
Acknowledgements We would like to thank the focus group participants for their time and contribution to the study. Funding This study is part of PhD research and was supported by the Norwegian Science Foundation, the Kvinesdal municipality, and the Health Network in the Lister and Lindesnes regions in Norway. The views expressed are not necessarily those of the Norwegian Science Foundation or the municipalities.

© Scandinavian Journal of Information Systems, 2019, 31(1), 31-66

Challenges of Mainstreaming Telecare

Exploring actualization of telecare affordances in home care services

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Abstract. Application of telecare has received increased attention as a means to address the future care needs in home care services. However, the uptake of telecare has been slow and fewer solutions than expected have been implemented. Healthcare employees' perspectives on telecare and organizational issues have not received appropriate attention in earlier research. There is a need to understand the challenges related to telecare services. Through the lens of affordance theory, the present study aims to explore municipal employees` experiences of TCS. The study contributes to affordance theory by developing an understanding of the collective actualization process. Focus group interviews were conducted with 26 employees involved in telecare services in eight municipalities in Southern Norway. Findings reveal that successful actualization of the seven perceived telecare affordances required involvement of several actors, new ways of working and close cooperation within the municipalities across units and disciplines. Furthermore, the actualization process was strongly influenced by contextual factors. The most prominent factors included *anchoring and cooperation, competence and knowledge*, and *routines and follow-up*. Findings indicate that specific focus on these factors is needed in order to succeed with mainstreaming of telecare in home care services.

Key words: actualization, affordance theory, healthcare, home care, organization, technology, telecare

1 Introduction

Telecare is seen as an innovative measure to address future care needs in home care services, given the increasing number of older adults and shortage of healthcare employees

Accepting editor: Magnus Bergquist

(NOU 2011). Several policy initiatives have been implemented in European countries to enhance the adoption and uptake of telecare services (Clark and McGee-Lennon 2011; Søndergård 2017). To ensure sustainable health services and improve the ability of individuals to cope with daily life, the government in Norway has launched a national program for the development and implementation of telecare, with the aim of using telecare as a fully integrated part of Norwegian home care services by 2020 (Norwegian Ministry of Health and Care Services 2015). Home care services represent a large field of care activities, and can be defined as care provided by professionals to a person in his or her own home (Thomé et al. 2013). Telecare used as part of municipal home care services, is termed telecare services (TCS).

Telecare is an umbrella concept comprising several technological solutions to promote safety and security in patients' homes (Draper 2012). Telecare devices include active alarms (user-triggered alarm button) and passive alarms (sensors that detect specific hazards, and do not require users to trigger them) (Stowe and Harding 2010). The Norwegian Directorate of Health (2017) recommends applying Global Positioning System (GPS) tracking and camera devices for digital surveillance and medication reminders as part of municipal telecare services, in addition to active alarms. The personal emergency response system (PERS) is mainstreamed in most municipalities in Norway (Stokke 2016), however, there is ongoing work to switch to digital PERS systems (Norwegian Directorate of Health 2015).

The promise of telecare is high in terms of increasing the quality of services and socio-economic benefits (NOU 2011). However, despite high interest and several projects with promising results, fewer solutions than expected have been implemented (Barrett et al. 2014; Berge 2017; Søndergård 2017). Hence; there is a need for research to understand the challenges related to implementation of telecare services.

Several prerequisites for realizing the potential of these technologies have been identified. Implementation of telecare should be understood as a socio-technical intervention (Greenhalgh et al. 2015), which requires a different approach from a pure technical implementation. Telecare may work differently in different situations, and thus will lead to different outcomes (Berge 2017). To be used, it must fit the needs of users of home care services (Karlsen et al. 2017), who often belong to vulnerable groups with several health challenges and multiple diseases (Dyrstad and Storm 2016). Introducing technology within complex organizational systems such as healthcare systems is not a straightforward process (Cresswell et al. 2010). Many actors are involved, and contextual factors must be specified, understood, and addressed (Sugarhood et al. 2014). According to Greenhalgh et al. (2017), it is extremely difficult to go beyond small-scale demonstration projects. Key barriers to wider use of technology have been identified

such as stability of the technical and financial environment (Knapp et al. 2015; Postema et al. 2012; Ross et al. 2016), lack of personal skills (Knapp et al. 2015; Ross et al. 2016), and obstacles in policies and regulations (Ross et al. 2016). Moreover, previous findings reveal that a common problem is that organizations are not ready or set up for technological innovation (Greenhalgh et al. 2017; Postema et al. 2012; Ross et al. 2016). However; organizational issues and healthcare employees' perspectives on telecare have not received appropriate attention in earlier research (Cresswell and Sheikh 2013; Nakrem et al. 2018; Saborowski and Kollak 2015). Hence, further research is needed on organizational issues related to implementation of TCS.

We will explore experiences of establishing TCS, from an organizational perspective, of municipal employees. To facilitate understanding of the complexity of telecare-enabled change in organizations, we build on the work of Strong et al. (2014), and use the affordance-actualization (AA) lens. Strong et al. (2014) developed a mid-range theory of electronic health record (EHR)-associated organizational change. Their study focuses on EHR affordances and the dependencies among them to help managers identify the potential value and challenges associated with different actions (Strong et al. 2014). The authors found eight affordances that were essential in determining how the use of an EHR resulted in organizational change; e.g.; the affordances of capturing and achieving digital data about patients (Strong et al. 2014). In their case, the actualization process meant that physicians who had the skills to create electronic notes needed to record all appropriate data about patients and interactions with them in the EHR. However, as individuals used the EHR, they encountered both supporting and restricting factors, which often affected them in various ways (Strong et al. 2014).

Healthcare is a collective achievement organized around the healthcare process, where different professions work together to treat patients. The AA lens helps us understand the complex relationship between technological artefacts, actors in the organization, and context, and how these relations lead to action possibilities (affordances) (Hausvik and Thapa 2017). In our case the technological artifacts were telecare devices, the actors were municipal employees, and the context was home care services. Moreover, the AA lens focuses on explaining how and why outcomes occur, instead of just focusing on whether the benefits of telecare are achieved; e.g.; lower costs, greater efficiency, higher quality of care.

The present study contributes to affordance theory with identifying and developing an understanding of the collective actualization process, which is a new concept. To understand the actualization process, it is necessary to identify factors that enables and inhibits this process (contextual factors), and the study also shows the affordances that were actualized, to serve as an illustration. The research questions were: How do

municipal employees experience the actualization of telecare affordances in home care services? Further, how is the actualization process affected by the context? Answers to these questions may provide valuable insight to practice and research on implementation and scaling of telecare.

2 Affordance theory

The affordance theory originated in ecological psychology, developed by James J. Gibson (1979). A key idea underlying Gibson's approach is that of actor-environment mutuality (Gibson 1979; McGrenere and Ho 2000), in which a goal-directed actor perceives an object in the environment in terms of how it can be used or what action possibilities it affords for achieving the goal (Gibson 1979). The main contribution of information systems research within affordance theory has concerned defining affordance (mainly theoretically), and highlighting the concept's characteristics (Pozzi et al 2014). However, affordance theory is also increasingly used to understand the relation between technology and human actors in organizational change (Anderson and Robey 2017; Klecun and Lichtner 2016; Leonardi 2013; Strong et al. 2014; Thapa and Sein 2017).

Following the view of Thapa and Sein (2017), we assume that every technical artefact offers action possibilities, potential or latent affordances, as long as there is at least one user who has action capabilities, a goal to achieve, and can use that artefact to achieve his/her goal. The ability to perceive an affordance may be dependent on the actors' experience and culture (McGrenere and Ho 2000). However, affordances do not lead to actualization without an interaction between the goal-oriented actor with action capabilities and the artefact that affords possibilities of action (Michaels 2003). The present study extends previous work on affordances and contributes to theory by addressing the collective actualization process, and the study shows how specific affordances are actualized, and the contextual factors that enable or inhibit this process.

We adopted Strong et al. (2014, p. 69) definition of affordances in an organization as "the potential for behaviours associated with achieving an immediate concrete outcome and arising from the relation between an artefact and a goal-oriented actor or actors." In the present study our artefacts are telecare devices (see table 2) and the goal-oriented actors are employees in Norwegian municipalities engaging in TCS. Previous research applies affordance theory to a specific technology, such as EHR in a hospital context (Anderson and Robey 2017; Hausvik and Thapa 2017; Strong et al. 2014). However, telecare differs from such systems, as it comprises various different technologies that can be used depending on the patient's needs. Moreover, use of the technology for one

patient may be on a short- or long-term basis. This means that employees must handle different technologies in different contexts (their offices and different homes). The first steps are therefore to explore experienced telecare affordances. We will extend the affordance concept to accommodate *telecare affordances* in home care services.

Actualization can be seen as a goal-oriented and iterative process (Leonardi 2013) and is defined by Strong et al. (2014, p. 70) as "the action taken by actors as they apply one or more of the affordances to achieve outcomes supporting organizational goals." An immediate concrete outcome is a specific outcome of actualization that is viewed as useful for realizing overarching organizational goals (Strong et al. 2014, p. 70). However, in the context of TCS, what is missing in Strong et al.'s work (2014) is the step beyond actualization of affordances. Mainstreaming telecare is an ongoing process with different artefacts (Røhne et al 2016). Hence, our contribution extends previous work by adding the concept of the *collective actualization process*. When scaling and mainstreaming telecare, it is not sufficient to actualize single affordances through the use of single artefacts. For instance, when a user needs change, the use of an artefact may be decommissioned. If there are no organizational processes to continue with TCS to the next patients, then the actualization process in the organization will stop. The challenge is that in such a case the use of telecare becomes non-permanent and is not developed into normal practice.

Strong et al. (2014) identified three factors that affects the actualization of affordances: abilities and preferences of the individual, features of the system, and characteristics of the work environment. According to Strong et al. (2014), there is a need for more exploration of the difficulties actors encounter during the actualization process. We will address this gap by exploring *contextual factors* that affect the process of scaling and mainstreaming telecare, and present additional factors relevant to TCS in addition to those suggested by Strong et al. (2014) and show how these affect the collective actualization process. To do so, we carried out an empirical study in eight municipalities in Southern Norway.

3 Methods

An interpretive research approach was used, and a total of 26 participants involved in telecare services were interviewed in four different focus group interviews. The study was approved by the Norwegian Centre for Research Data (NSD; project number: 52587). We will explain the selection of participants and of technologies studied below, before going into depth on data collection and analysis.

3.1 Participants

Participants were recruited from three levels in healthcare organizations after careful planning in cooperation with telecare coordinators and leaders who knew the organization and operation of TCS in the region.

Level one involved one group of healthcare employees who worked in direct contact with patients who used telecare, this includes occupational therapists, nurses, case managers, and telecare coordinators. The healthcare employees were involved in daily follow-up through receiving alarms, adjusting settings to needs, and so on. In addition, we interviewed one group of technicians/janitors assisting home care services in installing and following up PERS systems, and of IT operators responsible for information and communication networks, safety, and security were also included. The IT-operator participants worked in a shared IT entity that was owned by and served these municipalities, except for one who had his physical workplace in the municipality for which he was responsible. Five municipalities shared an IT entity, while three had independent IT entities. The IT operators in the shared entity were not physically present in the municipalities they served, and carried out technical assignments for the municipalities mainly over the Internet.

Level two participants included department managers, who were the immediate leaders of the healthcare employees and of different departments involved in providing telecare services to community-dwelling older adults.

Level three participants included unit leaders, who were the immediate leaders of the department managers in our study and had overall responsibility for finances and operations for the departments. Table 1 shows the participants' characteristics.

3.2 Technologies under study

The technologies that the participants had conrete experiences with and a description of how they were used, are listed in table 2.

Focus groups	*Participants*	*Age*	*Gender*	*Years of work experience*
Group 1: Unit leaders	Unit leaders N=4	31-40 N=1 41-50 N=1 51-60 N=1 61-70 N=1	Female N=4	Less than a year N= 1 1-5 years N= 1 More than 11 years N= 2
Group 2: Department managers	Leaders of healthcare employees at an institution N=1, at home care services N=4, at a department for mental health N=1, and at a department for people with disabilities N=2	31-40 N=3 41-50 N=3 51-60 N=2	Female N=8	Less than a year N= 1 1-5 years N= 2 6-10 years N= 3 More than 11 years N= 2
Group 3: Healthcare employees	Nurses N=2, occupational therapists N=2, case managers N=3, and telecare coordinators N=2	31-40 N=5 41-50 N=3 51-60 N=1	Female N=8 Male N=1	Less than a year N= 1 1-5 years N= 3 6-10 years N=2 More than 11 years N= 3
Group 4: IT and Technicians	Head of IT N=1, IT-operators N=3, and a technician N=1	31-40 N= 1 41-50 N= 1 51-60 N= 3	Female N=1 Male N=4	1-5 years N= 4 More than 11 years N= 1

Table 1. Characteristics of participants

3.3 Data collection

Data were collected through focus group interviews. This is an appropriate data collection method when studying a phenomenon of interest in an environment where many people interact (Malterud 2003), and for obtaining collective views and allowing participants to engage in thoughtful discussions (Myers 2009). In addition, we compared our findings with report data (secondary data) from pilot projects conducted in six of the included municipalities (Moe and Nilsen 2015; Røhne et al 2016). These pilot projects were part of the national programme (Norwegian Directorate of Health 2017).

Participants were recruited from municipalities that had been through a period of pilot testing and had started to implement and use some of the recommended solutions, although only on a small scale except for the PERS system. We included eight small- and medium-sized municipalities in Southern Norway, with approximately 1,750-15,500 inhabitants each, as these municipalities had tested different telecare solutions. All municipalities were in the process of organizing TCS, with the aim of integrating it as part of the health services.

The focus group interviews were conducted in May 2017. The main author mailed information letters and consent forms to leaders in the home care services in 11 municipalities (all municipalities in one region in Southern Norway). Participants were recruited through consecutive sampling, with a goal of forming groups of 4 to 12 participants (Liamputtong 2005). All of the participants signed the declaration of consent. Three of the four groups in our study were homogeneous in terms of level of positions. The exception was in the IT and technical group, where the head of IT was present at the request of the participants in the group. We did not mix leaders and employees since we aimed for an open interaction in the group, where participants could speak freely. Three of the interviews were conducted at the municipal administration in one of the municipalities, whereas the interview with the IT and technical group was conducted at the IT entity's workplace.

An interview guide was developed collaboratively by the research team, with questions about experience with the use of telecare, organizational goals, and the process of installing telecare devices (who is involved, what is their role, who does what/when). There were also questions on whether anything should have been done differently, on barriers, and on the most important enablers of success. The main author has a background as a nurse and health informatics professional, and she was the interviewer. There was a brief introduction at the start of the focus group interviews, with information provided on the study and the aim of the interviews. The co-authors were moderators; all of them have backgrounds in nursing and/or IS. Interview questions were asked in an open fashion, and moderators ensured that all participants expressed their

Telecare devices	*Description*
Personal emergency response system (PERS)	A personal alarm. The patient wore the PERS around the wrist or the neck. If the patient needed help, he/she could activate the alarm and alert healthcare employees.
Medication reminder type 1	An automatic medication reminder. Nurses dosed medication in the dispenser. If patient forgot to take the medication, the dispenser sent an alarm to healthcare employees. Visual and audio alarms would not be stopped until the pills were dispensed.
Medication reminder type 2	A more advanced medication reminder (robot). Nurses brought the prescribed multi-dose medicine sachets from a pharmacy and loaded them in the automatic medicine dispenser in a person's home. The robot offered instructions (visual and voice) on how to take the medicine. If a medicine sachet was not taken despite three reminders, the dispenser would lock the dose in a separate chamber so that the medicine could not be taken at the wrong time. The robot sent automatic and uninterrupted information about patients' medicine taking and alerted if the medicine was not taken.
GPS positioning/ tracking device	A mobile personal alarm with GPS tracking and GSM. If help was needed the patient could press an alarm button and alert healthcare employees. Moreover, the solution had the possibility of using geofence; a virtual area defined by the carer. Carers could be alerted if a patient went outside this area.
MemoAssist app	A calendar app to create daily plans and provide overview, structure, and reminders of activities for patients.
Door sensor	A wireless sensor on the door to prevent wandering during the night. The door sensors were connected to the same system as the PERS. If a monitored door was opened, healthcare employees could be alerted.
Epilepsy sensor	A wireless sensor that was used in the bed of a patient. It would be activated by epileptic seizures and could notify healthcare employees.
Camera device, FaceTime	A camera installed in house of patients. The healthcare employees could log into the camera at scheduled times to see the patient. Only picture would be shown, sound would not be transmitted. FaceTime on an iPad was used to communicate (non-medical issues) with patients.

Table 2. Description of telecare devices

opinions during the interviews, asking follow-up questions when appropriate. Some of the participants already knew each other, which helped the talk and discussion flow easily. All interviews were audio-recorded, and field notes were taken during and after all interviews, recording key words from what was said. The interviews lasted 86-102 minutes (mean: 95 minutes).

3.4 Analysis

The data were analysed using thematic analysis, which is in line with our approach based on interpretive epistemology (Braun and Clarke 2006). The analyses were conducted by the main author, and the findings were discussed over the course of several meetings to ensure consistency with all co-authors. The affordance theory guided the analytical process, which followed the six phases of thematic analysis; familiarisation with the data, generating initial codes, searching for themes, reviewing themes, naming themes, and finally building the construct (Braun and Clarke 2006). First, all interviews were transcribed word by word while listening to the recordings. The transcripts were then read carefully with a focus on how the participants described technical artefacts and events related to them. The data management software program NVivo 11 was used to organize the data. Every sentence or section was investigated to code for as many patterns as possible. Initial codes were categorised into meaningful categories in the process of searching for sub-themes and themes. The categories that emerged in the first round of analysis were *telecare artefacts* that participants had experiences with, *actors involved* in telecare services and their roles, and *aims of telecare* (organizational goals).

During the process of engagement with and analysis of the data, the theoretical AA lens began to reveal itself. The participants pointed to the possibilities with the use of technology that is the affordances and related outcomes. As they described events related to telecare, they also described actions needed to realize the affordances. Furthermore, the analysis process revealed another aspect of the actualization process: the participants were concerned about scaling the use of telecare, and described a process where they collaborated to actualize the affordances in the organization. In addition, the participants mentioned several barriers and enablers of mainstreaming and scaling TCS.

Our analysis included several cycles of coding and categorizing to reveal sub-themes and final themes. Further, the themes were reviewed to consider whether they appeared to form a coherent pattern. This was done as an ongoing process where large themes such as barriers and enablers needed to be revised and categorised into new themes such as anchoring and cooperation. Table 3 provides an illustration of the analytical proce-

Meaning unit	*Codes close to the text in NVivo*	*Category*	*Sub-theme*	*Final theme*
There is such a plug in the system…those who work in the IT entity ... we have to sit down together and find common solutions. But they do not participate. (Unit leader)	IT is not involved	Organizational barriers	Anchoring and cooperation	The work environment`s characteristic and organization
We feel we are chopping in front of IT people in this area. We have the ideas, but we cannot do it…Then it stops. (Manager of the Department for people with disabilities)	Lack of cooperation			
We get involved in the end. Once they have bought the equipment and plugged it in the wall and it does not work, then they call us. (Head of IT)	IT gets involved too late.			

Table 3. Illustration of the analytical procedure

dure when interpreting barriers and enablers experienced by the participants. Reading and comparing the categories with data from project reports (from telecare projects in the region) reinforced our insight and helped refine our findings.

4 Results

The results of the study are organized as follows; the telecare affordances perceived by employees are presented in section 4.1, the actualization process is covered in section 4.2, and the contextual factors that the participants experienced as inhibiting or enabling this process s
are presented in section 4.3.

4.1 Telecare affordances

The analysis revealed seven perceived telecare affordances; see table 4. Column 1 shows the specific artefact, column 2 shows the actors who perceived the specific affordance, and column 3 shows the specific actions individuals needed to perform in order to actualize the affordance, whereas column 4 shows the organizational outcomes of the actualized affordances. There is no standard grammar for labelling affordances; we used gerunds associated with the actions that would be taken to actualize that affordance, as suggested by Strong et al. (2014). Below is a description of our findings related to the experienced affordances.

Affordance 1 was perceived by unit leaders and was related to a door alarm installed in the home to a person with dementia. The healthcare employees experienced that the artifact provided a possibility for analysing and mapping patient`s activities. Hence, they could use it as a tool to map patient`s needs.

> If we told the patient in the evening that tomorrow you are going to day-care, the door alarm was triggered much more often. (Unit leader)

In this case the unit leader concluded that patient needed the information the same day as day-care instead of the evening before, due to stress.

Affordance 2 was perceived by unit leaders, department managers and healthcare employees and was related to camera devices. They experienced that the artifact provided a possibility of surveilling patients from a distance. This was resource saving as they did not have to drive home to patients only to see that they were sleeping, and saved a lot of time.

> It is just to log in and it is done. (Department manager, home care services)

Telecare affordances		**Individual actualization of the affordance**	
Telecare artefacts	*Perceived by goal-directed actors*	*Individual actions needed to actualize the affordances*	*Organizational outcomes*
Affordance 1. Analysing and mapping patient`s activities		Actualization	
Door sensor	Unit leaders	Healthcare employees need to receive and handle alarms from patients. They need to document number of alerts and use it as a tool to analyse and map a patient`s daily activities.	Discover the needs of patients with cognitive impairment, so that tailoring of services is possible. Delay or prevent institution.
Affordance 2. Surveilling patients from a distance		Actualization	
Camera device	Unit leaders, department managers, healthcare employees	Healthcare employees need to log on to a separate system on a computer in the office to perform digital surveillance.	Caregiver efficiency and resource saving.

Telecare affordances		**Individual actualization of the affordance**	
Telecare artefacts	*Perceived by goal-directed actors*	*Individual actions needed to actualize the affordances*	*Organizational outcomes*
Affordance 3. Communicating with patients		Actualization	
GPS tracking device, FaceTime, PERS	Department managers, healthcare employees	Healthcare employees need to receive FaceTime calls from patient. Through receiving alarms from GPS or PERS, healthcare employees can communicate with the patient.	Caregiver efficiency. Be available for patients if they need help.
Affordance 4. Providing medications to patients on time		Actualization	
Medication reminder	Unit leaders, department managers, healthcare employees	The nurses bring the prescribed medicine and loads it in the automatic medicine dispenser in the person's home. They set the alarm at the agreed time to alert the patient.	Caregiver efficiency and resource saving.

Telecare affordances		**Individual actualization of the affordance**	
Telecare artefacts	*Perceived by goal-directed actors*	*Individual actions needed to actualize the affordances*	*Organizational outcomes*
Affordance 5. Locating patients outdoors		Actualization	
GPS tracking device	Department managers	Healthcare employees need to receive and handle alarms from patients if they walk outside a restricted area.	Delay or prevent institutionalisation. Locate individuals outdoors quickly.
Affordance 6. Providing necessary help when needed		Actualization	
PERS, GPS tracking device, sensor technology	Department managers, healthcare employees	Healthcare employees need to receive and handle alarms from patients when needed.	Delay or prevent institutionalisation, or need for more help. Discover and prevent accidents.
Affordance 7. Visualizing daily activities and tasks		Actualization	
MemoAssist application on an IPAD	Department managers	Healthcare employees need to enter information in the system that is visible to the patient and the caregivers.	Caregiver efficiency. Increased predictability.

Table 4. Telecare affordances and individual actions needed to realize the affordances

Affordance 3 was perceived by department managers and healthcare employees and was related to GPS tracking devices, FaceTime and PERS systems. These artefacts provided a possibility of communicating with patients when needed.

> Sometimes the staff need to go to the patient, but you can explain things via FaceTime instead of regular phone. (Department manager, people with disabilities)

Affordance 4 was perceived by unit leaders, department managers and healthcare employees and was related to medication reminders. It provided a possibility for providing medication to patients on time, without physical supervisions.

> We drive so much up and down and back and forth…It`s really just to see that the patient has taken the medication. (Department manager, home care services)

Affordance 5 was perceived by department managers and was related to GPS tracking devices. Healthcare employees could locate and pick up patients with cognitive impairments outdoors if necessary.

> Then no one needs to follow him…we get an alarm on where he is. (Department manager, institution)

Affordance 6 was perceived by department managers and healthcare employees and was related to PERS, GPS tracking devices and sensor technologies. These artefacts provided a possibility for healthcare employees to provide necessary help when needed.

> We bought an epilepsy sensor…They (nurses) could be present in a minute. (Case manager)

Affordance 7 was perceived by department managers and was related to the MemoAssist application. Healthcare employees could enter information in the system, and hence visualize daily activities and tasks for the patients with cognitive impairments.

> If they (patients) wonder when they should go to the store…they can see it. Or tomorrow I`m going to work, and tonight that person is coming to work. (Department manager, people with disabilities)

However, our data revealed a *collective actualization process* that was necessary in addition to actions done by individuals. We will present the findings related to this in the next section.

4.2 A collective actualization process

To ensure scaling and mainstreaming of telecare, the participants narrated a process where actors were involved at different stages and needed to collaborate to actualize the affordances. The following description shows how a lot of people were involved in a collective process.

The first step in the actualization process was identifying a need that could be solved with the help of technology. There was a shared belief among participants that mapping the patient`s needs was the way to start. Often the process started with healthcare employees identifying a need for technology when they visited patients who already received services but needed more help. Patients' needs were further mapped, and the process involved finding a telecare artefact that could meet the needs, including reviewing legal aspects, costs and privacy rights. When a patient had a specific need, this issue was often discussed at treatment meetings with case managers and leaders. It was considered whether; e.g.; a medication reminder should replace or be a supplement to home care services.

> It (an identified need) is often addressed at treatment meetings where there are case managers who assist in the mapping process, and I make the decision, as the unit leader. (Unit leader)

The second step involved documentation and ordering the telecare artefact. Case managers documented the decisions from the treatment meetings. In cooperation with leaders they agreed on who and where to order the devices. In some cases the municipality had a purchase agreement, and it was clear which type of telecare device they could order. An occupational therapists could consider whether the technology could be applied free of charge, such as the MemoAssist. The municipalities who had a telecare coordinator, coordinated the process of ordering and implementation. Technicians were often involved in ordering of PERS systems.

> We refer to the occupational therapist. If we have anything in stock, then we deliver as soon as we can. (Case manager)

The third step involved installation and adjustment of the telecare artefact in the patient's home. Technicians were involved in installation of the PERS system, and in cooperation with IT, they also installed camera devices. Healthcare employees made the necessary settings and delivered some devices who were relatively ready from the suppliers, such as GPS devices and medication reminders.

> He (janitor) is the one who installed the camera and has followed up. (Nurse)

The fourth step involved information and training to all involved actors. Leaders, technicians and/or telecare coordinator organized information meeting for healthcare employees. In some cases they had; e.g.; a medication reminder in the office in home care services, so all nurses could practice the necessary settings and the handling of medications. If the municipality started with a new device, they conducted information and training before installation. If the device was familiar to the healthcare employees, written and oral information were given to patients and family caregivers at the time of installation or right after.

> Then there was training…and password distribution and so on. (Nurse)

The follow-up and evaluation stage consisted of necessary actions of employees after the telecare artefact was installed. Leaders were involved in evaluation of benefits and costs. Healthcare employees were involved in daily follow-up and regular use. Technicians and/or telecare coordinators followed up technical issues. Based on the evaluation process, an assessment of whether the technology needed adjustments was done, and the decision of whether or not to proceed with telecare.

> It is actually very important that it is followed up and actually used properly. If not, it must be removed. (Case manager)

The steps in the collective actualization process are shown in figure 1 below.

Each stage in the collective actualization process was affected by contextual factors that enabled or inhibited actualization of telecare affordances.

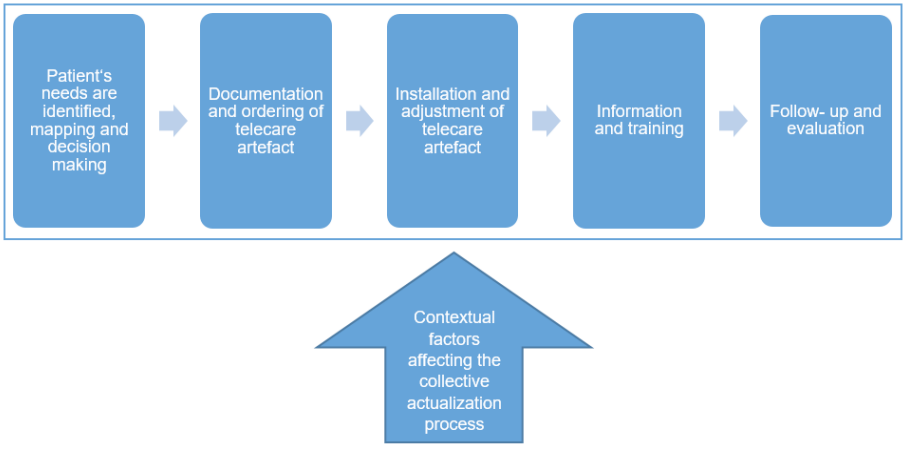

Figure 1. Collective actualization of telecare affordances needed to scale and mainstream TCS

4.3 Contextual factors affecting the collective actualization process

The interpretation of the data revealed eight interrelated main contextual factors affecting the collective actualization process. These factors can be divided into the work environment's characteristic and organization, individual and social abilities and preferences, and technology features and infrastructure. *Anchoring and cooperation* was the most prominent factor, followed by *competence and knowledge* and *routines and follow-up*. These were identified as they were mentioned most frequently, affecting all stages in the collective actualization process and discussed in all focus groups. To achieve a collective actualization we need to understand and take account of these.

The work environment's characteristics and organization.

Anchoring and cooperation. Healthcare employees and leaders stated that anchoring was important for all employees. It was important to root the use of telecare in the organization and let everybody and not only top management see its possibilities and involve them in the collective actualization process when needed. Participants stated that this was crucial for continual use of technology.

> You have to involve the professionals in the field, those who actually do the job…that they are included from the start. (Telecare coordinator)

The barriers mentioned most often were lack of cooperation between IT and home care services. This was most evident in municipalities where they had outsourced IT operations, and where IT operators were not physically present. Healthcare employees and leaders expressed that IT operators were important in the collective actualization process, but they experienced the IT entity as difficult to reach and to get involved in telecare services. In some cases, healthcare employees and leaders discovered telecare affordances, but these were not actualized, as the process was stopped by IT operators in the installation stage.

> It does not work as it should.…those who work in the IT entity...one has to sit together and find out what the problem is and how can it be solved. But they are not 'on'. (Unit leader)

In some cases, IT operators stopped the installation of telecare due to safety and security reasons. IT operators and the head of IT stated that they became involved too late and experienced this as a challenge. The outsourced IT entity was not updated about projects and telecare artefacts that the municipalities applied. Therefore, they could not contribute with their input before the technology was purchased and something went wrong.

> We get involved in the end. Once they have bought the equipment and plugged it in the wall and it does not work. Then they call us…at least it has been our impression. (Head of IT)

One municipality had IT operators physically present because they did not participate in IT cooperation with the other municipalities. In this municipality, IT operators were involved in decision-making and could provide input concerning what type of technology to apply and ensure that the use of this technology did not breach any regulations concerning ICT privacy and security.

> We and the supplier have been included in the meetings…They are very aware that they need us. (IT operator)

Routines and follow-up. All the included municipalities had been working on establishing work processes and routines for telecare services; however, all focus group participants agreed that this did not work well enough. Responsibilities were not clearly allocated, and the process from mapping and decision-making to evaluation was still slightly random. Hence, which actors were involved in the collective actualization process and how was not entirely clear.

> I think it (the process) is a bit bumpy. It is a little unclear who will do what. (Department leader, home care services)

If the case manager did not know who to contact or how the process should work, this could lead to challenges in the decision-making process.

> We, who handle applications for home care services and try to find solutions, wish we had a person who had the responsibility of keeping an eye on suppliers and technologies, so we could find something that could fit the needs. I do not know if anyone in the municipality completely has that overview…the responsibility…no one is in charge. (Case manager)

Healthcare employees agreed on the importance of having a telecare coordinator that knows the field and could assist all units in the municipalities. In the two municipalities that had a telecare coordinator in a 50%-position or more, the coordinators were in lead of the collective actualization processes.

> I think it's very important…to see the whole context. No one else does that to a large extent. The healthcare employees are employed in one unit, technicians in another unit, and everyone is busy and only sees their own things. (Case manager)

Despite the lack of routines and assignment of responsibilities, all groups agreed that they could solve challenges currently, but that they would not manage to do so if use of telecare should be increased.

> Much of the challenge is when you roll out on a larger scale. When it's on a smaller scale, one can handle it more ad hoc. But if there are very many (artefacts) then you cannot do it that way. (IT operator)

Benefit realisation. Healthcare employees and especially leaders frequently mentioned the theme of benefit realisation. Previous pilot trials had been carried out with project funds, and the employees saw a need for reorganizing services to benefit from telecare, and not being dependent on project funds for running telecare services in the future. This was considered important in the mapping and decision making stage and evaluation stage.

> Either we must run the service as they have always done, or we must remove something. We cannot use technology and do the work in the same way we have always done it…. Should we continue with (the old way), 'yes both please', and that is not possible. (Unit leader)

Unit leaders considered it important to visualize benefits and then decide whether to proceed or not with the use of the telecare artefact in the evaluation process. In addition, benefit realisation had an impact on the decision of whether to expand and scale up the use of telecare or not. However, findings revealed that there was little account taken of how much the organization had saved in costs. As one participant stated:

> We must actually evaluate what we do. In fact, this lady has lived at home for half a year longer. It's actually saved so and so many thousands. We are so good at care. But with numbers we are very bad. (Unit leader)

Individual and social abilities and preferences.

Competence and skills. A commonly mentioned factor was the competence and skills of healthcare employees. Lack of knowledge regarding what kind of telecare artefact could be used or how to use it was commonly referred to as a barrier. Healthcare employees and leaders expressed a need for training and information for everyone involved in the telecare service. If healthcare employees did not know how to use an artefact, the affordances were not realized, and they would often quit using telecare and go back to the way they worked before. One example was a participant who stated that they gave up the medication reminder because they did not understand how to use it.

> For us it was very complicated to follow the instructions for how to use it. (Department leader, home care services)

Our findings also revealed that telecare services required healthcare employees to obtain new skills when they had to use technology that was not included in their education.

> We do not have the skills...we are educated as health professionals, not as engineers. Right. (Department manager, institution)

The leaders saw a need for technical personnel to be more involved in the installation process of telecare services and follow-up of devices.

> But I do not want a nurse, I want an electrician. I have many nurses in home care services. (Unit leader, home care services)

Attitudes. Leaders and healthcare employees expressed that use of telecare could have more effect through scaling up. This required competence as described above, but attitudes towards the use of telecare also affected whether healthcare employees chose to use technology rather than another solution in the mapping and decision making process.

> I think that attitudes are still a barrier to a large extent. I'm employed in a 50%-position and I see that the technology could be used a lot more. (Telecare coordinator)

According to the leaders, the greatest resistance towards telecare was among healthcare employees.

> We have seen that the biggest resistance is among healthcare employees. Because when family caregivers and patients are explained (how the technology works), they are often positive. (Unit leader, home care services)

Telecare features and infrastructure.

Ease of use and technology working as intended. Technical issues with artefacts could stop the actualization process and make healthcare employees unsure of the potential of technologies. They could, for example, be unsure whether to implement a device for alerting them if a patient should fall, because the artefact available was too sensitive.

> There are many fall detectors, but we have not found a good one. (Telecare co-ordinator)

In addition, technical issues could impact the quality of patient care, for instance, if patients did not receive important medications. This affected the evaluation stage and could lead to decommissioning.

> A challenge with the medication reminder is that some tablets gets stuck… When the patient had a good period, we did not visit for 3-4 days. Then it was annoying to come back to see that the tablets were not taken because they were stuck in the chamber. (Department manager)

ICT safety and security. The IT operators and technicians expressed a concern that telecare systems, such as the personal alarm system, could only use the cellular network, which did not have an extra route for back-up. In their view, alternative back-up routes would increase ICT safety and security when applying telecare for vulnerable individuals.

> A bit surprised when talking about home-based solutions, they are almost willing to use only the GSM network. Then there are no alternative routes…when talking about life and health, one should have an alternative route. (Head of IT)

Integration. Integration of information from telecare artefacts with the EHR system is a factor that leaders and healthcare employees perceived to be important to prevent duplication of work processes and increase the service quality. This affected the documentation quality, in addition to limited electronic information in the evaluation phase.

> One has to enter the documentation (manually) into the EHR to prove that the alarm is received, instead of it being automatically entered. (Unit leader)

In addition, healthcare employees and leaders stated that they needed to deal with several separate systems, and that each system required its own login. This was considered manageable when using a few telecare artefacts, but not when scaling. Thus, lack of integration did not stop the use of telecare but made it more cumbersome and limited it to small-scale use.

> They (employees) deal with it. Now there are so few things (telecare artefacts). (Unit leader)

5 Discussion

The data were analysed through the AA lens to better understand the complex processes of scaling and mainstreaming TCS. Previous evaluations of telecare projects provide little information about why uptake is low and how to increase it (Knapp et al. 2015). Reports from telecare projects in Norwegian municipalities tend to focus on benefits and outcomes of using telecare (Norwegian Directorate of Health 2017; Røhne 2016). Less attention has been paid to the process of actualizing the possibilities in the organization and the factors that need to be considered in order to realize how technology diffusion can be accomplished in the long run. This study contributes to practice and theory by revealing a collective actualization process, and how contextual factors affect actualization of telecare affordances. Before discussing the collective actualization process and the contextual factors, we will discuss briefly telecare affordances.

5.1 Telecare affordances

The findings revealed seven telecare affordances that were interrelated in various ways. The participants could perceive the same affordances; however, they actualized them for different purposes. For example, in the case of surveillance of patients from a distance, department leaders told us that they used a camera device to see if the patient was sleeping and that this could save time and driving compared to physical surveillance. However, some unit leaders could not see the benefit of using a camera device to see if the patient was sleeping, and did not prefer to use it for this purpose. They expressed that the camera was used to log in to see that a patient took their medication, accomplishing the same goal of saving time and driving.

Moreover, actualizing one affordance sometimes led to actualization of another; according to Strong et al. (2014), these can be seen as bundles of affordances. For example, by using a GPS tracking device, a healthcare employee is able to locate the patient outdoors (affordance 5) to track a person; and if something happens, the device can allow two-way communication with the patient (affordance 3) and, most important, allow the healthcare employees to provide necessary help when needed (affordance 6).

Furthermore, the findings indicate that the participants needed to use several telecare artefacts to exploit multiple affordances, such as surveillance of a patient from a distance *and* communicating with patients. For instance, camera devices did not provide the possibility to communicate, and healthcare employees expressed a need for additional solutions to achieve this, such as PERS. The unit leader participants expressed a need for solutions with both image and audio transmission for digital surveillance. This indicates that awareness of affordances could be useful to telecare suppliers and designers.

Moreover, the participants used a range of different artefacts to actualize the same affordances, although according to Strong et al. (2014), affordances are technology specific. This was seen in particular with affordance 3, communicating with patients, and affordance 6, providing necessary help when needed. However, technology-specific affordances were also apparent, and could be actualized if the artefacts had certain specific functionalities, such as the possibility to alert healthcare employees if something happened (PERS, GPS, and sensor technologies). Healthcare employees who worked in direct contact with patients and could receive and handle alarms, such as nurses were made more able to provide necessary help to patients when needed, and used the technology available in their municipality to achieve the desired outcomes.

5.2 Collective actualization process and the contextual factors

Our findings revealed that actualization of telecare affordances involves different journeys made by different people. Individual actions are needed to actualize a concrete affordance. However, we found that this process was not sufficient to scale and mainstream telecare. Within TCS, it turned out that, in addition to what Strong et al. (2014) found when studying EHR, there was also a crucial element of collaboration that was required for the process of actualizing telecare affordance to take off. TCS required a collective actualization process that included several actors with different competence, knowledge, and goals. The involvement of the various types of actors involved in the present study was considered necessary at different stages in the process.

The actualization of affordance of practices of TCS (and possibly in healthcare in general) must therefore be understood as a collective actualization process; i.e.; "that affordance actualization unfolds over time, with some affordances being actualized early after go-live and others later" (Strong et al. 2014, p 75) where different actors in organizations cooperate to guide the patient through the healthcare system when doing their part. In an EHR (Strong et al. 2014) it is achieved through an integrated system, but TCS is more characterized by non-integrated systems where people constantly patch,

mend and bridge between systems and activities etc. That is why a collective process is required to actualize affordances for TCS as our findings indicates.

According to the report by Røhne et al (2016), the included municipalities implemented technology based on the patient's needs, with less focus on large-scale implementation. To assign technology that properly takes account of individual needs has been found to be essential for patient adoption and persistent use (Karlsen et al. 2018). However, organizational measures to achieve efficient and resource-saving services were also considered necessary. The collective actualization process was discussed in all focus groups, as they experienced the actualization journey as still under development and not completely clear. All participants agreed that it was desirable to have a fairly uniform process across technologies, although there could be local differences and adjustments. This view of continual use of telecare goes beyond just accepting the technology, and is also affected by several contextual factors.

The contextual factors were related to *the work environment's characteristic and organization*, *individual and social abilities and preferences*, and *the technology's features and infrastructure*.

Our findings revealed that the work environment`s characteristics was related to anchoring of TCS in the organization, cooperation between actors across units, and benefit realization. Work environment organization involves how TCS is organized and included routines and follow-up.

Lack of anchoring and cooperation were found to be the most common barrier to the collective actualization process; cooperation between employees with different positions and goals across the new tasks generated by the collective actualization process was identified as a challenge. This barrier was most prominent between the IT entity and home care services. Healthcare employees and leaders expressed it was a challenge to involve IT entity when they were not physically present in the municipality and close to the service. On the other hand, IT entity experienced being involved too late, and expressed a need to be more involved in the mapping and decision making process. The present findings indicate that proximity to the service may contribute to easier anchoring and cooperation: in the municipality where the IT operators were physically present, they were included and consulted early in the process, which enabled challenges to be solved together, with solutions that addressed all parties` needs.

Moreover, all the focus groups in our study reported that routines and follow-up were not entirely clear and responsibilities were not assigned. According to Greenhalgh et al. (2017), success of technology integration is more likely if there is a good innovation fit, that is, when technology fits existing work and routines well. It appears that some municipalities were not adequately set up and ready to scale up the use of telecare.

The present study shows that challenges were solved along the way, which worked because there were still only a few artefacts in use.

The participants in our study agreed on a clear process of who was to do what, when, and how (the collective actualization process). A frequently mentioned success factor was having a telecare coordinator to coordinate the process, keep a big-picture view, and act as an organizational link between other involved actors. The participants expressed a need for a person with assigned resources for the relevant tasks, preferably with technical skills, who could work across units.

Individual abilities and preferences are related to skills and work preferences. Findings from our data reveal that competence and technical skills were important to actualize telecare affordances. Moreover, our findings also indicate that attitudes of healthcare employees may be a preventing factor. Therefore, the social aspect is added to the contextual factors suggested by Strong et al. (2014).

Our findings clearly show that technical knowledge beyond that of general healthcare employees working with patients was required. Our findings indicate that actors may be aware of an affordance but do not have the knowledge or skills to actualize it. This indicates the importance of telecare training as part of implementation, in order to provide actors with the knowledge, skills, and attitudes required for new ways of working. Healthcare employees will most certainly inhabit a very different practice environment in the future, and telecare will be key in this transformation (Risling 2017). When scaling up the application of telecare, it is important to consider what new knowledge and expertise healthcare employees should acquire in addition to that related to their primary tasks. Our findings show that it may be necessary to include more individuals with technical skills, such as technicians or electricians, in the services as new artefacts need to be maintained.

Furthermore, it seems that the way information and training are provided may be decisive for healthcare employees' awareness of telecare affordances. The participants in the focus group interviews expressed concern about the patients' and the workers' own ability to take advantage of the opportunities. Previous research has shown that healthcare employees are positive towards technology when it can improve quality and safety in patient care (Nakrem et al. 2018). Information and training provided to healthcare employees should therefore be given with a focus on understanding the opportunities for patients, and on how the actualization process may lead to concrete benefits for both patients and the organization.

According to the unit leaders and some other participant interviewed, there is resistance towards new technology among some healthcare employees. Resistance towards technology has previously been shown to be associated with lack of competence, train-

ing, available time, and/or inappropriate technology (Saborowski and Kollak 2015). Similarly, in a report on previous projects in the region, it appears that healthcare employees were sceptical towards new solutions and new ways of working due to lack of knowledge (Moe and Nilsen 2015). The report shows that there was no direct aversion, but that workers did not see the purpose of the technology and did not know what solution to use (Moe and Nilsen 2015). Identification and discussion of telecare affordances in an organization may lead to increase of knowledge, which may in turn affect healthcare employees' attitudes.

The importance of technology features like interfaces was also noted by Strong et al. (2014) and deserves further consideration. We related this point to the features of the telecare artefacts that yielded the affordances. In fact, the participants did not experience many mistakes with the telecare artefacts, and thus technical factors were not among the most commonly mentioned problematic factors. This in turn might have been in part because there had been several projects in the municipalities testing different technical artefacts. Based on this, immature technology might have been either further developed before full implementation or not included as part of the service. However, the participants expressed a need for follow-up and for adjusting the technology to the patient's needs. An example from a previous project in the region showed that a patient was confused by a voice reminder, which was then replaced by a door sensor that worked as intended (Moe and Nilsen 2015). In addition, the present findings indicate that infrastructure, in terms of back-up systems and integration between systems, is important when scaling and mainstreaming TCS.

A notable limitation of the present study is that the context might have affected the experiences and views of participants. That is, the findings pertain to the particular organizational arrangements and social context of Norwegian small and midsized municipalities. Moreover, the participants were selected in cooperation with leaders in the municipalities, and there could be a risk that they were selected due to presumptively positive attitude towards telecare. However, nuanced experiences emerged, and the group composition may also have helped the participants to speak freely. In addition, the interviewer knew some of the participants from previous interactions; hence, all steps in the research process were discussed between all authors to reduce bias.

In addition, there may be other actors involved in telecare services who were not included in the study. The researchers are aware that the findings cannot be generalized; however, the identified factors may be transferable to other organizations in similar contexts implementing telecare as part of home care services.

6 Conclusion

Several affordances were perceived related to TCS that provided new opportunities to improve the care offered to patients. The findings revealed that successful actualization of telecare affordances requires actors in the municipalities to be collectively aware and capable of actualizing them. The collective actualization process requires new ways of working and close cooperation within the municipalities, involving several actors, across units and disciplines. Furthermore, the actualization process was strongly influenced by contextual factors, where *anchoring and cooperation, competence and knowledge*, and *routines and follow-up* were considered the most prominent factors. Increased attention to these factors may be important for the scaling and mainstreaming of TCS to succeed.

However, further research of the collective actualization process is needed. As this research design identifies several enablers and challenges of scaling and mainstreaming TCS, further studies are necessary to study large-scale implementation of telecare and of other digital technologies in home care services. Moreover, as this study explores telecare affordances and actualization from the perspectives of municipal healthcare employees, further research should explore this further from other perspectives, such as those of patients, family caregivers, politicians, and telecare suppliers.

Declaration of conflicting interests

There are no conflicts of interest in this study.

Funding

This study is part of PhD research and was supported by the Norwegian Science Foundation, the Kvinesdal municipality, and the Health Network in the Lister and Lindesnes regions in Norway. The views expressed are not necessarily those of the Norwegian Science Foundation.

Acknowledgment

We would like to thank the focus group participants for their time and contribution to the study.

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