# From "Plug" to "play"

## Making established technology innovations work in caring services

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Doctoral dissertation
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INLAND NORWAY
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OF APPLIED SCIENCES

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*Ååå det er langt å gå, og hvem vet om vi kommer i mål?*
*Det trengs mer enn en kubbe for å lage et bål*
*Så kom og gå sammen med meg*

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*Si meg, hvordan spiser man en hval?*
*En bit av gangen*
*Hvordan spiser man en elefant?*
*En bit av gangen*
*Hvordan gå på beina til Nepal?*
*Et skritt av gangen*
*Det kanke gå galt, bare man har trua på at det går bra*

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*Men så hender det at for selv de beste menneskene*
*At det som før var lett og spennendene*
*Har plutselig blitt et skrekk og skremmende*
*Det er da man trenger sine beste vennene*

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# Abstract

The overall aim of this article-based thesis is to develop the knowledge base of public service innovations as a way of understanding established technology innovation in municipal caring services. More precisely, the objective is to increase our understanding of the complex reality of technology in use in caring practices by focusing on the interactions between the technology and humans involved.

Policy documents describe a demand for increased technology innovations in community care services to meet perceived challenges in the services caused by a "silver tsunami" and to facilitate independent living. However, the integration of technologies has proven to be difficult, and many projects never integrate into regular use after the pilot stage. Research in the wake of these pilots seeking to identify drivers and barriers to technology innovations in caring practices does not capture the technology innovations that are actually integrated and used in regular caring practices, and what it takes to make them work. To understand these public service innovations we need a knowledge base incorporating the complex and diverse experiences with established technologies, and an understanding of the interactions between people and the technology involved. This thesis contributes towards a more comprehensive understanding of the "workings" of technology innovations when exploring the social alarm, which is a widely established and adopted technology innovation in caring practices.

Public service innovation is a developing field of exploring public services. More recent public service innovation has mainly studied public innovations on an organisational level. However, this thesis utilises the concept of co-production to explore the practice of the social alarm in use on a micro level. The concept of co-production is further developed by utilising aspects of science and technology studies as theoretical tools for exploring public service innovations.

A systematic integrated review was conducted aiming to scope the research history of the social alarm in use from a user perspective. Furthermore, a combination of participant observations, 22 in-depth interviews and a study of documents related to the use of the social alarm were conducted within the home care service in two municipalities in Norway. Consequently, the thesis is based on descriptive and explorative qualitative designs. The empirical data were analysed using a stepwise, deductive, inductive method.

Through empirical analysis, the overall findings indicate the need to add theoretical tools for understanding these innovations. By utilising the metaphor of script and domestication from science and technology studies, this thesis contributes a theoretical framework for exploring the co-production of expectations and experiences related to

technology in use in caring practices. Thereby it further develops the understanding of the field of public service innovation within caring practices.

This thesis demonstrates empirically how people involved with the social alarm utilise the technology. The results describe complex and multiple caring practices with divergent results related to its use. This promotes an increased understanding of how even rather simple and well-established technologies are unpredictable and work differently in different contexts when interacting with different people.

The focus is directed to efforts to make it work and to enable older people to live independently and safely at home. The study also illustrates how technology innovations change the dynamics between the people involved, rearranging caring practices, and opening up for bricolages as an integrated part of established technology innovations.

# Sammendrag

Det overordnete målet for denne artikkelbaserte avhandlingen er å utvikle kunnskaps-grunnlaget for offentlig tjenesteinnovasjon som en måte å utforske og forstå teknologiske innovasjoner i kommunale omsorgstjenester. Ved dette å øke vår forståelse for kompleksiteten som modne teknologiske innovasjoner i bruk utgjør, gjennom å fokusere på interaksjonen mellom mennesker og teknologi.

Offentlige dokumenter fremmer økt bruk av velferdsteknologi i de kommunale omsorgstjenestene som en viktig løsning på det stadig økte presset mot kommunale helse og omsorgstjenester. Dette presset skyldes den demografiske utviklingen med en stadig økning i andelen eldre i befolkningen. Samtidig er det en endring i omsorgs-sektoren med økt fokus på at folk skal få leve selvstendige liv og bli boende lengre i egne hjem selv med et stort hjelpebehov.

Satsningen på velferdsteknologi har vist seg å være vanskeligere enn forventet og mange prosjekter overlever ikke pilotfasen. Det gjøres mye følgeforskning til disse prosjektene, men denne fanger ikke opp de innovasjonene som lykkes og integreres i praksis over tid. For å få innsikt i disse trenger vi kunnskap om de kompliserte og varierende praksisene de velferdsteknologiske innovasjonene inngår i, og samhandlingen mellom teknologi og menneske.

Denne avhandlingen videreutvikler konseptet fra offentlig tjenesteinnovasjon om at all tjeneste samskapes mellom deltagerne i tjenesten ved å fokusere på omsorgstjenesten på et mikronivå. Avhandlingen bidrar til en økt innsikt i denne samskapingen ved å utnytte aspekter fra vitenskaps- og teknologistudier som teoretiske redskaper for å utforske tjenesteinnovasjon i offentlig sektor.

Avhandlingen bygger på en deskriptiv og eksplorativ kvalitativ design. En systematisk litteraturstudie av forskningen om trygghetsalarmen, bidrar til en oversikt over tidligere forskning knyttet til trygghetsalarmen i bruk siden denne ble lansert. Videre ble det gjennomført en empirisk studie fra omsorgstjenesten i to ulike kommuner i Norge. Datainnsamlingen besto av deltagende observasjon, 22 dybdeintervjuer med ulike aktører involvert i bruk av trygghetsalarmen samt en litteraturgjennomgang av skriftlig materiale fra de to kommunene. Det empiriske datamaterialet ble analysert ved hjelp av en stegvis deduktiv-induktiv dataanalyse.

Ved å nyttiggjøre seg av begrepene skript og domestisering fra vitenskaps- og teknologi-studier bidrar avhandlingen med teoretisk rammeverk for å forstå samskapingen knyttet til forventninger og erfaringer med trygghetsalarmen i bruk i omsorgspraksiser.

Avhandlingen viser videre hvordan personer involvert med trygghetsalarmen utnytter

teknologien og optimaliserer praksis ved hjelp av samproduksjon og bricolager for å kunne leve uavhengig og trygt i eget hjem.

Samlet søker avhandlingen å bidra til kunnskapsutvikling relatert til teknologibruk i omsorgspraksiser og åpner opp for en økt forståelse av hvordan selv ganske enkle og veletablerte teknologier inngår i komplekse omsorgspraksiser med store variasjoner. I ulike kontekster, med ulike aktører fører dette til temming og hemming av både teknologi og mennesker. Velferdsteknologi inngår i nettverk av relasjoner som bidrar til å endre dynamikken mellom aktørene i tjenesten, skaper nye omsorgspraksiser og åpner opp for bricolager som en integrert del av tjenesten. Dermed kan ikke trygghetsalarmen bli forstått som 'ferdig' implementert og som en forutsigbar gjenstand med predikert effekt.

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Paper 2: Stokke Randi: "*Maybe we should talk about it anyway*": a qualitative study of understanding expectations and use of an established technology innovation in caring practices.* BMC Health Services Research 2017, 17(1):657.
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# 1. Introduction

## 1.1   My personal inspirations

The relationship between human beings and technology has always puzzled me. Surrounded by high tech medical equipment as a young registered nurse working in the hospital intensive care unit, technological innovations were never few and far between. Later as an assistant professor working with bachelor students in radiography and nursing, I reflected a great deal on how we all relate differently to technology and how it changes our surroundings and ourselves. When the possibility of doing a PhD in service innovation within the community care sector came along, I seized this exciting opportunity to explore and study in-depth technology innovations in caring practices within public services.

When looking for relevant empirical cases for my PhD, I was faced with the difficulties and challenges in community care practices when dealing with technology innovations. Although there were many projects out there, they were often small, delayed for different reasons, and seldom incorporated into regular service. This discovery puzzled me, and I wanted to explore more.

To explore in depth what really goes on in these caring practices when technologies are used, I chose to focus on and examine an established and successful technology innovation in use in caring practices. The objective was to extend the knowledge base of the interaction between human and technology in caring practices to provide insights into how public services are co-produced. This focused my attention on what technologies were already out there. I eventually decided to focus on the social alarm; a well-established, widely used technology integrated into caring practices. Focusing on and exploring the use of this particular technology opens up for a thorough investigation of the social alarm as one example of how technology in use is applied in caring practices.

Later in the introduction, I will present the point of departure, providing an overview of the political and demographic background and challenges related to technology innovations in caring practices. Later the research purpose and questions will be presented and finally the structure of the thesis.

## 1.2   Point of departure

*'The community healthcare service has had more pilots in this area than SAS and Norwegian airlines combined. It is time for technology in caring practices to become the norm, providing better health and care services for the end users,' says Høie (Quote from Bent Høie, the Minister of Health and Care Services in Norway, in Aftenposten January 28. 2017).*

The quote above from the Norwegian Minister of Health and Care Services, Bent Høie, speaking on behalf of the Norwegian government, provides an illustration of the expectations politicians have towards the ability of Norwegian municipalities to implement technology innovations, and their impatience with the lack of results. In an interview with Norway's largest newspaper, the Minister expressed frustration over the municipalities' failure to utilise technology innovations in caring practices. So where does this political interest for technology innovations in caring practices come from? Further, what does this lead to?

### 1.2.1   The welfare state and demographic changes

The last decades have seen great changes in society. Most western societies are facing what is sometimes described as a "silver tsunami", with demographic changes due to prolonged living expectations and the post-war baby boom. This will result in the proportion of elderly people rising significantly, especially from the year 2020 and beyond (Tarricone & Tsouros, 2008; WHO, 2012). In addition, there is an increased policy focus on independent living, avoiding nursing home admissions, active ageing and a focus on older people maintaining their quality of life and contributing to society (Boudiny, 2013; Foster & Walker, 2013). Changes in family structures and cultural mobility leading to family members living far apart add to the picture (WHO, 2015). This demographic development is described in policy documents and research as inherently challenging and problematic (Neven & Peine, 2017) as it is expected to lead to an increased need for caring services. Consequently, staffing needs for healthcare professionals will increase dramatically over the next 50 years if we do not change the current patterns and trends. At the same time, it is anticipated that there will be fewer care workers due to demographic changes with smaller birth cohorts (Huber, Rodrigues, Hoffmann, Gąsior, & Marin, 2009).

For these reasons, there is a growing pressure on municipalities. In Norway, which forms the empirical base for this thesis, healthcare services are now the municipalities' largest cost area. Norway has a highly developed public care service (Mørk, 2015; Statistisk sentralbyrå, 2013; Vetvik & Disch, 2013). So how is society facing this challenge? Focusing on innovations is one suggested solution.

There is currently a trend towards governmental decentralisation. This means that the government are the policy-making authorities while the realisation of innovations and services is decentralised to the municipal level, for example. In this way, national governments can initiate innovation-processes through policy documents, regulations and funding, and the local government, who are closer to the citizens, are in charge of initiating, developing and activating the innovation processes. (Kjær, 2004). Benington & Moore (2011b) illustrate the government's different responsibilities in this way:

> *The role of government in society is not just as a rule-setter, service provi-*
> *der and social safety net, but potentially as a creator of public value and*
> *a pro-active shaper of the public sphere (politically, economically, socially*
> *and culturally) (Bennington & Moore, 2011b, p.3).*

Politicians are concerned with innovations because they are viewed as a necessity for prosperity and progress in society (Lundvall, 2013). At the same time, there might be many reasons for politicians to be cautious regarding innovations in the public sector as they are responsible in the case of failure (Hartley, 2005). This contributes to rather slow processes, and there is indeed an increased demand from both politicians and public administrations to emphasise more efficient service to the public (Fuglsang & Sundbo, 2016).

Through a series of white papers and green papers, the Norwegian government has pointed to a need for changes and innovations in community care services as an answer to the perceived challenges (Ministry of Health and Care Services, 2013; Ministry of Health and Care Services, 2009; NOU 2011:11, 2011; Ramm, 2013). This leads to what might be described as a discourse on ageing and innovation that identifies demographic changes as a crisis for society and launches innovations as the answer.

One major focus of policy in developed countries within this discourse is the increased use of technology in caring services. The white paper, Future Care (Ministry of Health and Care Services, 2013), describes how it is a government priority to put in place more technology innovations in care services. Technology innovation in the public sector is closely related to changes in services. In fact, policy documents in Norway claim that service innovation and changes in organisation and practice are a necessity, and a partial goal in the implementation of technology in services (Helsedirektoratet, 2012; Ministry of Health and Care Services, 2013; NOU 2011:11, 2011). Hence, the focus is not only on possibly solving the described challenges by means of technology innovations but also by service and organisational innovations in the municipality caring services that result from this. Underlying this focus is a demand for sustainable caring services. Future caring services need to change to be able to provide sustainable services to the population.

The perceived pressure on municipal health care services both motivates and represents a demand for technology innovations in community care services. Without innovation and change in services, the ever-increasing demands for efficiency will increase the burdens in an environment that is already struggling (Fuglsang & Rønning, 2014).

### 1.2.2   Technology innovation in municipality caring services

Technology innovations are regarded as of key importance in meeting the pressure on community care, as illustrated in the quote above from the Minister. The quote also represents a major concern shared by other policymakers that a vast majority of these technology innovations fail to result in a sustainable integration in service (Essén & Lindblad, 2013).

Policymakers and advocates of technology innovation often describe technologies in caring practices as "plug and play" solutions, giving expectations of providing help effectively, facilitating active ageing and autonomy, and reducing costs for the care service. The technologies are expected to provide ways for frail older people to stay at home, avoiding or postponing nursing home admission. The quote from Minister of Health at the start of this chapter is representative of this view. As described above, many pilot projects have been conducted in the municipal caring services with various forms of technology. The experience so far has shown that despite promising results in several projects, integrating technologies in regular caring practices has proven more difficult than expected, and many projects never pass the pilot stage and are not integrated into regular use (Andreassen, Kjekshus, & Tjora, 2015; Essén & Lindblad, 2013; Halford, Lotherington, Obstfelder, & Dyb, 2010).

There seems to be a gap between anticipated and actual practice, as the use of technology in caring practices tends to be more complex than such promises suggest (Procter et al., 2016; Sánchez-Criado, López, Roberts, & Domènech, 2014). It is vital to acknowledge the complexity of technology practices (Berge, 2016; Greenhalgh et al., 2015; Stokke, 2016), as I will describe later. Moving away from a rather naïve technological determinism where technologies are simply viewed as "plug and play" devices might provide a more accurate view of practice.

By shifting focus, we can think differently about technologies in caring practices. Technology may be viewed as a 'black box' implemented into practice. 'Black box' in this context means that the technological artefact is no longer questioned, but considered "closed (Fuglsang, 2013; Layton, 1977; Pinch & Bijker, 2012; Whitley, 1970). However, this thesis acknowledges technologies as socio-technical practices emerging as integrated parts of the caring service. Studying how different people interact with the social alarm offers a way of exploring this. What comes into play to make the technology work and

contribute to safety and independent living, which are the expressed aims for this particular technology? Understanding the complex interactions that take place enables us to meet new technology innovations and their complexity.

There is a huge number of studies on the effects of technology in caring practices. In general, these follow technology pilots looking for drivers of and barriers to technology innovations in caring practices (Pols, 2010, 2017; Pols & Willems, 2011). That research, however, does not capture when the technology innovations become integrated and used in regular caring practices. To understand what I choose to call "established innovations" we need a knowledge base consisting of the complex and diverse experiences of how technologies integrate into practices as well as an understanding of the interactions and relations with and between people involved. Studying existing technologies in use as ongoing activities embedded in everyday practice is one way of getting insights into these caring practices (Essén & Lindblad, 2013). Understanding how the users perceive and experience technologies is one of the key factors for success in the adoption of technology innovations (Sundbo & Toivonen, 2011). This study seeks to increase understanding of how people relate to established technological innovations and each other, thereby contributing towards a more comprehensive understanding of these "workings" in caring practices. This offers an excellent opportunity to explore the extended relations between the technology and the human actors involved. I will do so by using the social alarm as the empirical case. Furthermore, the social alarm will be introduced to provide an empirical example of technology as part of caring practices. Here the social alarm will be presented more thoroughly than the article format opens up for.

### 1.2.3   The social alarm

> *Technology design, then, is not so much a one-off occurrence, but rather a gradual process to which a broad range of societal actors contribute over time (Peine & Neven, 2011, p. 132).*

Despite the wide range of technology innovations, the social alarm still forms the bulk of technology solutions in use in caring practices in western societies (Heinbüchner, Hautzinger, Becker, & Pfeiffer, 2010; Procter et al., 2016). The social alarm as a technological innovation was launched in the late 1970s and has proved sustainable over time. It is the most common technological solution in use in caring practices and is spread throughout most western societies (Heinbüchner et al., 2010; Tinker, 1993). For example, there are approximately one million users of the social alarm in the UK (Fisk, 2003) 350 000 users in Germany (Heinbüchner et al., 2010) and 74 000 users in Norway (Mørk, 2015), where the empirical data for this thesis have been acquired.

The aim of the social alarm is to increase safety and independent living by enabling the

user to get help when in need, in a cost-effective manner (Fallis, Silverthorne, Franklin, & McClement, 2007; Gabrielsen, 2011). The social alarm is described as suited for dependent people living alone who need to call for help when feeling unsafe, or in need of medical assistance.

As indicated in the quote above, technologies often develop over time because of the interaction with different actors among other things. The social alarm is a technological device integrated into a service, embodying what might be described as three generations of alarm devices due to technical development, although most characteristics have remained unchanged. The first generation alarm device had a unit placed centrally in the home, with a switch or a pull cord to use in an emergency. The alarm went over the radio network to a receiver. The second generation has, in addition, a pendant, a necklace/ wristband with a button that the user can press when in need. This allows open communication between the user and a dedicated responder through the main unit, enabling the responder to effect a proper response. The range of the pendant is normally inside the home and partly outside in the garden and driveway. The third and newest generation of the social alarm has, in addition, the potential to incorporate a range of devices, e.g. automatic fall alarms, fire alarms, blood pressure device etc. (Fisk, 2003; Sugarhood, Wherton, Procter, Hinder, & Greenhalgh, 2013), thus providing remote care (Pritchard & Brittain, 2015). Implementation of additional alarms and other devices and services has proven difficult and is done on a much smaller scale than expected, as with other technologies in caring practices.



*Picture 1 The social alarm*

The second and third generations of the social alarm are mainly in use today. They operate either on the public telephone network, mobile network or broadband/fibre network (Boström, Kjellström, Malmberg, & Björklund, 2011; Fisk, 2003; Melander-Wikman, Fältholm, & Gard, 2008; Roush, Teasdale, Murphy, & Kirk, 1995).

The social alarm is often described as the foundation for further safety and monitoring technology and is often the starting point for additional alarms and applications. In fact, the Norwegian government suggested in the green paper Innovation in the Care Services (NOU 2011:11, 2011), that the social alarm provides the foundation for smart home technology innovations in home care services.

The social alarm is not a statutory service in Norway, but the service is included in most municipalities. Every third care recipient in Norwegian municipalities has a social alarm (Mørk, 2015). In Norway, the municipalities mainly organise the social alarm as an integrated part of the home care services. It is possible for people to buy a social alarm privately and connect it to private recipients, but in general, a person in need applies to the community care service for a social alarm.

As the social alarm is integrated into caring practices, there are many different actors involved in the use. The end user is the person obtaining the alarm in their home. This person is usually older, dependent and frail. The typical user is more than 80 years, widowed and living alone, and the social alarm is often one of the first long-term aid services offered in community care services (Mørk, 2015; Pekkarinen & Melkas, 2010; Stokke, 2016). Other actors involved are related either to the end user or to the organisation of the service. Relatives, neighbours, friends, home care workers, telecare facilitators, municipality care managers and alarm call centre employees are all users of the social alarm but have different experiences, roles, meanings, and relationships with each other and the technology. Indeed, the home care organisation as a whole is an actor offering and using the social alarm as a tool for providing safety and independence for frail and dependent inhabitants. The social alarm serves as a link for possible contact between the end user and the caring service.

The economic organisation of the care service in Norway, as for many other countries, makes it economically beneficial for the municipalities to help people in their own homes (Holmøy, 2016). This has led the municipalities to organise different kinds of living arrangements, where the residents are dependent and frail and in need of care and monitoring. These living arrangements are very much like nursing homes, but they are home-based, and the service is provided by the home care service. These living arrangements are often called care flats or residential facilities. The care flats are described as the resident's home. However, many participants in this study described how they saw the care flat as somewhere they had to live because they could no longer manage to live in their original home. The home was often described as the place they lived before they had to move to a care flat. There were no organisational differences when it came to the living arrangements as to how the social alarm was supposed to be utilised. However, as described in paper 2, the living arrangements played a role in how the social alarm was utilised in the municipality.

The phenomenon that the social alarm device represents can only be understood, analysed, and make sense when seen in relation to the social alarm as a service, as the alarm is always integrated into some form of care service.

The organisation of the social alarm service varies, from private arrangements where

the alarm goes to a nominated contact (often a middle-aged daughter) to the small or large public or private call centres answering and effecting proper response (Fisk, 2003; Melander-Wikman et al., 2008; Stokke, 2016). In Norway, the alarm call usually goes either to a call centre or directly to a municipal home care worker responsible for receiving alarm calls.

Regardless of the organisation, the home care workers often provide the service needed when the alarm is activated. Normally this is integrated into their regular work of visiting patients in their homes. As it is impossible to predict when the alarm will be activated, the home care worker might be anywhere in the home care district at the time the alarm is activated. The response time for the activated alarm until the care worker is present in the home, might, therefore, vary from immediate response to a wait of several hours. This depends on the number of care workers available, whether they are assisting other patients, the municipality's geography, and the geographical location of the care worker at the time of the alarm activation.

The social alarm service system is complex, as it is integrated into a variety of contexts and services in the municipality (Pols, 2010), and its organisation and use are part of integrated caring practices with multiple actors.

Different terms are used for the alarm system as described and discussed in paper 1. In paper 1, the term Personal Emergency Response System (PERS) is used since this review summarises the research in the field, and the PERS was internationally the most used term in this review. In this thesis (other than in paper 1), I have chosen to use the term 'social alarm' since the term, more than the PERS, is aligned with the Norwegian term "trygghetsalarm", and thereby represents the purpose of how the alarm is used in Norway. The term 'safety alarm', which would be a direct translation, is normally used for describing burglar alarms and is therefore not used in this context.

The name of a technology often expresses its purpose. The term 'social alarm' indicates that the alarm is there for the user's safety and therefore might include help with social issues. The PERS as a term indicates that the alarm is for emergency use only. These differences might also reflect the diversity of calls designated as false alarms.

## 1.3   Research purpose, positioning and contribution

The overall aim of this thesis is to explore and reveal what happens in the relations and interactions with an established technology innovation in use in caring practices. This includes how different people in the home care services involved in the use of the social alarm integrate the technology as part of their daily living and how the integrated technology affects the interaction between them, the service, and the technology. A further objective is to contribute theoretically to the field of public service innovation by

understanding established technology innovation in use. This by providing frameworks for exploring the interaction between people and technology in caring practices.

This research aim and purpose are operationalised through the following three research questions:

1) What can previous research related to the social alarm in use tell us about this technology when integrated into caring practices and the research stream following this?

2) What are the expectations towards the social alarm, and how can exploring those help us to understand different actors' interpretation, integration and utilisation of technology in home care services?

3) How do older people pursue, maintain and negotiate independence and safety in everyday life by utilising the social alarm?

Three appended research papers based on two empirical studies explore the aim and purpose of the thesis and the three research questions presented above.

### 1.3.1 Interdisciplinary fields

The study of technology, its shaping and use stem from different interdisciplinary academic disciplines (Bijker & Hughes, 2012). According to Bhupatiraju, Nomaler, Triulzi, and Verspagen (2012), three major adjacent fields are relevant for studying technology innovations in society; Science and Technology Studies (STS), Innovation Studies, and Entrepreneurship Studies. The focus in this thesis is on the interactions between actors involved with established technologies in caring practices, and entrepreneurship will not be in focus. Both innovation studies and STS are concerned with changes, social context (including economics) and usage of knowledge.

This thesis is mainly placed within public service innovation. Although this is the research tradition this thesis stems from, it is also placed within the intersection between public service innovation, STS and caring research. Even though innovation today is an established scientific field, it is valuable to hold on to the idea of utilising theoretical aspects from an adjacent field, and by this adding to the theoretical development.

This is in line with Nicolini's (2012) suggestion of using what he describes as the toolkit approach for studying social phenomena. This implies combining and switching between different sensitizing concepts and mobilising these aspects to contribute to a richer and more nuanced understanding of a social context. Hence, this thesis has an interdisciplinary ambition. By utilising concepts from STS to describe the public service innovation that takes place, I will be combining these scientific modes to contribute

in different ways to different fields. Already, both STS and innovation studies have a high degree of interdisciplinarity (Fagerberg, Fosaas, & Sapprasert, 2012), drawing from various disciplines and backgrounds. Both fields focus on how society is structured, the processes that occur and how evolvement takes place (Fagerberg, Landström, & Martin, 2012; Lundvall, 2013).

As a registered nurse, it is natural for me to focus my attention on the micro level and the interaction between people and technology. My impression is that within public service innovation, little attention has been paid to the social constructs in the micro context in which technology practices actually take place. Moreover, care research is rather sparse in describing challenges related to service innovations. By combining aspects from STS (particularly from the caring research area) and public service innovation, I aim to provide a framework to conceptualise technology innovations in caring practices. Light needs to be shed on what really goes on within these practices to increase our understanding of the integration and use of technology innovations in caring practices.

The thesis thus utilises the opportunity for learning across disciplines. However, the interdisciplinary position might be problematic as it is challenging to combine different fields and to get an overview of significant contributions to these fields. Indeed, both Service Innovation and STS are major interdisciplinary fields on their own, and combining aspects from them without cutting corners and treating the theories superficially is challenging. However, drawing from different fields also provides the possibility to utilise different aspects and tools to analyse and explain what really happens when established technologies are used in caring practices.

I will further present the contributions I aim to achieve both empirically and theoretically through answering the research questions presented above, and showing how this will contribute towards the research gap.

My thesis demonstrates empirically how people involved with the social alarm utilise the technology and what work they do to make it work for them. More specifically, the thesis:

- Contributes empirically by illustrating how established technologies, expected to be "plug and play", are actually complex realities integrated as part of caring practices, and by showing how technologies integrated into care always change caring practices.
- Exposes an in-depth understanding of different actors' expectations, experience and adaption of the social alarm. Thus, it further provides a comprehensive picture of the work that makes the social alarm function and thereby contributes to safety and independent living.

Further, the thesis contributes theoretically by:

- Providing an overview of the research knowledge base of the social alarm, an established technology innovation in use in caring practices.

- Expanding the knowledge base of how caring services are co-produced between the people involved in the service. This will illustrate how it is fruitful to draw from the two scientific fields and combine aspects from them to provide a theoretical framework for exploring technology innovations in use in caring practices.

- Contributing to the field of public service innovation by exploring how approaches from public service innovation and STS can be brought together to inform new theorising of technology innovations in use in caring practices. This will then address the research gap in understanding co-production on a micro level of public service innovation.

- Contributing to the field of caring research and public service innovation by providing a framework for increasing our insights into established technologies in use in caring practices. Consequently, new and fruitful ways of exploring co-production of caring practices are created.

As indicated above, this thesis aims to contribute to different fields in different ways. The thesis contributes to the care field by contributing empirically and with theoretical tools to focus on and explore established technology innovations in the field. Further, it contributes to the field of public service innovations by providing an empirical study and adding theoretical tools from STS to explore the co-production that goes on when using technology innovations in caring practices. In addition, the thesis aims to show how combining STS and the innovations field opens up for interdisciplinary and learning across disciplines. STS and innovation studies enrich one another by combining a critical perspective through STS and a more management-oriented perspective from innovation studies.

## 1.4 The structure of the thesis

The thesis is structured into two major sections. Section 1 consists of six chapters. Chapter 1 sets the scene, introduces the background, and describes the context and settings. The purpose of the thesis is presented along with the research questions and main contributions.

Chapter 2 presents the theoretical framing and focuses more specifically on the theoretical tools that are utilised in this thesis. The article form leaves little room for in-depth descriptions of the scientific point of departure and theoretical anchor. I, therefore, utilise the opportunity to elaborate on the theoretical foundation in this chapter. Here

I illustrate how innovations studies and STS are related, adjacent scientific fields that might complement each other, providing theoretical tools. I briefly describe the relationship between innovation studies and STS, before anchoring the thesis in the field of public service innovation and explore how it is relevant to utilise aspects of STS as theoretical tools when studying technology innovations in caring practices on a micro level. Furthermore, different theoretical concepts from STS that are utilised in this thesis are presented.

Chapter 3 gives an account of how the scientific point of view of the thesis reflects methodological research design, choices and reflections. This chapter presents and reflects upon the empirical data that form the basis for this thesis. Here I reflect on my role as researcher and choices made during the work.

Chapter 4 provides an outline of the three papers included in this thesis. The papers are not described in detail, as the papers are included in Part 2. However, an overview is presented to provide a link between this part of the thesis and the papers.

Chapter 5 synthesises and discusses the overall contribution of the thesis, based on the theoretical framing and the empirical results from the papers included. Practical implications will also be discussed.

Chapter 6 briefly draws the main conclusions and presents the overall scientific contributions as well as suggesting further research.

Section 2 includes the three included papers as well as appendixes.

# 2. Theoretical framework

This chapter presents the theoretical framing of the thesis. Before I give a brief description of the origin of studying innovations, I will start with a short description of the relationship between STS and innovation studies. Since this thesis utilises concepts from STS as sensitising tools, it is relevant to briefly elaborate on STS as a scientific field. I also provide a short historical background of today's public service innovation to frame the thesis theoretically. How innovation is understood in this thesis is explained, providing an account of how we can understand technology innovation in caring practices theoretically. Since the focus is on the micro level of service, and public service innovations mainly address the policy and organisational level of innovation, I will describe how I turn to aspects of STS and STS-inspired literature on studies of care. The script, domestication and heuristics metaphor thus provide relevant tools, as described later. One might say that public service innovation frames and provides concepts and goals while STS provides concepts for exploring these frames, concepts and goals in depth in this thesis.

## 2.1  The scientific fields utilised in this thesis

New scientific fields evolve as a response to problems in time and the resulting needs for new knowledge. In the beginning and middle of the twentieth century, science was growing rapidly along with intense technological and social development (Nydal, 2002). During this period, technical innovations provided important changes to people's lives. One can only imagine what things like electricity, the water closet, or the washing machine meant for people's quality of life. In this period, there was a significant growth in scientific and technological optimism (Asdal, Brenna, & Moser, 2001, 2001; Nydal, 2002), and social sciences started to take an interest in technology. Most social alarm users today grew up during this period and have experienced this technological development as part of their lives. The technological revolution made the world as we knew it, change.

Innovation studies and STS mainly emerged after the Second World War, and on a significant scale from the 1960s. Fagerberg, Landström et al. (2012) found that they are thematically related, have a lot in common and are inspired by many of the same existing theories. Even so, these are distinct research fields with little interaction between them (Bhupatiraju et al., 2012; Fagerberg, Landström et al., 2012; Hyysalo & Usenyuk, 2015; Lundvall, 2013).

While innovation research has developed through major shifts in attention, from macro-economics and industrial dynamics towards management and business, to including also services and public sector, STS had a more linear development in the beginning and an earlier maturity (Bhupatiraju et al., 2012; Fagerberg, Fosaas et al., 2012). According to Nydal (2002) and Sismondo (2010), STS was inspired by Kuhn`s description of the significance of controversies based on paradigms described in his famous book "The structure of scientific revolutions" (Kuhn, 1996). However, because of an interdisciplinary background, STS is both innovative and diverse (Sismondo, 2010), and STS today seems to be more fragmented into different "Schools"[1], than the innovation research field (Bhupatiraju et al., 2012).

Both STS and innovation studies focus on the analysis of the role of technology and science in society and economic development (Lundvall, 2013). However, according to Fagerberg, Landström et al. (2012) the major difference between innovation studies and STS is that while innovation researchers tend to focus on the management or organisational level, STS focuses more critically on the different sides of technology in use (Fagerberg, Fosaas et al., 2012; Lundvall, 2013) as described later. STS researchers study technology and science as constructed practices, which represents a break with the assumption that knowledge is determined by nature. Instead, knowledge is seen as evolved and socially embedded (Bijker & Hughes, 2012; Asdal et al., 2001; Sismondo, 2010).

Therefore, STS contributes fruitfully by providing concepts for exploring the micro level of service innovations involving technology in use. STS sees the use of technology as socio-material phenomena, and focuses on the "seamless web of technology and society" where technology is seen not only as a subject for society but also as an integrated part of society, and there is a move away from technological determinism (Bijker & Hughes, 2012; Fuglsang, 2001, 2013). The seamless web refers to the integration between actors in often loose networks. I conclude from this that when studying the technology integrated into caring practices, the focus is neither purely on technology as an artefact or on the service, but rather on the relations between participants: technology, society, politics etc. This constitutes a unique scientific paradigm in the study of innovation, focusing on socio-technologies and thereby making a contribution to the study of innovation (Van Oost, Verhaegh, & Oudshoorn, 2009). I rest on Law (2006), in his argument that the point is to stress the artefacts role within the network and by that enabling analytical focus on the interactions.

Theories of innovations mostly relate back to Schumpeter (1888–1950) and his theory

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1    Some examples of STS approaches and central contributors; radical constructivism (Latour), feminism (Haraway, Harding), ANT (Callon, Latour, Law), SCOT (Bijker and Pinch). The two latter were also known for introducing the seamless web together with Huges (Bijker & Hughes, 2012; Asdal, Brenna, & Moser, 2001).

of economic development and growth, which emphasised entrepreneurship as essential in innovations (Schumpeter & Poulsson, 2017; Sundbo & Fuglsang, 2002). According to Schumpeter, innovation can be understood as new ways of manufacturing, introducing, and using new products or services. It can be the diffusion of an innovation into a new and different market, or a new organisation (Rønning, Knutagård, Heule, & Swärd, 2013; Schumpeter, 1934).

After World War II, innovations were mostly related to R&D departments and were viewed as something that took place in laboratories (Fagerberg, Martin, & Andersen, 2013; Sundbo & Fuglsang, 2002).

At the same time, STS emerged especially as a reaction to how science and technology had been used during and after the Second World War (Mol, Moser, & Pols, 2010; Thygesen, 2009). Critical voices started to make themselves heard. Radical academics searched for a systematic way of exploring social science and the philosophy of science (Nydal, 2002). STS sees "epistemic, technological and social orders as co-produced" (Felt, Fouché, Miller, & Smith-Doerr, 2016, p. 1). Science could no longer be neutral but was rather seen as culturally embedded in society, in social and economic interests. There was both a critical and optimistic atmosphere, and science and technology were seen as important for change and prosperity (Fuglsang, 2001).

During the 1960s, a multidisciplinary research focus on innovation emerged, focusing both on science and innovation in industry and the diffusion of innovations. In this period, innovation studies mainly focused on the innovation of goods in the private sector and large manufacturing companies. This has changed during the last decades, giving us a broader view of innovation that acknowledges that innovation also takes place within services, in the public sector and between private and public sectors (Fuglsang & Sørensen, 2010; Lundvall, 2013). A more systematic understanding of innovation as a field emerged, especially around the 1980`s (Fagerberg, Fosaas et al., 2013), and since the 1990s, we have seen a rapidly increasing interest and research focus on innovation in services (Toivonen, 2010).

Especially during the early 90`s, both STS and innovation research changed in nature. Innovation research changed from having a major focus on economic studies and product innovation to an increased focus on service innovation which includes innovation in the public sector (Hartley, 2005; Lundvall, 2013). STS had increased focus on processes rather than disciplinary perspectives on science (Fagerberg, Landström et al., 2012). I will now focus on the field of innovation and return to STS when presenting the different concepts that are utilised within this thesis.

## 2.2   Innovation

A definition of innovation usually describes this as a new service or product implemented into practice, that is possible to repeat and which represents a significant change (Fuglsang, 2010; Fuglsang & Sørensen, 2010; Hartley, 2005, 2014). Rogers' (2003) widely used definition states that: "An innovation is an idea, practice, or object that is perceived as new by an individual or another unit of adoption. It matters little, so far as human behaviour is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery" (Rogers, 2003, p. 12). Greenhalgh, et al. (2004) amplify this in a review for the National Health Service in England by suggesting that an innovation should be "perceived as new by a proportion of key stakeholders" (p. 40).

On this basis I conclude that a relevant way of understanding innovations is that we are talking about a product or a service, or both, implemented into practice, which is possible to repeat, representing a significant change to practice for some actors involved. However, the borders for what qualifies as an innovation and for how long are still rather blurred. I previously presented the social alarm as an established technology innovation. Whether the social alarm can still be called an innovation, is a subject for discussion. However, this will be elaborated through this thesis. Innovation researcher Jean Hartley (2005) distinguishes between different types of innovation, for example, product innovation, service innovation and process innovations. From the above, we can infer that innovations are both goods and services and represent both an outcome and a process.

As mentioned earlier, the social alarm was an important technological product innovation in caring practices from the late 70s. The social alarm made it possible for dependent people living alone to press a button and get help when in need, enabling them to live independently at home and thus representing a radical innovation. The social alarm has since then changed and developed several times. Consequently, the social alarm is an example of product innovation.

The social alarm has a huge impact on how the home care service was and is organised, as it allows care workers to care for the patient at a distance. Integrating the social alarm into a caring service often provides completely new ways of organising services to users of the alarm, representing service innovation.

The whole service organisation of the social alarm changes in some municipalities when digitalisation of the social alarm takes place. For example, reorganising the service and including municipal technological departments in the healthcare practice, thus creating a more robust service, may be regarded as a process innovation. Consequently, this provides new ways of designing organisational processes.

Distinguishing between different types of innovations in this manner might provide fruitful ways of theoretically exploring what kinds of innovation are taking place. However, the distinction often made between service and goods innovation is probably less clear and helpful in the context of caring services since a large part of the innovations comprise both products and services (Greenhalgh, Robert, Bate, et al., 2004) as is the case with the social alarm. As shown by the examples above, the field is further complicated by the fact that often there are several types of innovations going on at the same time at different levels of organisation and society.

## 2.2.1   Service innovation

When the social alarm is integrated into caring services, the service innovation literature provides a fruitful way of understanding the innovations in services that emerge. Service innovation addresses how technological solutions or products might lead to new ways of delivering services (Hartley, 2005; Rønning et al., 2013).

Service innovations have many of the same characteristics as innovations in goods. Within the innovation literature, the focus is on how the innovations are integrated into a practice (Gallouj, 2002). Innovation in services also tends to be more "tailor-made" and adjusted to the individual client compared with innovations in goods, and often stems from user problems and needs, or is even user-driven.

Recent service innovation research is increasingly recognising the user's role in service innovations (Fuglsang & Sundbo, 2016), as addressed further in this synopsis. The process of service innovation also tends to be more complicated than we find within product innovations since service innovations often tend to be complex and unsystematic (Fuglsang & Sundbo, 2016). Service innovations take place in both the private and public sector. The social alarm is integrated into public services, and I will further elaborate on the emergence of the public service innovation field, providing an overview of public service innovation related to this thesis.

## 2.2.2   From private to public innovation

Innovations in public services have mainly been concerned with how the service is organised and managed or with the relationship between the different actors involved with the service on an organisational and administrative level. However, this field is in a process of growth (Fuglsang & Sundbo, 2016; Hartley, 2005), and my thesis aims to develop it further by focusing on the micro level of public service innovations.

The public sector is regulated and steered by government policy and the rules of democracy (Fuglsang & Rønning, 2014) with different and more complicated working mechanisms than the private sector. Public innovations are embedded in the complex

reality of society. Consequently, aims for the service are multiple and sometimes conflicting, aiming to provide benefits for individuals as well as public value (Hartley, 2005; Hartley & Rashman, 2007). This contrasts with private innovation, which is usually motivated by economic gain, as pointed out by Schumpeter (Schumpeter & Poulsson, 2017).

It is also worth noting that innovation tends to be linked to improvement and success. However, from a research point of view, it is important to provide a more nuanced view. An innovation might or might not lead to improvement (Hartley, 2005), and even when leading to improvement, we must always ask: "For whom is this an improvement?" This is especially relevant in public innovations, as one core element of public services is that there tend to be fluctuating and conflicting interests. One example might be an automatic medicine dispenser that made it possible for patients with cognitive impairment living at home, to get their medicine automatically. As a result, the home care nurse would no longer have to visit the patient twice a day. This would be an improvement for patients wanting to be independent of the visits from the home care nurses, and it would free time for the nurses to other tasks. However, it would not be an improvement for those who might now become lonelier as the visits from the nurse were an important social arena. It might also cause the nurses distress since they could no longer ensure that their patients were doing well.

Another major difference between private and public innovations is that innovations in the private sector are usually driven by competitive advantages, and innovations must be protected for business purposes. The public sector, on the other hand, aims to spread innovations for the public good in order to improve public value (Hartley, 2005; Hartley & Rashman, 2007). This is described as including the adoption and diffusion of innovations to other contexts, which often characterises public sector.

In addition to the theories of innovation, public service innovation draws on different and theoretical traditions and disciplines (Fuglsang, 2010) such as:

- Public Administration Theory, focusing especially on policy and organisations and efficiency and productivity (Niskanen, 1994).
- New Institutionalism, focusing on organisational changes (Røvik, 1998).
- Competition State, focusing on how growing competition is being transformed from the welfare state (Cerny, 2008).
- Social and Public Entrepreneurship that focuses on the entrepreneur's role in innovation in the public sector (Garud, Hardy, & Maguire, 2007).

This list firstly points to how public service innovations are a multidisciplinary field that opens up for contributions from different theoretical disciplines contributing towards

innovation theory from different angles and perspectives. Secondly, there tends to be a major focus on the organisational and administrative level. By adding aspects from the STS field, this thesis contributes to bridging the research gap in understanding innovations on the micro level and is therefore relevant to developing the field further.

Newer public service innovation theories acknowledge that service innovations in the public sector are complex and that citizens are not only the recipients of an innovation but also co-producers of the goods and services. I will address how we can understand the service as co-produced in caring practices. Further, I will examine how aspects of STS can be utilised for unpacking the co-production in caring services.

### 2.2.3   Co-production of public services

The term co-production has been used within public service innovation since the 80s when it was developed within public administration by Ostrom and colleagues as a term describing how individuals other than the service provider contributes to input and thereby co-produce goods or services (Nabatchi, Sancino, & Sicilia, 2017; Ostrom, 1996). Since then, co-production is now a widely used term within many different areas and covers a variety of activities (Nabatchi et al., 2017).

Co-production is used in different ways and its many definitions have been criticised for being rather blurred and lacking an empirical evidence base (Nabatchi et al., 2017). Nabatchi et al (2017) describe co-production as "an umbrella concept that captures a wide variety of activities that can occur in any phase of the public service cycle and in which state actors and lay actors work together to produce benefits" (Nabatchi et al., 2017, p. 769). However, the distinction between state actors and civil actors does not appear to be clear-cut as the public service sector includes all sorts of actors with different roles and relationships in networks. In connection with the social alarm, we have a number of actors, like the end user, relatives, friends, neighbours, care workers, alarm centre workers, social workers, and paramedic personnel to name a few.

Public service innovation literature describes how a service organisation can only suggest a service; it is in the interaction between the service provider and the service user that the actual service is co-produced (Osborne, Radnor, & Strokosch, 2016). I concur with Osborne's (2016) description of a service as always co-produced by the different people involved in the service, in the interaction of both service providers and service users (Osborne et al., 2016; Osborne & Strokosch, 2013). This differs from Nabatchi et al. (2017) who draw on Brudney and England (1983) among others and who describe co-production as an activity that can occur when different actors work together. In this thesis, co-production is viewed as an inevitable part of the service. Public service innovation theory does not, however, include the technology in the analysis of co-production. I argue that to understand the co-production between the actors involved

with technology in use in caring practices, we cannot ignore the role of the technology in the co-production. For this, we need tools from STS as presented later.

It is in the intersection and interaction between the different actors involved in using the social alarm that the co-production takes place. The potential for further innovations lies within these interactions. The co-production can occur at any stage of a service, and often the different stages (design, delivery, assessment) all occur simultaneously (Nabatchi et al., 2017). Osborne et al. (2016) emphasise this by stating that the co-production always takes place both voluntarily and involuntarily. If we look at the social alarm as an example, different actors might be involved in co-producing e.g. the design of the alarm device. This might be before the launch of the product but may also occur through bricolages (as described later and in paper 3) after using the product or as an improvement during the assessment of the service. When the social alarm is integrated into the caring service, the use of the social alarm is always a result of the co-production between the different actors involved.

A co-production can lead to different kinds of value for the service user (Osborne et al., 2016; Skålén, Engen, Magnusson, Bergkvist, & Karlsson, 2016). In connection with the social alarm, examples might be the value of feeling safe, getting help if in need, and being able to live independently.

The term 'value' in public services is rather complex. In addition to the value that the different actors experience, public services are also responsible for suggesting a public value, a benefit for society as a whole. Sometimes these values coincide, however, sometimes they conflict (Alford, 2016). In relation to the social alarm, offering an alarm that allows for dependent and frail people to live independently suggests a public value. Caring for dependent people at home both meets policy demands and strategy and is economically beneficial to the municipality care service. For many end users, this coincides with their individual wish to stay at home. However, for those who want to live in a nursing home for different reasons, the public value may conflict with his or her needs, wishes and values.

The co-production might also lead to a destruction of value (Echeverri & Skålén, 2011; Osborne et al., 2016) and in the worst case, the integration of technology may fail. An example of this is if having the social alarm results in the end user staying inside and being passive because he/she is frightened that the alarm will not work outside, or stops wearing the pendant entirely. The value is co-produced by the different actors involved within the organisation and is assessed by the different actors. The experience of value is highly contextual and is directly influenced by the expectations towards a service (Osborne et al., 2016; Skålén, Gummerus, von Koskull, & Magnusson, 2015).

Public innovations tend to concern complex processes trying to solve 'wicked problems',

and addressing the fact that an innovation might be positive for some and negative for others at the same time (Benington & Moore, 2011b; Halford et al., 2010; Rittel & Webber, 1973; Weber & Khademian, 2008). It might even be positive and negative for the same person at the same time. Roberts (2000) describes 'wicked problems' that typically occur in the public sector as having the following characteristics:

- There is disagreement between the different actors regarding the nature of the problem. (This was repeatedly the case for the subject of this thesis. Often the care workers, the end users and their next of kin have quite a different description of the situation and the challenges in the caring situations. Often there is disagreement between the different actors regarding how to trust the technology, the range of the pendant, and the aim and purpose of the service, as described and illustrated in papers 1, 2 and 3).

- Because of this disagreement, the solution is "open-ended" and there is often a competition to identify the problem and thereby what solutions are preferred, and how to reach these goals.

- As framework conditions and resources from government and politicians are constantly changing, the process of arriving at solutions is increasingly complex. (One example of this is described in Jon's narrative in paper 3.)

- Interested parties come and go; they tend to communicate badly or too little; actors involved change their minds, or rules and agreements may change (in caring services there are many people involved in the care work, and care workers often have minor part-time positions and work in rotating shifts, adding to the complexity. In addition, the social alarm has been around for many years and is hardly the subject of communication and dialogue at all).

Community care services are loaded with these wicked problems. Innovations in the caring services are often complex processes working to find solutions to the wicked problems by involving competing interests (Fuglsang & Rønning, 2014; Halford et al., 2010). Simultaneously, as indicated in the introduction, without innovation in the municipal health service, ever-increasing demands for efficiency will increase the burdens in an environment that is already struggling with low resources and high demands (Fuglsang & Rønning, 2014). This pressure often takes the form of intersecting demands for higher quality, individual user customisation, prioritising individual groups, flexibility and increased efficiency.

## 2.3   Caring services

*Patient care is complex work. Decisions must be made about what should be done, by whom, how, when, where and with what materials, and the more elements involved in the process then the more complicated this becomes (Allen, 2014, p. 54).*

So far, I have dealt with care and caring practices, but I have not described what caring practices really entail. Care is a complex field that sets the arena for this thesis. Care deals with relations between people, and caring for and about someone is a fundamental part of our existence (Martinsen, 2003). In this context, caring is related to the interactions and relations between the different actors involved with the social alarm in use.

If we do not focus on and discuss the care, we are at risk of its being eroded. The economic pressure on the caring service as described in the introduction and the demands for change are antagonistic to the traditional warm descriptions of care relations on an individual level (Mol et al., 2010). However, care work on an individual level takes place within these constant pressures and changes, and is characterised by a practice in constant change and by constant and persistent adjustments to meet another person's needs.

Care work differs from other services in terms of the demand for a personal and binding relationship of responsibility and commitment between the actors involved. Often receivers of care are dependent, frail, and unable to care for themselves (Neumann, Olsvold, & Thagaard, 2016), and thereby dependent on their relationship with other actors in the care service. At the same time, most receivers of care are not just receivers. They are often actively engaged in their lives and situations by caring for themselves according to their ability (Mol et al., 2010) for example,  by wearing and using their social alarm. As described earlier, services are always co-produced between the people involved. Care services are characterised by the personal relations and direct contact between the caregiver and the person receiving care.

STS sees reality as constructed through language (Asdal et al., 2001; Strydom & Delanty, 2003). In all interactions, language makes a difference and constructs reality (Latour, 1999). Another aspect of language is that words have value, and are never neutral (Asdal et al., 2001). Words always have a somewhat problematic history (Mol et al., 2010). One relevant example is how the social alarm is described as providing safety for frail dependent people. However, this description stigmatises users as frail and dependent, as discussed in paper 2. Another example is the meeting and communication between caregiver and care receiver, which are the terms used within the care field and in this thesis. Already, we can hear that the terms are loaded with value. One participant is the giver of something (care), whiles the other is the receiver, and thus dependent on the other. Language expresses values, intentions, norms and opinions.

Care involves emotional aspects and practical and instrumental tasks but is not limited to this (Rønning, 2004). Care might be seen as constructed within a discourse; how we define and relate to care is dependent on our previous experiences with providing and receiving care, and our relations to caring networks (Vike & Haukelien, 2016).

Understanding care as a social construction allows us to analyse the relations and expectations that contribute to our understanding.

Care work is characterised by a complex organisation, and the stakeholders have a myriad of often conflicting goals (Porter, 2010) as we recognise in the description of wicked problems earlier in this synopsis. If we are to understand technology as an integrated part of caring practices, we must also understand the ideas behind the organisation of the daily caring practices. When organising the caring services, it is both necessary and relevant to plan a pathway for how things should be done as an administrative tool. Care is hard to plan in detail, and in the daily practice, some things have to be prioritised while other work has to be suspended. It is an unpredictable, complex and emergent activity within a network of actors.

Care work is characterised by uncertainty and a demand for flexibility and competencies from the care provider (Davies, 1995). Situations vary from day to day and from patient to patient, forming a complex interaction demanding flexibility and ability to adjust the planned pathway (Allen, 2014). Therefore, care work requires different kinds of knowledge, competence flexibility and reasoning (Langergaard, 2017). This study illustrates this through the description of how the care workers have to prioritise answering the social alarms and incorporate this as an unpredictable part of their daily work, interfering with the pathway. Care work as a mutual relational matter is often hard to demarcate, and needs are constantly changing. These relational matters were often addressed in the empirical material.

The respondents in this study often talked about their relationships with other actors involved in the care work, and how the social alarm plays a role in these relationships. The end users of the alarm described how they felt close to the care workers, and that the social alarm worked as a safety connection between them. As described in paper 2, caregivers also worried about their patients living alone and described how the social alarm felt like a safety net. This illustrates how co-production in care work consists of mutual efforts to provide better care (Filipe, Renedo, & Marston, 2017).

Up until the beginning of the twentieth century, it was common to describe care as something other than technology. The two were opposites rather than different parts of the same complex reality. Care related to warmth and love, while technology related to cold and rationality. Care was nourishing, practical and impossible to calculate, while technology was effective and manageable to study (Mol et al., 2010). These arguments are still in use by critics of the "technification" of caring that some say we have. Hence the expression: 'warm hands and cold technology' that is often used in the media as a description of a threat from the technological development of society. The dichotomy where care and technology are viewed as something different from one another still

sometimes occurs in political debates and newspapers. However, caring research, especially within STS, acknowledges the relationship between technology and care.

Orlikowski and Scott (2015) describe how we need to acknowledge that service innovation is also about socio-materiality and that materiality in service innovation is always performative. This tends to be ignored by service innovation research literature (Orlikowski & Scott, 2015). A relevant example of this is a situation where the end user activates the alarm. Only the end user has the power to activate the alarm, affecting the work schedule of the care workers. Additionally, the care workers have the competence and power to decide how, when and whether to respond to the alarm. What is often forgotten is the power of the technology and how that comes into play. The action described only happens if the technology works. Another example of this, found in my material, is how the social alarm had the power to keep some users at home because they needed to be within the range of the technology to feel safe.

As the service innovation literature does not consider technology as an active part in this co-production, I turn to STS, which provides us with tools for including the technology as a subject for analysis and not just an object to be studied.

### 2.3.1   Technology innovations in caring practices

> *Kranzberg's first law reads as follows: Technology is neither good nor bad;*
> *nor is it neutral (Kranzberg, 1986, p. 545).*

According to Moser and Thygesen (2015), technologies in the health care service do not only support and complement the care provided. Caring research within STS has shown that technology in use is always interwoven in complex networks of caring practices contributing to changing, shaping and deriving new meanings of care in unforeseen ways (Oudshoorn, 2011; Pols, 2010, 2017; Pols & Willems, 2011; Procter et al., 2016; Sánchez-Criado et al., 2014). In paper 3, I call this "technology in use". The expression "Technology in use" indicates that any technology that is integrated and adopted into a caring practice is always interwoven into the practice as an integrated part. It must, therefore, be studied as such.

STS researchers study technology and science as constructed practices, which represents a break with the assumption that knowledge is determined by nature. Instead, knowledge is seen as evolved and socially embedded (Bijker & Hughes, 2012; Asdal et al., 2001; Sismondo, 2010).

According to Latour, there are no predefined boundaries between society and technology, or technology and science. The interesting question relates to the connection between different elements. There is nothing purely technological, and nothing purely

social. Everything is integrated as social and cultural constructions in the complex reality (Latour, 2012).

The main aim of many technological innovations in caring practices is to provide safe, independent, and autonomous living at home. This gives us a distribution of responsibility and tasks that target new care ideals and values (Mort, Roberts, Pols, Domenech, & Moser, 2015). These aims rarely take into account the struggle and difficulties faced by frail people, often with multiple chronic diseases, to achieve "independent living" (López Gómez, 2015).

In addition, we tend to expect the same processes and effects from different kinds of technologies in different caring contexts. This is all rather problematic, as we tend to end up treating different technologies and contexts in the same way and simplify the wicked problems at hand. The integration and use of technology in the health services include an interaction between technology and humans on both individual and service level, and tend to be much more complicated than suggested (Pols 2017).

Instead, we need to analyse what happens within specific contexts with specific types of technologies, and to explore who might benefit from the technology and what kind of practices they participate in creating (Pols, 2017) as demonstrated in this thesis. We thereby change the research focus from the assumed effects of technology innovations, towards viewing technology, the human actors involved and society as heterogeneous networks (Gherardi, 2010; Nicolini, 2006). We hereby acknowledge the complexity of wicked problems and open up for a realistic exploration of the field.

The inclusion of technology generates completely new forms of care and a different understanding of the care concept, entailing different problems and solutions. People are relational entities and care is "a relational, situated and embodied achievement in which people explore the right thing to do for themselves and their relationships" (Moser & Thygesen, 2015, p. 112). Accommodating an integration of technology and building a mutually satisfying relationship often implies a change in caring practices. This involves new interactions and changing roles and practices, thus redefining how actors live, work, and even identify their lives (Oudshoorn, 2011; Pols, 2017). One example of this from the empirical material is that when patients were discharged from hospital to the home after a fall, they were often recommended to apply for the social alarm by the home care service. While waiting for the alarm, the home care service offered home visits from the home care nurse to make sure the person was safe and well. When the social alarm was installed, these visits were replaced by the safety the social alarm represents. However, there is no doubt that these solutions represent quite different kinds of care.

Traditional research tends to view technology as something not affected by the surroundings and thus not in need of analysis. STS offers a way of viewing technological

artefacts, like the social alarm in this thesis, as an integrated actor that also needs to be analysed to understand the interactions and practice. This argument opens up for a focus on materialities, not just on the technological artefact as represented by the social alarm device. Different aspects of the materiality context are moved to the fore and into the centre of attention (Law, & Mol, 1995; Thygesen, 2009). An example of this way of thinking is described in Callon's famous study of the scallops in St. Bieuc Bay, where Callon discusses human actors and scallops in the same terms, as actors affecting each other (Callon, 2001, 2012; Felt et al., 2016; Law, 2009).

The introduction of a technology into a service complicates the already complex daily care practices as it involves new ideas, actors, tasks, relationships, and composites, as described. According to Star and Strauss (1999) and Allen (2014), care work largely consists of a way of working where actors in the network need to adjust the practices or the technologies (Allen, 2014; Procter et al., 2016). To make the social alarm work, in line with Procter et al. (2016) I found that actors using technology often make adjustments, thereby creating new practices. These changes in caring practices are described in service innovation as bricolages. The metaphor of bricolages provides a way of exploring these small solutions that are unintended and often not spoken of.

## 2.4   Bricolages

*Bricolage and innovation are not simply dichotomies, but can instead be considered a continuum of more or less formalized innovation processes that require different degrees of management intervention and mediation (Fuglsang & Sørensen, 2010, p. 594).*

There are different definitions of innovation in this context. As opposed to literature that defines service innovations as involving only radical changes or breakthrough novelty (Hartley, 2005), Fuglsang and Sørensen (2010), argue that the conventional definition of innovation overlooks the fact that innovation often takes place ad hoc in a relationship with a given "client". They provide a critique of the rigorous way of defining innovations and argue that an innovation might be recognised a posteriori. This means that only in retrospect will we recognise that there has been an innovation (Fuglsang & Sørensen, 2010). This is in contrast to the discussion that innovations have to be intentional (Fuglsang, 2010). These small ad hoc innovations are called 'tinkering', 'niches' or 'bricolages', and they are integrated parts of practice (Fuglsang & Sørensen, 2010; Toivonen, 2010).

The term bricolage, which originates from Lévi -Strauss (Fuglsang, 2010; Lévi-Strauss, 1966) will be used in this thesis. Bricolages can be practices developed as answers to a problem, as small solutions that are unintended and are not planned for beforehand.

Paper 3 describes and illustrates bricolages that emerged related to the social alarm. Bricolages are described as especially important for innovation in public services, as the public services are obliged to maintain a service, but due to economic constraints, they often have to manage with the resources at hand (Fuglsang & Sundbo, 2016). Furthermore, they can also represent a way of developing a quality improvement in practical everyday life.

Bricolages are often invisible as they are mainly hidden in daily activities and only visible through changes in routines or use of technology (Pols, 2012). Therefore, to understand them the analysis must be based on practice and be sensitive to the dynamics and complexity (Fuglsang & Sørensen, 2010). When implementing technologies in practice, these bricolages often take place as after-innovations/a-posteriori innovations, as solutions to problems, often in interactions between the actors. Sundbo (2008) claims that the customer contributes to adjusting the innovation after launch because it is impossible for them to know how things work before they are taken into use (Sundbo, 2008; Toivonen, 2010). As the focus of this thesis is exploring the interactions between human actors and technology in technology innovations, it was relevant to look for these bricolages in the empirical material.

According to Nicolini, Mengis, and Swan (2012), an object, as a technology, can take the centre stage at some point but later shift into the background as it becomes established and mundane, like the social alarm. In line with Goffman (1959), Bartunek, Trullen, Immediato, and Schneider (2007) I focus on this by utilising a description of frontstage and backstage of everyday life, describing what tends to shift into the background when becoming established and mundane. In this context, frontstage points to what tends to be in focus, articulated and visible observable, while backstage points towards the invisible messy reality that is found in caring practices due to its complex nature. According to Bartunek et al. (2007), it is necessary to understand both frontstage and backstage activities to provide a more complex and complete picture of an established innovation.

By bringing bricolages to the forefront of attention and making them visible for colleagues and management, it is possible to turn them into useful innovations and bring about quality improvement in the service (Fuglsang, 2010; Fuglsang & Sørensen, 2010). End users and family members also sometimes take the initiative to 'co-produce' better caring solutions through bricolages (Procter et al., 2013).

The notion of bricolages opens up for more in-depth exploration of the practices and interactions between the actors involved in a service in order to identify innovations. Bricolages, as a path to innovation, may represent a bridging of public service innovation and STS, as bricolage illustrates the complexity of innovations in public services, and how one might have to explore and study the less obvious to look for what is really going on.

To conclude, when analysing public service innovation including bricolage, it is relevant to study the human actors and technology and the relationship between them (Rubalca-ba, Michel, Sundbo, Brown, & Reynoso, 2012). Public service innovation literature has to a very limited degree focused on the micro level of caring practices, and the different actors' role, interaction and contribution on a micro level are scarcely addressed within service innovation research (Alford, 2016; Skålén et al., 2015). As the knowledge base is rather sparse, there is a need for contributions towards a more comprehensive under-standing of the "workings of technology in healthcare practice" (Pols, 2017, p. 6). In addition, public service innovation literature is rather vague in its empirical description of what really happens in co-production processes (Skålén et al., 2015). STS healthcare research provides us with ways of articulating this micro level.

This thesis aligns with Peine and Herrmann (2012) when considering STS as a scientific approach that offers theoretical tools that might be utilised as "sensitising concepts" for exploring technology in caring practices. This leads us to focus attention on aspects of STS, more specifically the metaphor of script and domestication. I will further present scripting, domestication and heuristics that represent three relevant sensitising concepts allowing an in-depth study of the co-production of caring practices.

## 2.5   Scripting of a technology

> *A large part of the work of innovators is that of "inscribing" this vision of (or prediction about) the world in the technical content of the new object Akrich (1992, p. 208).*

The notion of scripting as developed by Akrich (1992) provides tools for analysing the expectations of a technology integrated into practice. Paper 2 describes and utilises the script metaphor to analyse how the different actors involved understand and interpret the social alarm in their context. When viewing technologies integrated into practice networks, the question arises: How can we describe and analyse the role of the techno-logy and the expectations towards the technology within these networks?

The script refers to a text metaphor as illustrated in the quote above. The script metap-hor is inspired by how a film or a play contains a script, prescribing roles and relations between different actors (human and non-human), enacting and making manifest a specific normativity, and thereby shaping the world the actors live in (Akrich, 1992).

In the same way, the designers and technologists seem to envision a representation of the users and the use and function when designing and producing a technology, imagining users' needs and relation to the technology. Their representation of the users' behaviour materialises into a script with descriptions and expectations of how the actors involved with, for example, the social alarm will interpret, adapt and relate to the technology.

The script of a technology represents a framework for the use of a technology, like a film script represents the production of the movie (Akrich, 1992; Berker, 2011; Joyce & Mamo, 2006; Woolgar, 1990).

The script is a way of translating the expectation and experiences related to technology in use. To do this we have to go back and forth between the technical and the social (Akrich, 1992).

Like a movie script that sometimes gives the actors precise description of how to act and other times opens up for improvisation, Aune (2002) describes how a technology can be designed with a strong or weak description. A strong script gives a firm and strong direction for the use of the artefact, just as a weak script opens up for more flexibility in the use of the technology.

The technological artefact defines in various ways the human actors involved and the ways the interaction between them and the technology takes place. Some actions are delegated to the technology, others left to the human actors (Akrich, 1992). In relation to the social alarm, the alarm is designed and scripted to only work when the human activates it by pressing the alarm pendant. How the human actors relate to the scripting of the non-human actor, the technology, within networks is not necessarily aligned with the intentions of the designer/engineer of the technology. I find that the metaphor of domestication provides relevant tools for analysing these interactions.

## 2.6  Domestication

*A unique feature of domestication research is that it links insights about consumption, as a wider context of use, to the theory of innovation (Peine & Herrmann, 2012, p. 1500).*

Domestication originally comes from the media and communication field but shares elements with STS as it also follows an interpretivist approach (Peine & Herrmann, 2012). The notion of domestication as described by R Silverstone (Silverstone, 2007; Silverstone & Haddon, 1996) is inspired by the process of domesticating wild animals. It describes a way of understanding the process of how technical objects gradually become an integrated part of someone's everyday life.

Domestication offers us a way of understanding the relationship between technology and human when technology is introduced into someone's life. Within a cultural context, domesticated technologies usually have a recognisable repertoire of how they are normally used (Peine & Neven, 2011; Pols & Willems, 2011).

The domestication process can only be seen as relational, where different actors, as well as the technology, have a social impact (Silverstone, 2007; Sørensen, 2007). Silverstone

(2007) describes this process through four overlapping dimensions of appropriation: commodification (also called acquisition) (Berker, 2011; Sørensen, Aune, & Hatling, 2000), objectification, incorporation and conversion.

*Commodification* represents the process leading up to the acquisition of the object. The technology is acquired by someone because they are acknowledging needs or desires, and they have a range of expectations. The social alarm is acquired by the end-user, often after recommendations from relatives, neighbours, and care personnel or because they acknowledge that they have a need. The dimension of *objectification* represents how the technology becomes a physical object in the actors' life and household. The home care services often manage the installation of the social alarm in the end-users' home and they inform the end-user about the use of the alarm. The third dimension is the *incorporation* of the technology into everyday life. This is a complex process of negotiations between the technology, how it is scripted, and the human actors involved. This part of the domestication process describes how the technology, for example, a social alarm, gradually becomes a part of everyday living, and encompasses the values, pride, resistance, refusal, and the tension in the interaction between human and technology that changes everyone involved. During the process of domestication, there is a rivalry between maintaining the stability of the present and expectations for the future. The technology gradually changes from something strange to an integrated part of everyday life. Silverstone calls this last phase of domestication *conversion* (Berker, 2011; Silverstone, 2007).

However, this is not a linear process, but rather messy, complicated interactions between human and non – human actors. Hubak (1996) argues that you might say that the designers and producers of a product try to domesticate and configure the users through the script.

## 2.7   Heuristics

From the domestication process, more or less stable relationships are established between the actors and the technology.

Pols (2017) merges domestication theory and script theory and describes this as the taming and unleashing of caring practices where heuristics emerge as I have described in paper 2 and 3. It is relevant to present, from paper 3, my modified and extended version of Pols' (2017) different heuristics as presented in Table 1. Heuristics enable us to focus on how co-production comes about, by exploring the interactions and co-production in depth.

| Heuristics | Description of the heuristics |
|---|---|
| The technology is utilised in accordance with the scripts | Actors adopt, integrate and domesticate the technology in accordance with expectations, and the technology is part of co-producing care practices. |
| Taming the users | Technologies sometimes tame users by making them dependent on the technology. They must adjust their lives in line with the technology. |
| Unleashing the users | Technologies can unleash users, making them request new services from the technology. Here the script and intention of the technology do not meet the demands and expectations of the actors involved. This leads to bricolage or dissatisfaction with the technology. |
| Taming the technology and unleashing practices | Actors tame the technologies by using them to pursue their goals, either by exploiting only some possibilities the technology offers or by finding new ways of use, often through bricolages. This often occurs in other ways than scripted and intended by designers and vendors. Sometimes the technologies unleash unexpected and completely new areas of use. |
| Non - use | The users reject the technology altogether, domestication does not occur. |

*Table 1 Describing the heuristics of taming and unleashing of technology and actors. An expanded version of Pols (2017)*

Even though technological artefacts are described and expected to function in a particular way interpretative flexibility always occurs. Interpretative flexibility points to how human actors in different contexts and networks relate, utilise and construct different meanings of the same technology, acknowledging human intentionality (Pinch & Bijker, 2012). The social construction of technology (SCOT) was among the first approaches to describe how different people could create and interpret their understanding of a technology quite differently. However, the early SCOT theory was rightfully criticised for not taking into account how actors changed and modified even well-established and stable technologies, arguing that even established technologies interact with and change practices (Oudshoorn & Pinch, 2003), as explored in this thesis. This was remedied by Kline and Pinch (1996) through an example of how established technologies like the Model T automobile was redesigned by farmer users. This illustrates how established technologies are not "closed" and opens up for an understanding that even established technologies change when interacting with users, creating new practices. In line with this, this thesis explores how the social alarm interacts and influences caring practices.

## 2.8   Final comment

In this chapter, I have presented the theoretical framework utilised in this thesis. By combining and utilising the different aspects of STS and public service innovation studies, I provide tools for exploring established technologies in use in caring practices as described later. In this thesis, I have used the notions of script, domestication, heuristics

and bricolage as concepts for exploring and understanding the interactions and co-production between the different actors involved, and the technology in these complex caring practices as illustrated in Figure 1.



*Figure 1 illustrates how the users, the technology and the service are connected and how script, domestication, heuristics and bricolage are concepts used to explore the co-production*

The above figure does not illustrate the interconnection between the different aspects, the human actors and the technology. This is presented in chapter 3 and 4, in the frameworks in paper 2 and 3 and in chapter 5 in the framework presented in the discussion. I will now turn to the philosophical foundations for the study. Furthermore, the methodological choices and the empirical work will be presented.

# 3. Philosophy of science, methodological choices and empirical studies

*Scientific knowledge doesn`t reflect nature. Instead, it is a practical tool*
*for handling and making sense of the world (Law, 2016, p. 33).*

This chapter presents the philosophical foundation of this thesis and my ontological stand. I will further present the methodological choices made on the basis of the scientific point of departure when working on this thesis and reflect upon these methodological reasonings. The research design of the two empirical studies included in this thesis is presented. Finally, I reflect on the research process and the quality of the work.

## 3.1  Philosophical foundations

Although all research is based on philosophical foundations, there is more than one philosophy of science (Alvesson & Sköldberg, 1994). As previously described, this research is positioned in two camps as the thesis draws on both STS and innovation studies. Both STS and innovation studies originate from multi-professional and interdisciplinary scientific fields and are based on several philosophical foundations. However, providing a general overview of these foundations is far beyond the scope of this thesis. Instead, I will position my scientific point of departure.

Briefly described, science has been traditionally divided into two major ontological views of the world (Snow, 2001): a realist (based on positivism) or constructivist (interpreted) view. This is, of course, a vast simplification, as the reality is much more complex with several "paradigm wars" through time (See Denzin & Lincoln, 2018 for additional reading).

The quote at the beginning of this chapter sets the tone for my elaboration of the scientific departure. Science is never neutral; it is always contextual and within a research paradigm. The earlier part of the thesis gives an indication on my point of departure.

Care has not long been in focus in science (Mol et al., 2010). Although Florence Nightingale (the "mother of nursing") conducted research as early as the late 1800s, (Ballangrud, 2013; McDonald, 2001; Nightingale & McDonald, 2013), it took a long time before care was on the scientific agenda. According to Mol et al. (2010), researchers viewed care as a practical necessity rather than an intellectually interesting field for a long time. Eventually, care came into focus in science (Mol et al., 2010), first when

nursing researchers starting to talk about care, and this was later followed by sociology, anthropology, philosophy and ethics researchers (Asdal et al., 2001). In other words, this has turned into a multidisciplinary science field. [2]

Care researchers had little interest in natural science and technology until quite recently (Melby & Tjora, 2013). Unlike care, technology has been in the interest of science all the way. Traditionally, science technology was mainly embedded in a realist tradition. (Fjelland & Gjengedal, 1995). Objectivity and neutrality were important conditions for the positivistic science ontology, viewing the world as something objective out there for us to study and understand. However, STS took into account the fact that technology was used for both good and bad purposes, and never neutral, as described earlier in this thesis. Both STS and service innovation research have mainly an interpretative approach today.

In the realist tradition, objectivity is strived for, aiming to capture the "true" description of the phenomenon studied. In the interpretative approach, the world is viewed as constructed between the participants and based on our perception of it. I align myself with Alvesson and Sköldberg (1994) who describe how it is fruitful to acknowledge that the world exists outside our reality, and we need to find ways to explore these realities. The word 'realities' is used in the plural precisely to emphasise that even though there is a reality in the world, how different people interpret this reality and include it as a part of their lifeworld differs. This concurs with Van de Ven's (2007) description of pragmatism. Pragmatism holds that although artefacts exist outside our reality, they are always integrated into practice and need to be interpreted. Therefore technology and other artefacts must be studied within some kind of context, focusing on what functions (Van de Ven, 2007).

These interpretations create different views of the world as we know it – who has the power to determine what is real and how do we talk about it (Berger, Wiik, & Luckmann, 2000). The focus of this thesis is indeed to study these different realities of the social alarm in use, and I have done this inspired by both pragmatism and the constructivist paradigm.

Constructivism sees reality as constructed. What we consider as reality is largely constructed in the interaction and interpretation within a society. As mentioned above, this does not necessarily imply that there is no reality, but rather that knowledge is situated and when studying a subject it will always be the representation of the subject that is studied (Berger et al., 2000). Take the social alarm as an example. The social alarm as a

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2    As an example, we can look at the field of nursing science where the hermeneutic approach has been strong.  We can see this in the work of well-known philosophers of nursing science: Kari Martinsen, Katie Eriksson, Watson, Benner, Nissen etc. (Austgard, 2008).

device is real. How we interpret the social alarm, on the other hand, is constructed. This depends on our emotions, knowledge, skills, our expectations and previous experience with the social alarm, with technologies in general and with the service in which the social alarm is embedded among other things.

To provide an example of this, I describe in paper 3 how the actors involved in the social alarm have different emotions related to the alarm, depending on how they relate to the script of the technology. However, it is important to point out that even though people have different interpretations of the social alarm, this does not mean that they do not experience the alarm as real.

Phenomenology aims at capturing a deep understanding of how a person experiences a phenomenon, focusing on the lived experience (Patton, 2015). Phenomenology is both a scientific discipline and a method and an attitude of thought. All research might be described as the quest for knowledge. According to Edmund Husserl, a founding father of phenomenology, knowledge can never be more than a mental exercise belonging to a knowing subject. Husserl described it as necessary for the researcher to bracket out the world and individual presuppositions in order to capture the essence (Husserl, 1999; Laverty, 2003). Positivism views reality as something objective for us to study, while phenomenology views the word as multiple realities altered by humans.

Although striving to capture the essence and bracket out my presuppositions may constitute a goal, I acknowledge that it is impossible to be neutral and that, as a researcher, I will always have preconceptions. However, I have focused on letting the voice of the respondents and the field speak freely, focusing on their interpretations in line with hermeneutic phenomenology. Heidegger developed the concept of hermeneutic phenomenology and claimed that bracketing out the world was impossible for the researcher since pre-understanding and interpreting is a part of being a human being. Instead, researchers should consider thoroughly their pre-understanding and position in relation to what is being studied (Laverty, 2003).

The empirical material for this thesis involves the social alarm (goods) used within a service. Within innovation literature, the focus on goods is largely replaced by a focus on services (For additional reading see Vargo & Lusch, 2004; Vargo & Lusch, 2008). The social alarm is integrated into caring practices and only makes sense when integrated. It has no function if the actors do not include it in their lives in some form. At the same time, according to Orlikowski and Scott (2015), we cannot ignore the artefacts and just talk about the service as newer service innovation tends to do. I view these practices as constructing and incorporating materiality, including actors involved and technology artefacts. There are always processes of materiality within the service that "draw together and thread through tangibility and intangibility agency and structure, words, things and deeds" (Orlikowski & Scott, 2015, p. 16).

I have repeatedly gone back and forth between the parts and the whole, the materiality and the immateriality, in working with the basic elements of hermeneutics and the hermeneutic spiral. It is necessary to understand the whole of the social alarm in use in caring services in order to understand the parts of the individual experience, and vice versa. This acknowledges the fact that empirical observations and transcripts are always based on the researchers' preconceptions, and are both adjusted on the basis of empirical and theoretical experiences (Alvesson & Sköldberg, 1994; Mantzavinos, 2016).

The metaphors of script, domestication and heuristics presented earlier allow us to turn our focus to the materiality and the interactions between the actors involved.

As a result, it follows that research is also constructed and that my position as a researcher is situated in the relationship to the respondents and the field in which the research is conducted. This is elaborated on in the chapter on trustworthiness and methodological considerations.

## 3.2   Study design

A qualitative interpretive design comprising different qualitative methods was applied to answer the research questions addressing established technology innovations in caring practices from a public service innovation perspective. The empirical study is descriptive and explorative. A study inspired by the principles of ethnographic studies was applied to answer the research questions and to acquire an in-depth understanding of the field.

The data collected are inherently qualitative. It might be fruitful to use a variety of qualitative methods when studying complex phenomena aiming to cover a more comprehensive picture of practice (Flick, 2004). A combination of different qualitative data collection techniques is therefore used in order to gain an in-depth understanding of how different actors experience this technology in use in caring services. The combination of literature review, observations, interviews and examination of documents provided a comprehensive and rich data capture.

This is done by collecting "thick descriptions" as elaborated by Geertz (1994) and Ryle (2009). The term "thick description" is widely used within qualitative research, but there is confusion regarding what the term really means. It might be considered bold to describe my data collection as thick descriptions as the term is mostly used within ethnographic studies. Thick description is characterised by the inclusion of rich descriptions about context and meaningful descriptions and interpretations, as opposed to the thin description that merely reports facts and occurrences (Denzin, 2001). I align with Ryle (2009), in acknowledging that thick descriptions involve a focus on the context and intentionality of the behaviour. The thick description implies a multi-methodical approach where participant observation (here in home care practices),

interviewing participants and document analysis are relevant (Ryle, 2009; Strydom & Delanty, 2003; Thygesen, 2009). Some thick descriptions are full, meaning that a "complete thick description is biographical, historical, situational, relational, and interactional". However, a thick description might also focus on some aspects alone, or have a primary focus, for example biographical, micro context, or relationships and interactions (Denzin, 2001), as in this study.

Thick description in this context aims to provide accurate descriptions and interpretations of a given situation by absorbing and providing rich, detailed descriptions of context, emotions, actions, and the network of social interactions between the actors involved with the social alarm in use. The interpretative characteristics of the studied situation are important, not just the detailed descriptions (Alvesson & Sköldberg, 1994; Denzin, 2001; Ponterotto, 2006). The aim is to achieve this by providing a rich and detailed description of the practice of the social alarm in use, as presented in paper 3. I considered a sociotechnical approach relevant for exploring and describing how different actors are endlessly connected. This approach is viewed as appropriate because it addresses the collaborative processes between different actors rather than individual tasks, as described earlier.

## 3.3  Methods

The thesis includes three papers based on two studies with different designs. As with most PhD students, this work started with a literature search, aiming to gain an overview of previously published research. However, I found no previous published review of the social alarm, despite its being widely used in many countries for more than 30 years. I wanted to contribute towards bridging this research gap. Therefore, the first study in this thesis is a qualitative systematic integrative review of research literature on previous research related to the use of the social alarm, presented in paper 1. The second study is a qualitative study exploring the social alarm in use in two Norwegian municipalities, presented in papers 2 and 3. Table 1 presents an overview of the characteristics of the two studies and the three papers that constitute this thesis.

| Study | Study 1: A qualitative systematic integrative review | Study 2: A qualitative study including participant observations, interviews and document analysis. | |
|---|---|---|---|
| Paper title | Paper 1 "The personal emergency response system as a technology innovation in primary health care services: an integrative review." | Paper 2 "Maybe we should talk about it anyway": a qualitative study of understanding expectations and use of an established technology innovation in caring practices. | Paper 3 Older people negotiating independence and safety in everyday life using technology: Qualitative study. |

| Study | Study 1: A qualitative systematic integrative review | Study 2: A qualitative study including participant observations, interviews and document analysis. | |
|---|---|---|---|
| Aims | To provide an overview of previous research exploring the social alarm in use in caring practices | To explore the expectations and experiences related to the use of the social alarm for the actors involved. | Through narratives, explore how actors experience the social alarm in use, and the efforts to make it work. |
| Study design | Descriptive, explorative | Explorative, descriptive | Explorative, descriptive |
| Data sources | Peer-reviewed articles of the social alarm in use | Home care service and different actors involved with the social alarm. End users, relatives, and care workers from different backgrounds and with different responsibilities. Relevant documents. | |
| Data analysis | Integrative review analysis | Stepwise deductive inductive analysis | |

*Table 2 An overview of the two studies and the three papers included in this thesis*

Furthermore, the methodology of the two studies is described separately, starting with the integrative review.

### 3.3.1   Study 1. A qualitative systematic integrative review

Study 1 is an integrative review aiming to scope the field and summarise previous research on the social alarm in use in caring practices. The choices made during the work with this review are presented here and their consequences reflected upon. Since the social alarm has been an integrated part of caring practices since the late 70s, it is relevant and necessary to develop a knowledge base of the research conducted on this topic. An overview of the field is provided through addressing and presenting such a diversified knowledge base. This literature review focuses on the social alarm rather than reviewing existing literature on technology in use in caring practices more generally. This is done to provide a demarcated focus that allows for a thorough study of the different sides and consequences of one of the most widespread technology innovations in caring practices.

As a topic matures and the extent of its literature grows, there is a corresponding growth and development in the knowledge base of the topic. An integrative literature review of a topic addresses the need for a review, critique, and the potential reconceptualisation of the expanding knowledge base of the topic (Whittemore & Knafl, 2005).

The integrative review contains a systematic review process, which includes a thorough description and a transparent search strategy that gives results as described in paper 1. The integrative systematic review is unique as opposed to other systematic reviews as it provides a systematic overview of the field when opening up for an integration of both

qualitative and quantitative articles. The aim is to scope the field through a rigorous and systematic search and quality assessment of included articles. The inclusion of both qualitative and quantitative papers provides a more comprehensive overview of the field. However, this adds to the analytical complexity (Whittemore & Knafl, 2005). To obtain the required academic rigour, a protocol providing a plan for the review was produced[3].

The following steps describe the research strategy process of the review.

Problem identification stage. The purpose of the review was established in relation to the research question of this thesis.

Literature search stage. Ideally, all relevant research should be included in the study to avoid publication bias (Whittemore & Knafl, 2005). Therefore it was important to find relevant and all-embracing search terms. The initial terms were determined through pre-search and expert advice. The following terms were identified: "Personal Emergency Response System" (PERS), "social alarm", "safety alarm", "security alarm," and "community alarm system". As relatively few articles were found, there was no need to narrow the searches with search strings/ Boolean/Phrase.

In the first round of searches, the terms "safety telephone", "safety telephone services", "medical alert pendant", "life call/life alert pendant", "home alarm system", "tele surveillance", "personal trigger", "personal security alarm", "personal alarm", "personal response system", "community alarm service" and "dispersed alarm" were found used in the articles from the systematic search. For databases using the medical subject headings (MeSH), a variety of terms were used by combining terms indicating the technology device with terms indicating the user of technology in all combinations (search string available on request). MeSH proved to be challenging, as the terms did not quite fit my focus. However, I chose to search widely using relevant MeSH terms to ensure inclusion of the relevant articles.

Additionally, Google Scholar was used to assess the relevance of detected terms. I then explored the 100 most relevant results for each term in Google Scholar. Broader terms like welfare technology, assistive technology and telecare were not searched since they cover many different kinds of technology. Searching ended on 1 May 2015. This review has a rather narrow focus, as it only includes articles focusing on the social alarm. However, as illustrated here, it proved rather difficult to detect all the relevant search terms covering the technology in use. Therefore, research that uses other terms might have been missed, especially literature using only collective terms such as telecare or assisted living that concerned the social alarm.

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3    The review protocol has never been submitted for publication, but can be presented on request.

The searches were conducted in several databases, including the Cochrane Library, Academic Search Elite, Age line, Cinahl, ERIC, PubMed, Science Direct, ProQuest - all databases, Medline, Embase, Ovid Nursing Database and Clinical Evidence. The databases were selected in collaboration with a librarian at the university. Search engines Google Scholar, NORA and discovery tool Oria and BISYS ASK, and the "snowball" methods citation and reference search proved to be important.

Data evaluation stage. All articles were reviewed according to pre-produced inclusion criteria:

- Articles dealing with older people's attitudes, experiences, interactions, feelings, use and non-use, consequences, and effects of the use of a personal emergency response system (PERS) in home care
- Peer-reviewed articles from academic journals describing and focusing on different aspects of the PERS in use rather than articles with the main focus on further technology innovation
- Articles are written in the Nordic or English language, no limitation in the publication period, and no methodological restrictions.

I developed a checklist (Appendix 1) inspired by previous studies as a tool for assessing the quality of the included studies (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Malterud, 2001; Rashman, Withers, & Hartley, 2009) The checklist was then pilot tested and used. It included details and evaluation of keywords, aims, themes, methods, analyses, findings, discussions, and references. This provided a useful tool for quality assessing the articles.

Since the review includes studies with diverse methodology, a methodological quality evaluation as a viable reason for explaining findings was used (Whittemore & Knafl, 2005). I found it difficult to assess the quality of the included articles for two reasons. First, although it was fruitful workwise to have one data extraction sheet for all the different articles, it proved difficult to assess the articles and relate them to one another due to differences in methodology. Secondly, the development of the field and of research methodology soon became visual as older articles generally had fewer methodology descriptions than newer articles, making them harder to assess. This led to my decision not to rank the articles by quality in article 1.

Data analysis stage. A descriptive integrative thematic analysis, as described by Whittemore and Knafl (2005) was used to analyse the articles. This required ordering, coding, categorising and summarising data. The extracted data were explored and displayed around different variables and subgroups, looking for patterns, themes, and relationships, and providing a map of the essential identified themes. This was followed by abstracting and grouping the themes into categories, aiming to subsume the particulars

into more general findings as described in Table 3 that is derived from paper 1. To ensure quality, the included articles were repeatedly checked to verify accuracy and confirmability. Uncertainties were discussed with the group of supervisors throughout the process.

| Main Categories: | Themes emerging into main categories: |
|---|---|
| Relating to the PERS as a device | • Development of the PERS as a device<br>• Assessing the appearance of the PERS<br>• Technological issues<br>• Demand for training |
| Experiencing the service system | • Organising the service<br>• Bottlenecks in the service<br>• Economic issues |
| Who is the user of the alarm | • Demography<br>• Not suitable for everybody<br>• What motivates people to get a PERS<br>• Who motivates users |
| Experiences with having an alarm | • Being satisfied with the PERS<br>• Effect of anxiety and quality of life<br>• Living independently<br>• Effect on daily living socially<br>• Choices whether to wear the pendant |
| Activating the alarm | • Reasons for activating the alarm<br>• Reasons for not activating the alarm<br>• Uncertainties |
| Wishes for the future | • Improvement of the device<br>• Improvement of the service |

*Table 3 Categories from analysing the 33 articles*

### 3.3.2   Study 2. A qualitative study of the social alarm in use in caring practices

In study two, data were collected through participant observations and in-depth interviews, as well as through the examination of documents. The data collected during the interviews were particularly rich and provided valuable input on the issue.

Here I align with the constructionist analytics of interpretive practice as described by Holstein and Gubrium (2011) that centres on what they call " interactional constitution of lived realities within discernible contexts of social interactions" (Holstein & Gubrium, 2011, p. 341).

### 3.3.3   Setting and sampling strategy

Both phenomenology and hermeneutic phenomenology research select participants aiming for diversity, thus providing rich and unique stories of the phenomenon in focus.

The aim is to study their experiences in depth (Laverty, 2003). I have done this in my empirical study by strategically choosing two municipalities with the aim of achieving maximum diversity. This was done in order to acquire a rich material, not for comparative reasons.

The study was therefore conducted in two home care districts, in two heterogeneous municipalities in order to acquire diversity and variation, as described in Table 4. There is diversity in size, geographical location, inland/coastland and how the service of the social alarm was organised. This opened up for a rich data collection with a cultural and individual diversity providing abundant data material.

A home care district covers a distinct geographical area, either being part of a municipality (as in municipality 1) or a whole municipality (as in municipality 2). My choice of municipalities was also based on practical considerations as I live within one of the municipalities and my family originate from the other. This turned out to have positive consequences for the data collection as described later.

Home care services are responsible for providing care for people living in their own homes in need of assistance. The health and care service managers in the municipalities were contacted, and written consent to access to the home care services in the municipalities was provided. Further arrangements were made in collaboration with a home care manager in one home care district in the larger municipality and a home care manager for the whole municipality in the small municipality. They were quite enthusiastic and helpful and helped to arrange the observational study and to recruit informants for interviews.

|  | Municipality 1 | Municipality 2 |
|---|---|---|
| Size | 30 000 inhabitants, urban inland district. Focusing on one out of a total of 6 districts | 2600 inhabitants. Rural coast district |
| Development | Population in growth | Decreasing population |
| Part of country | Inland eastern part of the country | Coastal North of Norway |
| Service organizing | The alarm is routed directly to the phone of the home care worker on call | A private alarm central receives the alarm calls. They effectuate proper response. Normally that means reporting to home care personnel at work, and they call on the patient. |

*Table 4 An overview of the study context of the two municipalities included in study 2.*

In combination, the empirical material from the two municipalities represents the empirical case for this thesis.

### 3.3.4   Data collection

The data collection was conducted in two phases. The first phase consisted of participant observations in the home care service observing the interaction between different actors involved in the social alarm. Relevant documentation in the municipalities related to the social alarm was studied in this phase. The second phase was interviewing the respondents.

Data collection focused on different actors' perceptions, experience, and interaction, acknowledging that analysis and interpretation already start at the time of the data collection (Kvale & Brinkmann, 2015). The data collection for study 2 was conducted in 2015.

### 3.3.5   Observations

According to Fangen og Sellerberg (2011), observations make it possible to get direct access to the reality of practice and might contribute to a better understanding of the actors and the interaction in the field.

Participant observation is described as ethnography, field work or participant observations and is usually part of sociological or anthropological studies (Delamont, 2004).

I planned for a longer observation period in the home care service in the municipalities. In line with Delamont's (2004) description, the aim was to understand the work involved in making the social alarm function, and the lifeworld of the participants. At the start of the empirical period, the social alarm was found to be very little in focus in the daily home care settings, so that general observation as a method would provide little experience and knowledge of the use of the social alarm. This forced me to change my approach. Instead, a short and targeted observation study in both municipalities was chosen. This involved observing the care personnel responsible for receiving the social alarm telephone calls at work.

To gain an overall view of the service provided and the organising of the social alarm service, I observed different sides of the social alarm in use: installation, discussions, testing, information to the end users and activating of the alarm. One-week of full-time observation was conducted in each municipality. As a participant observer, I was present in the practice but was not very active in the interaction between the actors in line with Johannessen, Tufte, and Christoffersen's (2010) advice. I wrote detailed field notes during and at the end of each day. The notes were summarised the same day and were analysed and included in paper 2 and 3. I sought an open and rich data collection. An inductive approach provided insights and useful aspects that I further utilised when preparing for the interviews.

### 3.3.6   The interviews

I planned to interview different actors involved with the social alarm in use. Qualitative methods seek to investigate the unique and special, discovering different phenomena (Jacobsen, 2015). Aiming to gain insights into different actors' experience with the social alarm, the interviews had the form of an open conversation. Variation among the participants was sought and the strategic selection based on inclusion criteria. A strategic selection of respondents for the interviews opened up for a diversity in the collected data. It is therefore suited for qualitative methods (Malterud, 2003).

The managers of the home care service carried out the recruitment in accordance with the inclusion criteria presented in Table 5. They identified possible respondents according to the criteria, asked if they wanted to participate, gave them information and asked for their written consent (information and consent form can be found in Appendix 2).

| Participants | Recruiting criteria. Aiming for maximum diversity. |
|---|---|
| End users | Had possessed the social alarm in their home for more than one year. Different experiences with activating the alarm. Both sexes, a variety of age and dependency, rural and urban living, living independently in own home and in a home care centre. |
| Next of kin | Next of kin with a different relationship to the end user. The difference in interactions and how far they lived from the end user. |
| Home Care workers | Experience with the social alarm. Employment in a 50% part-time position or more, employment for more than three months, and the ability to speak, read and write in Norwegian. Different educational background, sex, and work responsibility related to the social alarm. |

*Table 5 The recruitment criteria for selecting interview respondents*

Even though the recruitment was left to the care managers, I was repeatedly in dialogue with them to get a large variety and as many different experiences as possible. Table 6 presents an overview of the respondents in study 2.

The interviews took place in a location of the respondent's choice. End users were all interviewed in their home. All interviews but one with the next of kin and the care workers were carried out in the home care centre.

| Respondent | Description of the respondents |
|---|---|
| The end user of the alarm | 2 widows living alone in care flat in a home care centre. 2 widowers living alone in their houses. 4 widows living alone in their houses. 1 widow living alone in a home care studio flat. 2 single men living alone in their houses. |

| Respondent | Description of the respondents |
|---|---|
| Next of kin | 1 close male friend.<br>1 daughter of a deceased user.<br>1 daughter living close.<br>1 daughter living far away. |
| Care worker | 1 female nurse.<br>1 night-time female nurse.<br>2 female assistants. |
| The alarm manager | 1 female nurse assistant.<br>1 female nurse (same person as the home care manager). |
| Home care manager | 2 female nurse managers |

*Table 6 An overview of the respondents interviewed*

### 3.3.7   Critical Incident Technique

> *(…) a qualitative interview procedure which facilitates the investigation of significant occurrences (events, incidents, processes or issues) identified by the respondent, the way they are managed, and the outcomes in terms of perceived effects. The objective is to gain an understanding of the incident from the perspective of the individual, taking into account cognitive, affective and behavioural elements (Chell & Pittaway, 1998, p. 25).*

In the search for in-depth insight into how different actors perceive the social alarm the Critical Incident Technique (CIT) was found to provide a valuable tool for the interviews.

CIT as an exploratory tool is described by Chell (2014). The CIT originates from the work of Flanagan and Dennis (1954), and it is more than 50 years since he wrote his classic article studying occupational psychology in aviation. It started as a quantitative method but is not bound to any specific research tradition, and has developed into a research method suitable for different scientific approaches (Butterfield, Borgen, Amundson, & Maglio, 2005; Chell & Pittaway, 1998; Flanagan & Dennis, 1954; Keatinge, 2002). Within qualitative research, the Critical Incident Technique is later defined as described above.

Chell (2014) developed CIT within a phenomenological-interpretivist tradition that is utilised in this thesis. She underlines that the researchers pre-understanding of the context is important to data that are collected through focusing on the respondents' cognitive, affective and behavioural experience. She also refers to a constructivist tradition (Fuglsang, 2017).

CIT focuses on the respondent's descriptions (Butterfield et al., 2005). This was done

by asking the respondents to tell stories about their experiences with the social alarm but attempts were also made to elicit stories by questions and follow-up on stories. These stories illustrate both the best and the worst experiences with the alarm.

One of the main ideas about CIT is that if you ask a person to talk about a critical incident, these incidents are more likely to be remembered as they actually occurred than if you just ask the respondents to talk about a theme. However, an interview will never be an objective description of an incident; it will always be a representation of the responder's interpretations constructed within the interaction between the respondent and the interviewer.

The CIT was developed as a technique based on real-life experiences, suited for collecting data that was unarticulated e.g. stories that were never verbalised (Fuglsang, 2017).

22 in-depth interviews were conducted with the different actors in the two municipalities seeking their experiences. In accordance with the previous description of constructivism, it is important to call attention to the fact that the material from the interviews is not just collected, but emerged from the dialogue between the informant and the researcher (Kvale & Brinkmann, 2015). All interviews were tape-recorded and transcribed verbatim.

After transcription, I listened through the transcripts to ensure the quality. Working with the transcripts provided in-depth insight into the material.

I chose to use field notes during the observational study and taped all interviews. Additional notes during the interviews and reflection notes immediately after each interview were made. All this was clarified with the respondents ahead of the interviews. The interviews lasted from 25 to 85 minutes and were taped. In addition, I always had an informal talk with the informants that was not recorded for about 30 minutes immediately before the interview. The two shortest interviews were done with men. When analysing the content of the interviews I found no great differences between the short and long interviews.

After finishing the transcripts, I was left with a large and substantial empirical material.

NVIVO software for qualitative data analysis was used to help organise, analyse and find insights into the material. Utilising NVINO helped to maintain an overview of the extended material.

As described previously, the data collection provided a rich and diverse data material which the three included papers in this thesis only partly realises. The unrealised potential of the material will be further utilised in other settings as anonymised transcripts are kept for further analysis. This partly relates to the care workers' experience with

the social alarm as an unpredictable part of the care pathway, and relatives' stories of their relationship with the social alarm. The materiality and comparative dimensions (however partially utilised in the paper 2) are relevant and exciting themes that could be further brought out in the analysis. However, this was not in focus in this thesis and must be followed up in a different context.

I will now further describe the analysis of the empirical material for the two papers.

### 3.3.8   Data analysis

The field notes and transcriptions were analysed thematically by a stepwise deductive-inductive analysis, as described by Tjora (2012) inspired by Strauss and Corbin (1990, 1997). The analytical focus was on the participant's perspectives and experiences, in accordance with CIT (Butterfield et al., 2005). The first part of the analysis included both papers. The data from the two municipalities were analysed in combination as the purpose was not to compare the two municipalities but rather to achieve richness in the material.

The analysis started with an empirical close coding of the observation notes. The transcripts and the documents were analysed separately, starting with a detailed coding resulting in 68 empirically closed codes focusing on the participants' perspectives. The relationship between the codes from the interviews, observations and written material was then examined. These codes were merged and condensed and grouped into 11 categories. The interview transcript provided the most relevant material, and the field notes from the observational studies and the documents mainly provided important background material for the papers. It was impossible to utilise this huge amount of data completely, and I had to choose what themes to pursue further.

To answer research question two for this thesis, three of the categories were relevant for the second paper: how the social alarm is scripted, how the scripts are articulated, and the taming and unleashing of the social alarm through domestication in caring practices. These categories were further explored, resulting in three broad themes related to expectations and use of the social alarm relevant to this paper. This mainly inductive qualitative analysis was rooted in the actors' perspectives, focusing on their "voices" (Tjora, 2012). The themes emerged from going back and forth between theory and empirical data using theory as a sensitising tool for the analysis. The notions of the script, in particular, provided a theoretical lens for the analysis. The themes that emerged, forming the empirical-analytical basis of the paper were: 1. Expectations related to the physical artefact, 2. How the technology in use is expected to be integrated into the home care services, and 3. Attitudes and values that come into play.

These themes embrace the process of the expectations and experiences with the

interaction between the different actors involved and the technology, i.e. from the time the technology is presented until it is integrated and domesticated or refused by the end user. This is presented in Figure 2, providing an illustration of the three main themes that emerged from the analysis and formed the analytical framework presented in paper 2.
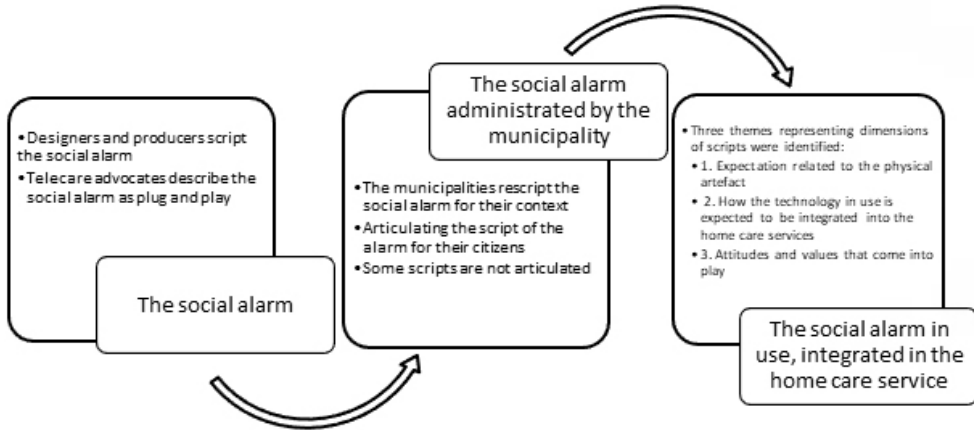


*Figure 2 The scripting process of the social alarm that emerged in this study*

In relation to research question three, three categories formed the empirical-analytical basis for the last paper: "attaching to the alarm"; "interacting with others", and "tinkering and bricolage".

To understand the complex realities of practice, the analysis draws on the theory of co-production, the notions of script, domestication, heuristics, and bricolage. By bridging the different theoretical "constructs" with the results from the analysis, a framework was developed that offers ways of exploring how the co-production between the actors emerges, and how it contributes to different kinds of value for the end-users as presented in Figure 3 (from paper 3). By utilising the theoretical framework as a sensitising tool working with the themes, three narratives emerged. These narratives illustrated the themes from different perspectives and provided rich descriptions, opening up for further discussions in relation to the theory. This illustrates how the social alarm opens up for different co-production practices and contributes to different experiences of safety and independent living when integrated into the daily lives of people in the care service.
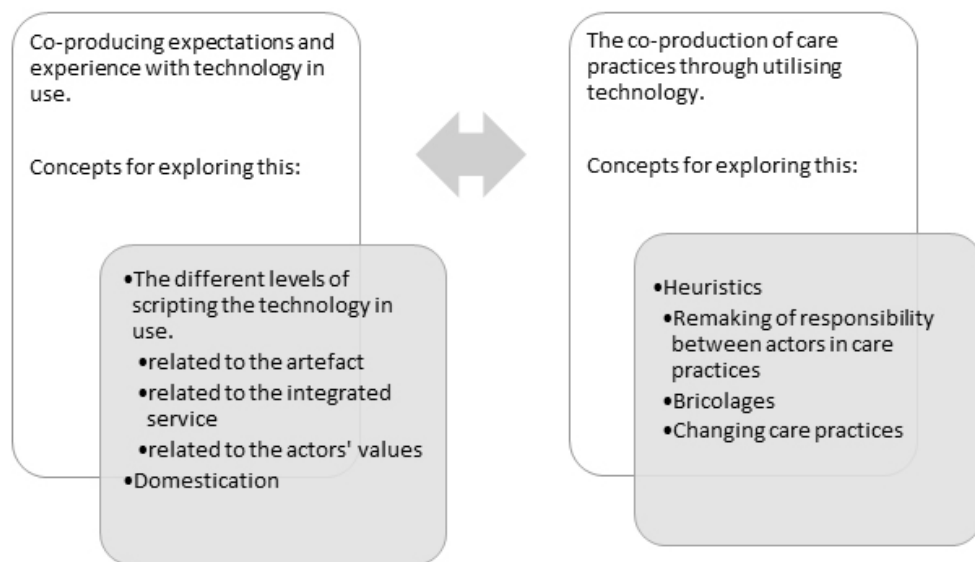
*Figure 3 Theoretical tools for understanding the co-production of technology in caring practices*

The introduction of the term "narrative" here may seem strange since it is a term that has not been introduced previously in this thesis. I acknowledge that narratives are a particular form of qualitative inquiry that evolves around the lived life experiences narrated by the respondents who live them (Chase, 2011). However, for this paper, it was fruitful to present narratives from the extended material as they provided rich stories that illustrated the themes from the analysis as described in the methods chapter in paper 3.

## 3.4 Approvals and ethical considerations

The research project was signed and approved by the Norwegian Social Science Data Services (NSD) that gave consent for the collection and filing of data materials, project number: 38605 (Appendix 3).

For study 1, it was sometimes challenging to assess the quality of the included papers. However, as described earlier, the data extraction sheet provided a valuable tool. One article was excluded from the study due to conflict of interests, as the author of the article had economic interests in the results, and the conflict of interest was not described or assessed in the article.

For study 2, the managers of the home care services in both municipalities approved access to the field. All respondents were adults and competent to give their consent.

All respondents received oral and written information about the study and gave their written informed consent. They were all informed that participation was voluntary and anonymous and that they were free to withdraw their consent at any time with no consequences. However, no participants withdrew from the study. The principles of anonymity were emphasised in written and oral information. No names were given in the transcripts.

## 3.5   Trustworthiness and methodological considerations

In this section, the trustworthiness of this study will be reflected on, and limitations based on the criteria of Malterud (2001) and Lincoln and Guba (1985) for assessing quality in qualitative inquiries will be addressed. It is important for me as a researcher to be critical to my work and question findings and interpretations. The awareness of my position as a researcher has helped me to acquire insight into biases and preconceptions, the significance of contextual factors and the search for the respondents' experiences.

To address the trustworthiness of this study, its credibility, dependability, transferability, reflexivity, and confirmability are addressed, thus assessing internal and external validity. "Internal validity asks whether the study investigates what it is meant to, whereas external validity asks in what contexts the findings can be applied" (Malterud, 2001, p. 484).

### 3.5.1   Credibility and dependability

Credibility can be compared with internal validity and concerns the accuracy of the study, while dependability involves an assessment of whether the decisions and methodological choices are appropriate for answering the research questions (Lincoln & Guba, 1985).

Triangulation is one way of increasing the probability of credible findings of a study since multiple sources might provide a more robust description (Lincoln & Guba, 1985). I used a qualitative method triangulation including a systematic integrative review, participant observations, interviews and studies of documents. As I started with the review study, I was able to explore the findings from the first study further when conducting the second.

Another way of increasing credibility is by involving others in the research process as critical reviewers (Lincoln & Guba, 1985). Both study 1 and 2 were repeatedly presented to my group of supervisors in addition to groups of colleagues and three different article-writing groups, giving an outside view of the choices made and the data included. Peer debriefing exposed me as a researcher to others questioning different aspects of the research. This heightened my awareness as a researcher and provided valuable critiques of the work (Lincoln & Guba, 1985) All parts of the research process were repeatedly presented and discussed with my supervisors. My supervisors have all been

actively involved with all parts of the research processes; however, their involvement in the different parts of the process has varied. This relates to their fields of expertise as well as being a consequence of a practical approach. Journal reviewers have also examined the papers. All three papers are submitted and assessed by two or more reviewers in high ranked journals.

All interviews were tape recorded. However, during one interview the recorder stopped working after 15 minutes. This was discovered in the middle of the interview, after about 40 minutes. The recorder was then restarted, the respondent and I reconstructed our conversation and we finished the interview. The respondent was a healthcare worker. Immediately after the interview, I sat down and wrote down everything I could remember from the interview. These notes and the recorded material were later compared. I discussed with my supervisors whether the interview should be repeated, but we decided that it was not necessary as I had a rich material, including transcripts from this interview.

Critical Incident Technique proved to be a relevant method for the interviews as it provided a rich data material. However, I found it to be a demanding technique requiring good communication skills to bring to the fore rich stories of people's experiences.

In study 2, immediately after having completed two interviews, a skilled researcher/nurse with experience in qualitative research transcribed the interviews according to my instructions. We then had a meeting to discuss my communication with the respondents and interviewing techniques on a meta level to validate and increase interview quality. The main change based on this discussion was that long pauses were left before follow-up with comments or questions. This provided time for reflection and often made the informants elaborate further on their stories.

When going through the transcripts, I discovered that a larger number of richer stories had been obtained in the second municipality than in the first. There might be several reasons for this. Firstly, this was the first time I had used the CIT as an interview method, and I had gained more experience with it when I used it in the second municipality. Secondly, I had developed my communication skills due to the discussions mentioned above. Thirdly, the second municipality was in a different part of the country, with a different and more open culture. Finally, it might just be a coincidence.

There is a duality in having someone else doing the transcripts. On the one hand, transcribing might be a valuable way of getting to know the data thoroughly. On the other hand, it offers the possibility of a more objective transcription as the external transcriber is not affected by the context of the interview. For me, it provided a new way to approach the material, as reading the transcripts while listening to the tape allowed me to take a step back and free myself from the interpretations made during the interviews.

Two different people made the transcripts and I was concerned that this would affect the results. Exact instructions were therefore given to make sure they worked with the material in the same way. According to Kvale & Brinkmann (2015), this is important in order to obtain high quality transcriptions. When comparing the work, no visible differences were found between the ways the transcripts were performed.

To obtain dependability, the researcher should strive towards assessing all steps of the research process. This also involved avoiding an early closure, preventing the researcher's preconceptions steering the analysis instead of the material. Additionally, the researcher should endeavour to find both negative and positive data (Lincoln & Guba, 1985).

### 3.5.2   Transferability

Transferability can be compared with generalisability. It is a well-known critique of qualitative research that the results are not generalizable. In fact, the title of Lincoln and Guba's (2000) book on the subject is: "The only generalisation is: There is no generalisation". However, this thesis aims to provide what Malterud calls "ambitions of transferability beyond the study setting" (Malterud, 2001, p. 483).

This thesis emphasises and shows how context matters for the understanding of technology in use in caring practices. In fact, one of the major findings in this thesis is that we need to study technology in use in the context in which it is embedded. Even so, the discussion of transferability is still relevant, as research studies should provide knowledge beyond the local context of the articles included in study 1 and the two municipalities included in study 2. According to Lincoln and Guba (1985), purposeful sampling and thick descriptions may contribute towards transferability. This thesis provided a purposeful sampling aiming for diversity in study 2. The inclusion criteria were discussed with my supervisors and with the care manager in both municipalities to obtain as relevant criteria as possible. I was striving for thick descriptions in study 2, and this provided context-richness in the material. However, the thick descriptions were not fulfilled in paper 2 as a result of the review process.

Providing a presentation of a study's demographic context enables the reader to ascertain in which settings the results might be relevant (Malterud, 2001). I believe the study is relevant for other settings within municipal caring services involving simple established technologies. However, it is probably less relevant for private contexts involving complex advanced technological innovations. Even so, the framework provided might still prove relevant.

Following Malterud's (2001) recommendations of working thoroughly with the material to gain in-depth knowledge of its content made it possible to ascertain what parts of the material were relevant in answering the research questions. NVIVO provided a valuable tool in this work.

### 3.5.3  *Reflexivity and Confirmability*

Reflexivity relates to how the researchers' background and preconceptions affect the research (Malterud, 2001), and confirmability can be compared with objectivity (Lincoln & Guba, 1985). According to Chell (2014), the researcher must be aware of and investigate his/her preconceptions related to the theme of the interview, in order to be able to understand the respondent.

When doing qualitative research, the researcher is indeed "the instrument of inquiry," (Patton, 2015, p. 3). Furthermore, I must relate to a world that has already been interpreted by the participants. However, will it be possible to capture the experience and "truth" from the participants?

I can never view myself as a researcher without seeing myself as a part of the cultural, social, professional and political context and society in which I am embedded. As a researcher, all of my lived life, all my experiences, competence, personality, sensitivity, how I engage in the research work, my pre-understanding and experiences of the social alarm and caring practices make a difference in the relations between the respondents, the technology and myself. A researcher can never be completely value-free and objective (Malterud, 2001).

I align with the interpretivist view that the researcher and the respondents also form loose networks that influence each other reciprocally (Laverty, 2003). Since I am a registered nurse and have experience with practical care work, my theoretical and empirical background from nursing is something that affects how I have designed this study, what I am searching for and how the data collected are interpreted. Another example is the going back and forth between theory and practice that the work with the thesis has involved, following the principles of the hermeneutic spiral as described earlier. Theoretical framing and input will inevitably affect the ways I view and conduct the dialogue with the participants in the caring practices.

It is important to be conscious that the dialogue with the respondents, the observations and the written materials takes place on different levels. I have related to Skjervheim (1996), and his reflections on how a dialogue is about the content, the emotions and the relations between the participants. To go into a dialogue involves being engaged in the other, listening to the other and listening to what the other says, what they do not say, how they say what they say, how they act etc. As described earlier, I can never be objective since I can never objectify myself. However, as Skjervheim (1996) emphasises, we do tend to objectify the other and need to be aware of this.

Although there is no special focus on power within this thesis, I do recognise that there are differences related to power between the different actors involved, as described

earlier. When doing the empirical work for this thesis I was sensitive to these aspects of power in the dialogue between the respondents and myself as a researcher.

The awareness of these factors is cardinal for the quality of the research conducted. I strived to identify the voice of the respondents and the empiric context but acknowledged that who I am, and all my previous experiences have inspired me in choosing the questions asked in this thesis. As a scientist, acknowledging preconceptions and social location, and to "treat that location, its prejudices, and its blind spots as a matter of critical inquiry in their own right" is vital, as described by Law (2016, p. 35).

According to Gadamer (2004), our understanding occurs through the universal medium of language. The aim is to make the invisible visible through language, where meaning emerges through the interpretative interaction (Laverty, 2003). My use of language and the way we communicated through language within the culture was important in terms of preconceptions and ability to be in a dialogue with the respondents.

My background and position will affect the research in respect of my ability to sharpen the focus, making choices regarding methods, prioritising findings and how I choose to lift results to the forefront. In line with Malterud (2001), I have endeavoured to assess my impact as a researcher in all parts of the process, and to describe this as clearly and adequately as possible in this thesis, thereby attempting to provide as valid a representation of the situation as possible. My background and the PhD-programme of service innovation in which I am enrolled affects the theoretical basis of the thesis, resulting in a focus on care and public service innovation research. At the same time, I wonder whether and how my background as a nurse affected the data collection. The end users in this study all stressed how grateful they were for the home care service they received. I sometimes wondered if they emphasised this more because they somehow viewed me as part of the system. I therefore always explained my distance to the service and my role as a researcher as clearly as possible.

I chose to conduct this study within municipalities that I had some relationship to for practical reasons. These municipalities provided a diversity in culture, organisation and demography that provided a rich data material. I grew up and currently live in one of the municipalities, and although I did not know any of the respondents in advance, I spoke the same dialect and knew the culture and codes of the place quite well. I could thereby respond and resonate with local expressions and stories, which made it easier to provide an open environment for the respondents to tell their stories. This enabled me to interpret the material. Some members of my family originate from the other municipality, and we have a holiday home there. This is a small community, and the respondents repeatedly asked how I came to do the research in their community. I then told them where my family came from and where my grandfather used to work as a

teacher. One respondent spontaneously burst out: "*But then you are one of us, then I can really talk to you*". I experienced that my background provided me with an access to the field. At the same time, I was aware that this "closeness" to the field should not affect the respondents' ability to speak freely.

Multiple researchers doing a parallel analysis of the same material might strengthen the relevance and validity of an analysis (Malterud, 2001). This was not applicable to me as the guidelines for the PhD programme I participated in require and recommend sole authorship of the papers. I was, however, fortunate to have four very accomplished supervisors that provided peer reviews during the whole research process. Consequently, even though this thesis is an individual work, input and feedback from my supervisors have added to the relevance and validity of the thesis.

All transcripts both of the interviews and the fieldwork are anonymised, making it possible for others to audit them without breaking confidentiality. For the systematic integrative review writing, a study protocol provided insight into choices made by the researcher and provided transferability. The protocol, inclusion criteria, data extraction sheet and analytical choices were thoroughly discussed with two of my supervisors before conducting the study.

Using NVIVO provides a lucid way of checking whether the findings are grounded in data, as the program provided a detailed overview of the original transcripts while working with the analysis. The analysis was assessed by going back and forth between the different phases and repeatedly going back to the original transcript to verify the context and the respondent's descriptions and interpretations. Moreover, in both studies, I have strived to present the data analysis in a transparent way.

# 4. Results

The results from the three appended papers are summarised in this chapter. I will now give a short presentation and overview of the three papers, including the main findings and contributions presented in each paper. Table 7 provides an overview of the papers and their main contributions.

| Title of paper | Paper 1<br>"The personal emergency response system as a technology innovation in primary health care services: an integrative review." | Paper 2<br>"Maybe we should talk about it anyway": a qualitative study of understanding expectations and use of an established technology innovation in caring practices. | Paper 3<br>"Older people negotiating independence and safety in everyday life using technology: Qualitative study" |
|---|---|---|---|
| Main contribution | The paper provides an overview of previous research related to the social alarm in use. The results indicate diverse results in the included studies. It illustrates how the social alarm contributes to safety and independent living for users of the alarm. However, there are also unforeseen consequences and possible improvements. The social alarm integrated into practice changes the users' everyday life and even affects their identities. The complexity of practice needs to be accounted for. This calls for a recognition that place and actors matter, including a sensitivity to technology as an integrated actor. | This paper contributes by establishing that the script of the technology in use must be understood as multidimensional and offers a framework for doing so. It reveals how articulation of the scripts proves important for understanding the practice. This provides tools when integrating and using technology in caring practices. Further, it identifies how using the technology leads to taming and unleashing of both technology and actors. The study offers an increased theoretical understanding of how and why technology is unpredictable and works differently in different contexts. Moreover, it stresses the importance of avoiding expectations of plug-and-play in a reality of complex interactions between different actors. | The main contribution of this paper is an integrative framework, utilising "takes" from innovation studies, and STS. This framework provides ways for exploring and understanding technology in use integrated into end users' lives. Three narratives demonstrate how actors utilise the technology and perform heuristics workabouts, bricolage and optimising practice enabling them to live independently and safely at home. This allows them to utilise the potential of this established technology. Further, the framework contributes theoretically by contributing to ways of exploring co-production by combining aspects from STS and Service Innovation. |
| Publishing | Published in JMIR. Journal of Medical Internet Research | Published in BMC Health Services Research | Published in JMIR. Journal of Medical Internet Research |

*Table 7 An overview of the three papers included in this thesis*

I am the sole author of all three papers, conducted the studies and wrote all parts of all papers. All papers are published in high ranked journals focusing mainly either on health care services or use of technology within health care services. Service innovation is in central focus within health care services today, and the choice of journals is reflected in the need to contribute to knowledge about service innovation within the healthcare sector. My background is in health care services and this is the empirical framing of the thesis. Thus the papers contribute to the field of caring research by providing interdisciplinary insights into how we can explore and develop knowledge of understanding technology innovations in use in caring practices. This makes it possible to learn across disciplines since the knowledge base of public service innovations and STS contributes fruitfully to the caring field. However, the papers also aim to contribute empirically and theoretically towards public service innovation as described in the concluding chapter of this synopsis.

## 4.1 Paper 1

Stokke, R. (2016). The personal emergency response system as a technology innovation in primary health care services: an integrative review. *Journal of Medical Internet Research*, *18*(7).

To answer research question 1, an integrated systematic review of the use of the social alarm from a user's perspective was conducted, as presented in paper 1. As described earlier, the Personal Emergency Response System (PERS) is the term used in this paper.

Technologies integrated and used in caring practices vary from simple to complicated, from pilot projects to established technologies integrated into practice. As described in the theory chapter, it is important that we distinguish between the different technologies and study them within the context in which they are integrated (Pekkarinen & Melkas, 2010). It was, therefore, relevant to study the social alarm in use rather than focusing on the existing literature on technology in use in caring practices more generally.

This paper presents an overview of the body of research, summarising key elements of this widely used and well-accepted technology in use in caring practices. It describes how different actors experience the social alarm in use, and what is important for them as regards accepting and using technology in community care services. The review also gives an overview of the development of research on this topic.

The paper presents how research literature describes the use of the social alarm focusing on the users' perspective, thus exploring how different actors experience the technology in use and how it affects the complex interactions between multiple actors in caring practices.

An integrative review is a rigorously developed review method that enabled me to summarise the empirical and theoretical literature on the social alarm. This is done by conducting systematic searches in relevant databases as described previously. The review incorporates peer-reviewed articles of diverse methodologies in order to capture findings, the context, processes and subjective elements of the topic and to pinpoint the overall research contribution in the history of the social alarm. The aim is to synthesise various perspectives of the social alarm in use into a systematic knowledge base, providing a point of departure for further research in the field.

In this paper, I found that the research on the social alarm in use is derived from different scientific fields. User innovations are mainly studied from an economic and management point of view. According to Peine & Herrmann (2012) this view focuses on value, knowledge sharing and incentives in particular. I found in addition that several articles included in the review, especially earlier studies that focused on outcome and effects, have primarily a positivist approach. Newer studies differentiated this impression and included more complex and interpretative studies.

The major finding was that the social alarm contributes to an experience of safety and independent living for users of the alarm. However, there are also unforeseen consequences and possible improvements in the device and the integrated service. The review illustrates how this rather simple and well-established technology in use interacts with the actors involved, creating changes in daily living and even affecting their identities. The social alarm has proven to be sustainable over time, and there might be many reasons for this, as the paper describes. However, the paper also provides an illustration of the complexity of practice and acknowledges the diversity in the user group, and how the technology contributes to changes in caring practices.

This study argues for an approach to telecare in which the complexity of practice is accounted for, and shows how the plug-and-play expectations advocates of technology innovations tend to generally represent a simplification of the reality. This calls for research that acknowledges that place and actors matter, as does a sensitivity to technology as an integrated part of complex caring practices.

## 4.2  Paper 2

Stokke, R. (2017). "Maybe we should talk about it anyway": a qualitative study of understanding expectations and use of an established technology innovation in caring practices. *BMC Health Services Research*, *17*(1), 657.

Paper 2 answers research question 2 by using the notion of the script and describing technology as theoretical tools.

This paper explores how the different actors in home care services interpret the aim and purpose of the social alarm. It also examines how their expectations influence their experience and the way they relate to, perceive and articulate these expectations of the technology in everyday life.

In addition, the paper explores whether the social alarm as a well-established technology is taken for granted in the care service, leaving the script unclear, unarticulated and thereby backstage when experienced by the actors.

The empirical findings demonstrate that even though the social alarm represents a simple and well-established technology, expectations for its use are complex and multidimensional. The notion of the script provided empirical contributions by serving as a relevant tool for exploring these expectations and for understanding how actors interpret and adapt their practices of using the technology. The analysis revealed that the scripts of the social alarm are multiple, and the paper offers a framework for studying the scripts of technologies in caring practices as presented in Figure 2. This figure also provides a theoretical contribution to public service innovations. We need to address the scripts of a technology both related to the artefact, how the technology is integrated into a service network and what values come into play. This enables a more comprehensive understanding of how technology opens up for different interpretations and puts values in play.

This paper also reveals how the scripting of the social alarm was partly unarticulated and made tacitly, thus identifying how this can lead to unpredictable practices. The scripting and articulation of the technology proved important for understanding the complex reality when the social alarm was integrated into home care practices. The study offers an increased empirical understanding of how and why technology is unpredictable and works differently in different contexts. Moreover, it stresses the importance of avoiding expectations of plug-and-play in a reality of complex interactions between different actors.

## 4.3 Paper 3

Stokke, R. (2018). Older people negotiating independence and safety in everyday life through telecare in caring practices: Qualitative study. *Journal of Medical Internet Research 20 (10)*.

Technology innovations in caring practices have proven to be more difficult than expected and technology must be understood as an integrated part of complex practices. This paper adds to the knowledge base of the complex and diverse experiences of people interacting with established technologies.

Paper three answers research question three. It explores and describes the different

actors' in-depth experience with the social alarm integrated into care services. Thus it examines how the different actors in the service deal and cope with this technology, and how the interaction with the technology affect their way of living and feeling safe and independent.

Furthermore, paper 3 explores how users of the social alarm utilise and work with the technology. A better understanding of the interrelationships between human actors and technologies in caring practices is thus provided.

This paper addresses the research gap in public service innovation research related to understanding the micro context of co-production when technologies are integrated into caring practices.

Public service research describes a potential co-production of services by utilising user-experiences. By exploiting concepts from STS this paper offers tools to explore what really happens when different actors utilise technology when co-producing caring practices.

The paper found that caring services are always co-produced between the actors involved. The results reveal how co-production assumes different meanings and forms according to how actors utilise the technology, perform bricolages and optimise practice to co-produce independent and safe living. The results reveal the need for theoretical tools for understanding a practice with unexpected results and interpretative flexibility.

By utilising theoretical 'takes' like scripting, domestication, heuristics and bricolage, an integrative framework is provided for exploring the co-production of caring practices involving technology in use in caring practices as presented in Figure 3. The model provides tools to unpack and articulate the process of co-producing services. Moreover, it shows how technology innovation changes the dynamics between the actors and rearranges caring practices. Additionally, it opens up for unexpected results and bricolages as an integrated part of technology innovations.

## 4.4  Summing up

The overall aim of this thesis is to explore how different people integrated with an established technology innovation in use in caring practices as part of their everyday life. It also examines how the integrated technology affects the interaction between them, the service, and the technology and the co-production of care. The thesis contribute to knowledge development in understanding what happens in use of an established technology in caring practices by combining different theoretical perspectives from STS with public service innovation. This provides us with frameworks for exploring this co-production of care between people and technology on a micro level.

The three papers presented above answer the three research questions presented in the introductory chapter. Additionally, each paper contributes to the aim of the thesis and collectively advances our understanding of established and integrated technological innovations integrated into caring practices. The papers provide a combined exploration and together provide a comprehensive picture of the work that makes the social alarm work and contribute to experiencing safety and independent living.

Paper 1 addresses the first research question in this thesis by providing an overview of earlier research in the field. Above all, this paper reveals a diversity in the results of the included papers illustrating the need for more in-depth exploration of the practice of this established technology in use in caring practices. Paper 2 addresses this need and focuses on the meeting of expectations and experiences and how the script metaphor provides valuable tools for exploring this, thereby addressing the second research question. Paper 3 follows up on this and further explores through narratives how different practices are played out and how care is co-produced through older people interacting with the technology and other actors to ensure a safe and independent living, as addressed in the third research question. The papers present a framework for exploring this co-production, and thereby provide an in-depth understanding of the work included in making technology in use work in caring practices.

The papers are interconnected as they all contribute towards an in-depth understanding of the social alarm in use.

# 5. Discussions of the research contributions and implications

This section summarises and discusses how the thesis seeks to provide empirical and theoretical contributions to understanding the interactions with established technology innovations in use in caring practices. This encompasses how actors involved in the use of the social alarm integrate the technology as part of their daily living and how the integrated technology affects the interaction between them, the service, and the technology. A further objective is to contribute theoretically to the field of public service innovation in which this thesis is positioned by providing frameworks for exploring the interaction between people and technology in co-producing caring practices.

In this chapter, I will discuss this by first elaborating on how it is relevant to study technology innovation in caring practices through public service innovation, and how aspects from STS contribute to the research field. In addition, I will introduce a framework, based on the frameworks presented in papers 2 and 3, to explore established technology in use. Based on this framework, essential terms, findings and context that contribute to the knowledge base are discussed.

## 5.1   Studying technology innovation in public services

The introduction to this thesis frames the theme, describing the demographic changes with an ageing population and a de-concentration of healthcare services towards primary care. It further describes how this has led to increased pressure on municipal caring services and how political aims for increased technology innovations in caring practices add to the picture. Technology innovations in caring practices are advocated as providing triple benefits: reducing the pressure on municipal health care services, providing an economic gain for society, and better care for dependent older people enabling them to live independently and safely in their homes. However, as described, these goals have proven more difficult to reach than expected, and technology innovations often never integrate into regular use.

I have therefore argued that we should start by gaining knowledge of what happens when established technologies are integrated into caring practices, as this thesis attempts to show by focusing on an established, successful and simple technology, which the social alarm is described as being.

There is an underlying expectation from society that technology innovations are rather straightforward, as illustrated by the quote from the Minister of Health and Care Services at the beginning of this thesis. It is tempting to use the famous slogan from Nike "just do it" to describe the political expectations of integrating technology into caring practices. Traditional innovation theory, which focused on the innovation of goods mainly in the private sector, might stand as a representation of this way of valuing innovations. We thus view these technological innovations as a linear process that is rather predictable and straightforward.

Many of the articles included in study 1, the integrated review, are rather simple studies representing this view and way of working. The social alarm in use contributes to safety and independent living for the users. However, most of the papers included in the review describe diverse results with unforeseen consequences and possible improvements in the device and the integrated service (Stokke, 2016). Many of the included studies captured only fragments of how the social alarm in use integrates into caring practices with rather diverse and fluctuating results. As a result, we can see a research gap that requires further investigation of the complexity of the situation in order to gain more in-depth knowledge. By choosing qualitative research triangulation, study 2 provided a rich data material giving a more comprehensive picture of what is going on, as opposed to many of the articles included in paper 1.

Over the last decades, the innovation field has developed. More recent innovation studies have turned their focus from traditional goods innovations to service innovations, primarily in the private sector at first. Later, the public service innovation research field emerged, acknowledging that innovations in public sector fundamentally differ from innovations of goods in the private sector since the public sector tends to be more complex, dealing with wicked problems often with competing interests (Fuglsang & Sundbo, 2016; Hartley, 2005).

Public service innovation today acknowledges that the users of technology innovations are an important part of the innovation process and that context matters. Moreover, that the services are always co-produced between the different actors involved. The concept of co-production provides tools for understanding how services are a collaboration between the actors involved (Fuglsang & Sundbo, 2016). Public service innovation research has so far mainly focused on the organisational and administrative level. However, this thesis contributes by providing insights into how co-production is relevant for exploring the micro level, focusing on the interaction between the actors involved with the social alarm.

Co-production provides an analytical tool for studying the interaction between the human participants. However, public service innovations do not offer tools for focusing

on the role of technologies in the interaction. From STS caring research and practice, we know that technologies integrated into caring practices affect the service and change the practices. There are always interactions between the actors, including the technology integrated into caring practices as an actor as illustrated in Figure 4.
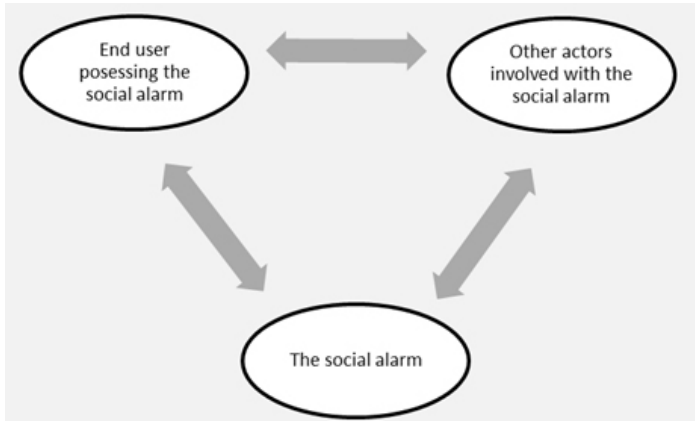


*Figure 4 How Technologies like the social alarm interact with human actors within a context*

I found that public service innovation research does not fully acknowledge the materiality of technology in use in caring practices and that we must look outside the innovation research field to provide tools.

When innovation literature talks about materiality, this entails innovations of goods, addressing goods as an outcome – a black box that might be implemented – not as something that needs to be integrated into the analysis. STS focuses on materiality and demands that technology and other artefacts are analysed in the same way as human actors. Thus the focus is on the interaction between all kinds of actors, including technology as an actor (Fuglsang, 2013; Law, 2010). A technology always needs to be addressed, and by including aspects from STS, it allowed for the inclusion of the technology's role in the interaction in the analysis.

As described earlier in this synopsis, different scientific fields have paid interest in studying technology innovations in caring practices. They all contribute to different ways of studying aspects of the practical reality with different lenses. Combining elements from different fields, (as in this thesis), is relevant for developing a scientific field further (Kuhn, 1977; Nicolini, 2012). Including concepts from STS allows for the possibility of developing frames for exploring the co-production of technology practices on a micro level.

The way STS is utilised in this thesis adds to the public service innovation field by allowing the interactions between the technology and the human actors into the analysis. This means taking the materiality of the service innovation seriously, as well as viewing actors involved in a technology innovation as a web of relationships all affecting each other, described as "the seamless web" in STS literature (Bijker & Hughes, 2012). This emphasises technology as something fluent and interwoven with actors in complex and multiple ways. In contrast to some public innovation authors (e.g. Alford 2016), my intention was not to show how distinctions between different types of co-production can be made, but rather to state the complexity and contextuality of the phenomenon that the actors engage with. This thesis focuses on networks and interactions between the actors, including the social alarm as an actor, and how this is constructed and inter-related, including my role as researcher. This provided the concepts of co-production with new tools for exploring these complex realities.

## 5.2   Framework for exploring the work of technology in caring practices

Through the work with this thesis, I have aimed to develop theoretical tools for exploring technology innovations in caring practices that take the complexity of the field into account, thereby contributing to the public service innovation research field. Co-production opens up for studying the interactions between the actors and thereby the work of making the technology function. However, we need aspects that open up for analysis of what goes on within the co-production between the actors on a micro level. This is done both in paper 2 and 3 through frameworks that include different aspects of STS and public service innovations, thus providing ways of widening our understanding of how we can explore and understand expectations and relations to technology in caring practices. Paper 2 offers a framework for exploring how the expectations towards a technology are scripted. In addition, it portrays how these expectations merge with the experiences of the technology in use in established caring practices. The main contribution of this framework, as described in the previous chapter, is providing analytical tools for understanding how scripts are multiple, and that they need to be addressed for us to understand the practice, as part of the scripting tends to be sparsely articulated.

Paper 3, widens our understanding and provides ways of exploring the work of utilising technology in caring practices by providing a framework that utilises scripts, domestications and heuristics as theoretical tools for exploring the co-production of the social alarm in use.

I have now developed this work further aiming to provide a more robust framework suitable for exploring other technology innovations in caring practices that are perhaps less established than the social alarm. Figure 5 presents an integrated theoretical framework for exploring technologies in caring practices.

This framework provides an extended combination of the frameworks presented in paper 2 and 3. Part of the framework is addressed in only one of the papers, while others appear throughout both papers and develop over time. Figure 5 illustrates a united theoretical framework based on the papers in this thesis, aimed to be applicable outside the context of the social alarm.
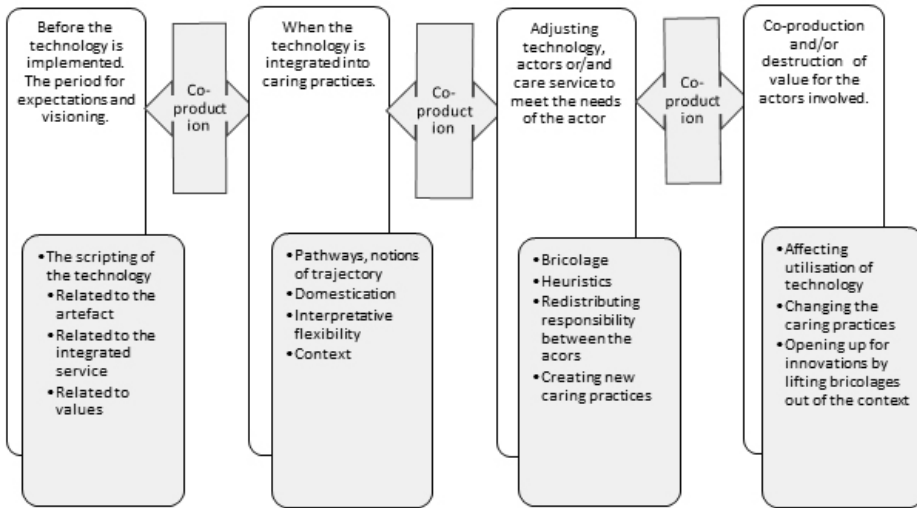


*Figure 5 A framework for exploring technology innovations in caring practices*

The framework consists of four double columns with arrows between them. The arrows are central as they represent the co-production that always takes place in the interaction between the human actors and the technology in caring practices.

By looking at the framework in isolation, it can be used to follow an innovation process of technology innovations. However, this thesis does not focus primarily on the innovation as a process. Here, the framework provides tools for understanding the co-production of an already established and integrated technology.

As illustrated in Figure 5, technology in use in caring practices is presented as a rather linear model. However, this is for analytical purposes only, and I must stress that in reality, these are dynamic processes that alternate back and forth thus co-producing care.

## 5.3   Utilising the framework for exploring co-production of expectations

The first double-column in Figure 5 opens for an analysis of the co-production of expectations towards the technology and service. As described here and discussed in paper 2, the technology was found to be scripted in different dimensions, related to the artefact, the integrated service, and to values for the actors involved.

The script metaphor allows a focus on exploring expectations towards a new technology, but it also opens for focusing on continuous expectations towards an already integrated technology as with the social alarm. Different actors have different and shifting expectations towards a technology: both when and how to utilise the technology, and the values that come into play related to the artefact. Examples of this are illustrated in paper 2 and 3.

If we do not focus on the co-production of these expectations, we risk missing these intricate and complex interpretations from the actors involved. It is therefore relevant to focus on expectations even with established technologies. In addition, the first column of Figure 5 is vital when exploring new technology innovations as the actors' expectations are vital for how they experience the technology when integrated. For example, if you expect the social alarm to provide you with safety when you are active outdoors, you might be disappointed if you find the alarm only works inside your house. This might lead to the person failing to use the technology or that the technology has another effect than intended, leading to the person becoming passive and staying indoors. Instead of creating value in use, we then see a destruction of value. To be able to analyse these expectations, they need to be addressed. What parts of the technology in use have become frontstage and addressed, and what parts become backstage and tacit affect how we interpret and utilise the technology.

I found that a lot of the scripting of the social alarm was unarticulated and thereby backstage. The frontstage script of the social alarm describes a technology that is easy to use and when integrated, emphasises the feeling and state of being safe (Stokke, 2017). This thesis illustrates how the actors involved feel attached to the alarm and express great satisfaction and enthusiasm for it. The story of Jon provides an example that differentiates this attachment, as he described how he struggled to accept the backstage script of the alarm as being suited for dependent and frail people. By focusing on the different dimensions of the script, the framework presented in Figure 5 offers tools for addressing what tends to be backstage and unarticulated.

## 5.4 Utilising the framework for exploring the work of technology in use

The second double-column in Figure 5 provides analytical tools for focusing on the co-production of care services between the actors involved with the technology in use. This relates to how the technology in use integrates into the practices and the planned pathway of caring practices.

Focusing on the domestication process allows us to analyse the process of negotiations and the struggle between the technology and the actors involved as partly described in papers 2 and 3. By focusing on the domestication of the technology, we are able to analyse what kind of practices are co-produced.

As described in paper 2, these technology practices also need to be addressed and articulated, and to become frontstage, acknowledging that unarticulated practices tend to be unpredictable and indescribable. Utilising the analytical tools provided in Figure 5 opens up for articulating these sides of the technology in use that tend to be backstage, allowing us to focus on aspects of the technology in use that need to be addressed.

The notion of domestication describes how domesticated technologies have a recognisable repertoire, and a "normal" problem-solving takes form (Silverstone, 2007). The social alarm must to a large extent be recognised as a domesticated technology, as it is established and widely integrated into the caring services with a recognisable set of expectations and use. The social alarm might also provide an illustration of how a technology never "closes", leading us to the third double-column of Figure 5. Here we focus on analysing the co-production that takes place when adjusting the technology, and the relations between the actors or the service.

The data in this thesis, as presented earlier in this synopsis and in paper 3, enable us to see that different heuristics emerge as the various actors interpret and experience (domesticate) the technology in use differently. Heuristics merge script and domestication and help us to analyse how people relate to the technology and technology to the human actors (Pols, 2017). The social alarm is recognised with a constant adaption, both related to the artefact and the service. However, this also illustrates how we can work towards the quality improvement of practice, through continuous adjustments in practice or bricolage.

How we acknowledge and treat the bricolages is decisive for whether they might contribute to quality improvement and open up for further innovation in the service. By addressing the bricolages and lifting them out of their context, we might be able to utilise them for quality improvement, as described in the theory chapter. Paper 3 provides an example of how bricolage might affect the window of time for utilisation of technology through collaboration, as shown in the narrative of "Peter and Marie".

If a technology is domesticated and integrated into a caring practice, we might see that the human actors involved and the technology co-produce value for the actors. By focusing on the heuristics, we can assess whether the technology and the human involved co-produce value for the user. Perhaps the interactions lead to a destruction of value, as we see in the empirical example from paper 2, where end users of the social alarm never activate the alarm, fearing that their needs are not sufficiently urgent.

As described earlier, technology in caring practices tends to involve a redistribution of responsibility between the different actors, creating changes in caring practices. We need to analyse these changes and redistributions to understand how the technology affects practice, and how the practice affects the actors involved with the technology. In the case of the social alarm, we recognised that the social alarm contributed to a redistribution of responsibility for the safety of the person using the social alarm over to the social alarm, the end user and the care worker.

This thesis allows a focus both on the interactions with technology and the human actors, thereby acknowledging that they are all actors affecting the practice and vice versa. Moreover, it illustrates empirically how even rather simple established technologies entail complex realities when integrated into caring practices.

In this thesis, I have talked about technology innovations and established technologies, and how the social alarm should be understood related to technology innovations as a phenomenon may seem implicit. The social alarm as an artefact was a technological innovation when launched in the 70s. The third generation social alarm device with possibilities to integrate new types of alarms illustrates how innovations are always a process that is affected by changes in context, actors, needs, politics etc. This may result in new innovations related to the device, and the service is in a constant process of development. The social alarm is also repeatedly introduced to new contexts, as both a technological and service innovation. Simultaneously, the social alarm seems domesticated and well established. As one of the respondents expressed: *"There is nothing to it, it just works".* Even so, when looking in-depth at the social alarm in use, there are still many challenges to make it function as aimed. This illustrates how even an established technology in caring practices, like the social alarm, is at the same time both an innovation and something established.

## 5.5  Context

Even though the social alarm has been used for 30 years in caring practices, more recent studies still show challenges in use and unpredictable results as described in paper 1. This indicates that even very simple, established technologies are part of complex caring practices.

Municipality caring services are pressured by regulations, laws and governance, and by the demands of citizens with varying and often conflicting interests. This complexity is described as stemming from the fact that public services often involve complex organisations and wicked problems. The municipalities are responsible for the public good. This involves different needs and interests, a planned pathway of care, limited resources, serious problems, inequality between actors and power in relations.

We need to take the context seriously since a technology must be viewed and adapted within context (Fuglsang, 2013). Focusing on the context in addition to the script and domestications opens up for understanding how interpretative flexibility comes into play.

The social alarm represents an example of how context matters. I argue that technology must be studied within the context in which it is embedded, as context matters in terms of how a technology is implemented, accepted, and integrated into a practice. Context is changed by technology, and technology works differently within a different context – different people, resources and culture. Technology is an integrated part of practice and must be studied as such.

One of the main empirical findings in this thesis is that we can hardly ever talk about one practice; there are always different practices, involving different actors in different contexts at different times. This might be one of the most important reasons why, when reviewing the research on experiences with the social alarm, the results are so diverse. Different cultures, communities, and actors with different living situations, health situations and interpretative flexibility lead to different experiences with the same technology. Consequently, we experience different problems and as well as different successes when integrating the same technology into caring practices. It is important for public managers to take this into account when they employ technology in their context. Utilising the frameworks presented in this thesis allows them to analyse how the technology integrates into the caring practices at hand. In this thesis, the various living situations provided an example of how context creates different uses and approaches to the social alarm. There were large differences in the use of the social alarm between those living in their original homes as opposed to those living in care flats.

Summing up, Figure 5 provides a framework for exploring a technology integrated into caring practices by utilising the tools described above. I found that STS and public service innovations complement each other in exploring the co-production of caring practices involving technology in use. Even though both the metaphor for scripting and domestications are described as relational, and indeed they do focus on the relationship and the process of interacting with a technology, the co-production addresses this process in a unique way.

# 6. Conclusions, practical implications and further research

When writing the conclusion of my thesis, a scene from the brilliant animated movie "Shrek" comes to mind. "Ogres are like onions, we both have layers", says Shrek the troll to his annoying companion Donkey, the donkey. What you see on the outside is only a part of what trolls are about. Technologies integrated into caring practices are in many ways like trolls or onions. There are many layers, and in this thesis, I have tried to "peel the layers" and explore them to get an understanding of what technologies in use in caring practices are all about.

In this chapter, I will briefly summarise my main conclusions and arguments, and comment on some theoretical and empirical implications of my research.

The overall aim of this thesis has been to develop the knowledge base of public service innovations as ways to explore and reveal what happens in the relations and interactions between different actors and an established technology innovation in use in caring practices. More precisely, the study shows how different people in the home care services involved in the use of the social alarm integrate and utilise the technology as part of their daily living. Furthermore, it demonstrates how the integrated technology affects the interaction between them, the service, and the technology itself.

In the Introduction, this aim is operationalised in three research question, which I have answered in papers 1, 2 and 3. This is briefly presented below. For a more thorough presentation, I refer to the Results chapter in this synopsis, and the papers that are attached in part 2 of this thesis.

The first research question asks what previous research related to the social alarm in use can tell us about this technology integrated into caring practices and the research stream following this. Paper 1 answers this questions through a systematic integrated review that provides an overview of previous research related to the social alarm. Additionally, the paper finds that even though the social alarm provides safety and independent living for the end user, the social alarm is still a technology with diverse results that needs to be explored further.

The second research question asks what the expectations towards the social alarm are. Further, how exploring them can help us understand different actors' interpretation, integration and utilisation of technology in home care services. Paper 2 addresses these

expectations and provides a framework for exploring them by utilising the script concept as a theoretical tool.

The third research question asks how older people pursue, maintain and negotiate independence and safety in everyday life by utilising the social alarm. This is addressed in paper 3 which also provides a framework for exploring and understanding this by utilising the concepts of scrip, domestication, heuristics and bricolage.

The thesis has taken a step back and focused on an established technology, rather than a new technology innovation, to explore what makes the technology work and how the technology in use affects caring practices and people involved. In doing so, I discovered that not even studying technologies that work can provide any easy answers to the question of what it takes to make them work. In fact, the most relevant answer to the question is probably that the question not only has no answers, but it is also indeed the wrong question. What we must develop further is to ask better, more relevant, and maybe even more accurate questions. In addition, we must keep asking these questions as technologies are integrated and established (but never "closed"). The thesis provides a theoretical contribution by offering frameworks for exploring the interaction between people and technology in use in caring practices.

## 6.1   The contribution of combining different scientific fields

This thesis is mainly placed within public service innovation and provides both theoretical and empirical insights by providing ways of utilising aspects from STS to analyse the co-production of independence and safety for the end user of the social alarm in caring practices. Utilised this way, STS and innovation studies enrich one another by combining a critical perspective from STS and a more management-oriented perspective from innovation studies. The frameworks presented permit an in-depth exploration of technology innovations in caring practices. This provides learning across disciplines and gives a richer and more nuanced understanding of established technology innovations in caring practices.

By doing so, the thesis utilises insights from STS and contributes to the theoretical development of the field of public service innovation. By this, it places itself in the intersection between public service innovation, STS and caring research through opening up for analysing the role of the technologies, and by taking materiality seriously. This has provided theoretical knowledge and increased understanding of how materiality must be included in the analyses of the co-production of technology innovations in public services. By focusing on networks, and allowing the technology into the analysis, this thesis develops the concept of co-production with new tools for exploring these realities.

Co-production has developed into a core term from both management theory and service innovations theory for exploring and understanding the interaction between different actors in relation to service innovations. However, this field has mainly focused on the organisational level. This thesis, however, explores how co-production proves relevant for exploring technology innovations on a micro level, and thus adds to the field of public service innovation. It illustrates how a technology develops over time, and always in co-production with human actors involved. The interdisciplinarity in the thesis contributes by linking and connecting the fields of public service innovation, STS and caring practices.

## 6.2  Theoretical contributions

A further objective has been to contribute theoretically to the understanding of established technology innovation in use by providing frameworks for exploring this interaction between people and technology in caring practices.

This thesis has contributed theoretically to the field of public service innovation by exploring how approaches from public service innovation and STS could be brought together to inform new theorising of technology innovations in use in caring practices. It has thus addressed the research gap in understanding co-production on a micro level of public service innovation.

The thesis contributes theoretically by offering a framework for exploring the expectations the actors have towards a technology as presented in paper 2. It also provides a framework for exploring the co-production of care that goes on as presented in paper 3. The framework is designed to be applicable in other contexts than the social alarm.

The main theoretical contribution this thesis provides is by further developing and strengthen the field of public service innovation as it opens up for including technologies into the analysis of the co-production of public innovation. Providing analytical tools for understanding the interactions between humans and technology leads to an increased understanding of these complex public innovations.

Care research is rather sparse in describing challenges related to service innovations and the framework presented in figure 5 provides sensitising concepts for exploring and elaborating on technology innovations within the field of caring.

This illustrates the relevance of drawing from the two scientific fields and combining aspects from them to provide a theoretical framework for exploring technology innovations in use in caring practices.

## 6.3  Empirical contributions and implications for practice

This thesis illustrates empirically how even rather simple established technologies entail complex realities when integrated into caring practices. Moreover, it shows how people involved with the social alarm utilise the technology and what work they do to make it work for them and to contribute to safety and independent living. Further, as part of the co-production process, the study demonstrates how heuristics emerge and how acts of bricolage and optimising practices enables people to live independently and safely at home.

There is a perceived need for more empirical knowledge within the public service innovation literature related to the co-production of services (Aagaard, Sørensen, & Torfing, 2014; Hartley, 2014). Even though public service innovation has been an emergent and fast-growing field for some time, we are still overly reliant on knowledge, ideas and theories from the private sector. There is a need for robust systematic evidence of what works, for whom, and in what way within different contexts (Hartley, 2014). This thesis contributes by providing an empirical study on co-production in public services on a micro level.

The title, 'From plug to play', indicates that even though this sounds like a simple process, the reality is always more complex than promoted by advocates of technology even when the technology is well established and integrated. One important finding from this and previous studies is that even if the technology device is simple, as with the social alarm, the service integration is complex. We tend to be fooled by the simplicity of a technological artefact, and therefore do not take the complexity of the integrated service seriously enough. The empirical material presented in papers 2 and 3 illustrates how we tend to consider established technologies as 'black boxed', and therefore do not address the expectations and experiences of the different actors. However, this thesis elaborates on how a technology never closes and always needs to be addressed. By articulating parts of practice that have been backstage and hidden, we may get insights into why technology in use is so unpredictable and what factors affect the use and interaction with a technology in a given context. Technology in use develops through interactions with and between the actors involved.

I hope that this dissertation can increase awareness of the complexity of integrating and using technology in caring practices. It has critically explored what is going on in the interaction between the human actors and the technology and revealed a need for further exploration. Technology will increasingly be a vital, important integrated element that we must utilise as well as possible. This can only be done if we constantly work towards quality improvement. The framework presented here can be used within the caring practice to explore and understand the practice of involving technologies and bringing practices to the frontstage, thus enabling quality improvement through bricolage.

## 6.4  Personal learning and knowledge creation, and further research

Writing this thesis has been a personal learning and knowledge creation process. An important part of my personal development was to be able to explore how public service innovations can be combined with aspects from STS in order to explore technology innovations in caring practices more deeply and more broadly. I was excited and motivated when I started this journey, and I still am. I hope to get the opportunity to continue the work within this field and build on this thesis for other projects in the future.

The empirical data collected are rich and diverse, and only partially utilised. Even though the focus has been on the interactions between the actors, and I mainly address actors as a whole in the discussion, the included papers focus mostly on the interactions from the end users' perspective, hence, how the social alarm affects their safety and ability to live independently at home. The social alarm also affects the next of kin and the personnel since it affects the way they think of the end user living alone, how the technology affects the relations between them and how they plan their work. The social alarm in use provides a sense of security both for the next of kin, and for the personnel, as they know that their loved ones or their patients are safe, and can reach help if needed. However, there is little focus on how the social alarm affects the service and the care workers in their daily work, and more research on these perspectives is needed.

The care workers' responsibility to answer and respond to the activated alarms comes in addition to their regular care work in the home care service. This work has another focus, as it is unpredictable and often involves life-threatening situations. The narrative of "Anny" in paper 3 illustrates the serious situations that might occur. None of the papers discusses these issues, and we need further research to explore what the social alarm means for the care workers' working situation.

The power aspect has not been a focus of this thesis and should be analysed further. However, STS' focus on networks opens up for analysing power structures in a way that service innovation literature hardly addresses.

In this thesis, the empirical data describe how the social alarm is quite simple and easy to use. The frameworks presented in Figures 2, 3 and 5 need to be explored further and utilised for analysing other technologies in different caring contexts. We need more empirical studies to investigate whether the frameworks are relevant and robust with regard to analysing more complex technological innovations in other contexts. The framework also needs to be developed further theoretically, e.g. should the theory of power relations be explored more.

Finally, a theoretical framework needs to be tested empirically over time for us to experience whether it is a fruitful way of studying a phenomenon. In this respect, the overall

framework for studying technology in use in caring practices illustrated above needs to be empirically tested as a whole to see if it provides a suitable tool.

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"The personal emergency response system as a technology innovation in primary health care services: an integrative review." *Journal of Medical Internet Research* 18.7 (2016).

# Appendix

Checklist for assessment of included articles.

| DATA EXTRACTION SHEET | |
|---|---|
| Article | |
| Detail of reference | |
| Year of publication | |
| Country of study | |
| Definition of key words | |
| Aim<br>Is the research question a relevant issue?<br>Is the aim sufficiently focused, and stated clearly?<br>Does the title give a clear account of the aim? | |
| Reflexivity<br>Is the researcher's motives, background, perspectives, and preliminary hypotheses presented?<br>Are there dealt with consequences of the above? | |
| Method and design<br>What research methods are used?<br>Are the research methods suitable for exploration of the research question? | |
| Data collection and sampling<br>Is data collection strategy clearly stated and justified?<br>Are the consequences of the chosen strategy discussed and compared with other options?<br>Are there enough depth characteristics presented to understand the study site and context? | |
| Theoretical framework | |

| | |
|---|---|
| Are the perspectives and ideas used for data interpretation presented?<br>Is the framework adequate, in view of the aim of the study?<br>Does the author account for the role given to the theoretical framework during analysis? | |
| **Analysis**<br>Are there full description of principles and procedures for data organisation and analysis, allowing the reader to understand what happened to the raw material to arrive at the results?<br>Are inclusion and exlution criteria's described?<br>Are categories identified from theory or preconceptions in advance, or were they developed from the data?<br>Which principles follow to organise the presentation of the findings?<br>Are strategies used to validate results presented, such as crosschecks for rivalling explanations, member checks, or triangulation? If not, they should appear as validity discussions later in the report. | |
| **Findings**<br>Are the findings relevant to the aim of the study?<br>Is the presentation of the findings well organised and suited to ensure that findings are drawn from systematic analysis of material? | |
| **Themes:**<br>• innovation catalysts/drivers<br>• innovation hinders/barriers<br>• Possible bricholages<br>• Users experience<br>• Technological issues | |

| | |
|---|---|
| **Discussion**<br>Are questions about internal validity (what the study is actually about), external validity (to what other settings the findings or notions can be applied), and reflexivity (the effects of the researcher on processes, interpretations, findings, and conclusions) addressed?<br>Has the design been scrutinised?<br>Are the shortcomings accounted for and discussed, without denying the responsibility of choices taken?<br>Have the findings been compared with appropriate theoretical and empirical references?<br>Are a few clear consequences of the study proposed? | |
| **Presentation**<br>Is the report easy to understand and clearly contextualised?<br>Is it possible to distinguish between the voices of the informants and those of the researcher?<br>Is the writers conclusions supported in data or analyzis. | |
| **References**<br>Are important and specific sources in the field covered, and have they been appropriately presented and applied in the text?<br>Relevant references to follow up: | |
| **How would you rank the scientific quality of the article?** | |
| **Is the paper to be included?**<br>• Is the paper theoretically interesting? Does it rely on, or does it develop    theory? | |

| | |
|---|---|
| • Is the paper empirically sound? Does it have large sample size or a good qualitative case study?<br>• Is the paper conceptually important? (although it may not be at the stage of developing good theory yet)<br>• Is the paper a literature review, overview, or synthesis? | |
| *Inspired by:*<br>• *Kirsti Malterud: Guidelines for authors and reviewers of qualitative studies*<br>• *Kunnskapssenterets sjekkliste for systematiske oversikter Basert på EPOC Checklist for Refereeing Protocols for Reviews. EPOC, Effective Practice and Organisation of Care group,*<br>• *Guide for review authors. www.epoc.cochrane.org*<br>• *Rashman, Lyndsay, Erin Withers, and Jean Hartley. Checklist used in: "Organizational learning and knowledge in public service organizations: A systematic review of the literature."* | |

# Forespørsel om intervju til bruker av trygghetsalarm eller deres pårørende om Erfaringer med bruk av trygghetsalarm

**Bakgrunn og formål**
Jeg skriver en doktorgradsavhandling om bruk av trygghetsalarm i kommunehelsetjenesten. Det er svært mange som bruker trygghetsalarm i Norge, men det er gjort lite forskning på erfaringer med hvordan de opplever å ha trygghetsalarm. Vi ønsker i dette doktorgradsprosjektet å undersøke de erfaringene brukere, ansatte, leverandører osv. har til bruk av trygghetsalarm. Forskeren vil se på hvordan de dere erfarer at bruk av trygghetsalarm påvirker deres hverdag og samhandlingen mellom dere.

Ved å undersøke hvordan bruk av trygghetsalarmen erfares av ulike aktører, håper vi å kunne finne faktorer som er viktige for å øke sannsynligheten for å lykkes, når man skal ta i bruk ny teknologi i tjenesten.

Du får herved forespørsel om å delta i dette prosjektet fordi du har trygghetsalarm eller er nær pårørende til noen med trygghetsalarm. Utvalget av personer som inviteres til intervju er gjort i samarbeid med leder av tjenesten i kommunen.

Studien som intervjuet er en del av vil inngå i avhandlingsarbeidet for stipendiat Randi Stokke ved Senter for Omsorgsforskning ved Høgskolen i Gjøvik. Hun er tilknyttet Phd – programmet Innovasjon i tjenesteyting – offentlig og privat sektor (INTOP) ved Høgskolen i Lillehammer.

**Hva innebærer deltakelse i studien?**
Deltagelse i studien innebærer at forskeren får lov til å intervjue deg om dine erfaringer med bruk av trygghetsalarm. Intervjusamtalen vil handle om dine erfaringer med trygghetsalarm.

**Hva skjer med informasjonen om deg?**
Alle personopplysninger vil bli behandlet konfidensielt. Det er kun forsker som vil ha tilgang til personopplysninger om deg. Alle personopplysninger vil bli avidentifisert. Alle personopplysninger og notater vil bli lagret nedlåst på låst kontor. Evt. Oversikt over navn og kontaktinformasjon vil bli oppbevart adskilt fra notatene fra observasjonen og eventuelle intervjuer.

Deltagerne i studien vil ikke kunne gjenkjennes i eventuell publikasjon.

Prosjektet skal etter planen avsluttes 31. desember 2017. Alt innsamlet data anonymiseres og alle data som inneholder personopplysninger blir slettet.

**Frivillig deltakelse**
Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli slettet. Om du velger å ikke delta i studien, eller om du velger å trekke deg underveis vil dette ikke få noen innvirkning på deg og det tilbudet du mottar fra kommunen.

Dersom du ønsker å delta eller har spørsmål til prosjektet, ta kontakt med:
Stipendiat Randi Stokke
Senter for Omsorgsforskning, Høgskolen i Gjøvik
Postboks 191
2802 Gjøvik
Tlf. 95158088/61135342
Mail. randi.stokke@hig.no

**Appendix 2**

Studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS.

# Samtykke til deltakelse i studien

Jeg har mottatt informasjon om studien, og er villig til å delta

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(Signert, dato)

☐  *Jeg samtykker til å delta i intervjusamtale om mine erfaringer med trygghetsalarm.*

   *Jeg kan kontaktes for nærmere avtale om intervjuet på telefonnr:………………………..*

# Forespørsel om intervju om
## erfaringer med bruk av trygghetsalarm til deg som arbeider med tjenesten

**Bakgrunn og formål**

Det er i dag økende krav til omsorgstjenesten i kommunene i Norge, som et resultat av stadig flere, og sykere brukere. Myndighetene fremmer at disse utfordringene blant annet kan løses ved at man innfører mer velferdsteknologi i tjenesten. Vi ønsker i denne doktorgradsprosjektet å undersøke aktørenes (brukere, ansatte, leverandører osv) erfaringer med bruk av trygghetsalarm. Ved å undersøke hvordan bruk av den etablerte trygghetsalarmen erfares av ulike aktører, håper vi å kunne finne faktorer som er viktige for å øke sannsynligheten for å lykkes, når man skal ta i bruk ny teknologi i tjenesten.

Forskeren vil se på hvordan de ulike aktørene i kommunehelsetjenesten erfarer at bruk av trygghetsalarm påvirker deres hverdag og samhandlingen mellom dem.

Studien som intervjuet er en del av vil inngå i avhandlingsarbeidet for stipendiat Randi Stokke ved Senter for Omsorgsforskning ved Høgskolen i Gjøvik. Hun er tilknyttet Phd – programmet Innovasjon i tjenesteyting – offentlig og privat sektor (INTOP) ved Høgskolen i Lillehammer.

Du får herved forespørsel om å delta i dette prosjektet fordi du arbeider i helse- og omsorgstjenesten i kommunen eller på alarmsentral, og møter brukere som har trygghetsalarm. Utvalget av personer som inviteres til intervju er gjort i samarbeid med leder av tjenesten.

**Hva innebærer deltakelse i studien?**

Deltagelse i studien innebærer at forskeren får lov til å intervjue deg om dine erfaringer med bruk av trygghetsalarm. Intervjusamtalen vil handle om ulike sider ved bruk av trygghetsalarm.

**Hva skjer med informasjonen om deg?**

Alle personopplysninger vil bli behandlet konfidensielt. Det er kun forsker som vil ha tilgang til personopplysninger om deg. Alle personopplysninger vil bli avidentifisert. Alle personopplysninger og notater vil bli lagret nedlåst på låst kontor. Evt. Oversikt over navn og kontaktinformasjon vil bli oppbevart adskilt fra notatene fra observasjonen og eventuelle intervjuer.

Deltagerne i studien vil ikke kunne gjenkjennes i eventuell publikasjon.

Prosjektet skal etter planen avsluttes 31. desember 2017. Alt innsamlet data anonymiseres og alle data som inneholder personopplysninger blir slettet.

**Frivillig deltakelse**

Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli slettet. Om du velger å ikke delta i studien, eller om du velger å trekke deg underveis vil dette ikke få noen innvirkning på ditt arbeidsforhold og vil ikke få innvirkning på ditt forhold til arbeidsgiver eller annet personale.

Dersom du ønsker å delta eller har spørsmål til prosjektet, ta kontakt med:
Stipendiat Randi Stokke
Senter for Omsorgsforskning, Høgskolen i Gjøvik
Postboks 191
2802 Gjøvik
Tlf. 95158088/61135342
Mail. randi.stokke@hig.no
Studien er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS.

# Samtykke til deltakelse i studien

**4**

Jeg har mottatt informasjon om studien, og er villig til å delta

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(Signert, dato)

☐    *Jeg samtykker til å delta i intervjusamtale om mine erfaringer med trygghetsalarm.*

     *Jeg kan kontaktes for å avtale intervju på telefon:……………………………………..*

# From "Plug" to "play".
## Making established technology innovations work in caring services

There is a demand for technology innovations in community care services to meet perceived challenges. However, the integration of technologies has proven to be difficult, and many projects never integrate into regular use after the pilot stage. Research in the wake of these pilots does not capture the technology innovations that are integrated and used in regular caring practices, and what it takes to make them work. This thesis contributes to a more comprehensive understanding of the "workings" of established technology innovations when exploring the social alarm, which is a widely adopted technology innovation in caring practices.

A systematic integrated review and a combination of participant observations, in-depth interviews and a study of documents related to the use of the social alarm were conducted.

The thesis demonstrates empirically how people involved with the social alarm relate to and utilise the technology. The results describe complex and multiple caring practices with divergent results related to its use and promote an increased understanding of how even rather simple and well-established technologies are unpredictable and work differently in different contexts when interacting with different people.

By utilising the metaphor of script and domestication from science and technology studies, the thesis provides a theoretical framework for exploring the co-production of expectations and experiences related to technology in use in caring practices.

The study illustrates how technology innovations are changing the dynamics between the people involved, rearranging caring practices, and opening up for bricolages as an integrated part of established technology innovations.

Further, it develops the knowledge base of public service innovations as a way of understanding established technology innovation in municipal caring services. By this, increasing our understanding of the complex reality of technology in use in caring practices by focusing on the interactions between the technology and humans involved.

Randi Stokke is born in 1967 and holds a position at NTNU in Gjøvik.

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