Aging-in-place with ICT
A qualitative study of senior citizen users’ perception and acceptance towards Smart home technology

Author: Magdalena Gudmundsson
Supervisor: Niki Chatzipanagiotou
Examiner: Anita Mirijamdotter
Date: 2017-05-24
Course Code: 4IK50E
Subject: Informatics
Level: Master (15 credits)
Abstract

This is a qualitative, interpretive research study of how six senior citizens’ aged 70-85 describe their use and need of Smart home technology for their independent living and welfare. Data was collected through technology probing and interviews. Data analysis was done using a thematic method. The research was underpinned by the theoretical model Unified Theory of Acceptance and Use of Technology (UTAUT2). The research setting was senior citizens’ living in Care housing rented out by the municipality owned company.

The findings show that technology is perceived by the senior citizens’ to be something must be taught and takes effort. Senior housing need to be better designed for its senior tenants. It was also found that if technology is used to ensure safety, fall detection for instance, trust and sufficient support is crucial. The findings suggest it could be difficult to assess your own need and to realize when assistance technology is needed. It also found that the use of technology was perceived as being individual and as something that cannot be treated collectively. It was suggested that health professionals do have some influence on the senior citizen and their use of technology. The findings of this study was compared to previous studies and how it relates to the determinants and moderating factors suggested by the theoretical model UTAUT2.

Keywords: Smart home technology, aging-in-place, Information and Communication Technology (ICT), senior citizen, assistance technology, user acceptance, E-health, UTAUT2
Thanks

I would like to thank my supervisor Niki Chatzipanagiotou for her valuable advice and support, and for being my guide through this research endeavour.

I also would like to thank my classmates Jonas Kring and Viktoria Eriksson for always being there, for all the great discussions and for really enhancing this master programme experience.

Most of all I would like to thank my participants for agreeing to participate in my research and for the insights and window they provided to their user perspective. You have taught me a great deal: “Empathy is important to understanding users holistically” (Goltz 2015)
Contents

Abstract and keywords 2
Thanks 3
List of abbreviations 5
Motivation for this study 6

1. Introduction 7
1.1 Background and Research setting 7
1.2 Purpose statement and Research questions 8
1.3 Topic justification 9
1.4 Scope and limitations 9
1.5 Thesis organization 10

2. Literature review and theoretical framework 11
2.1 Search strategy 11
2.2 Information and communication technology (ICT) 11
2.3 Ageing 11
2.4 Smart home technology for the senior citizen user 12
2.5 The senior citizen user of Smart home technology 13
2.6 Theoretical framework 15
   2.6.1 Unified theory of Acceptance and Use of Technology 16
   2.6.2 Unified theory of Acceptance and Use of Technology2 16
   2.6.3 The use of UTAUT2 in this research study 18
   2.6.4 Similar studies that use UTAUT and UTAUT2 18

3. Methodology 20
3.1 Philosophical paradigm 20
3.2 Research approach 21
3.3 Methods for data collection 21
   3.3.1 Inviting participants 21
   3.3.2 The participants 22
   3.3.3 Technology probing 23
   3.3.4 Interviews 26
3.4 Data collection 26
3.5 Data analysis 28
3.6 Reliability and Validity 29
3.7 Ethical consideration 30

4. Empirical findings 31

5. Discussion 36
5.1 The findings viewed through the lens of UTAUT2 36
5.2 Findings compared to previous researches 37
5.3 The research questions answered 37

6. Conclusion and future research 39
6.1 Conclusive remarks and further research 39
6.2 Reflections 39

References 41
Appendices
Appendix A. Invitation to participants
Appendix B. Informed consent form
Appendix C. Interview guide
Appendix D. Signs
Appendix E. Interface mock-ups

List of Images, Tables and Figures
Figure 1.1 Organization of the thesis
Figure 2.1 Smart home technology for the senior citizen user
Figure 2.2 Unified Theory of Acceptance and Use of Technology
Figure 2.3 Unified Theory of Acceptance and Use of Technology
Figure 3.1 Ground plan of the apartment for the Technology probing
Table 3.1 The Smart home technology in the Technology probing
Figure 3.1 Photographs from the Technology probing, signs
Figure 3.2 Photographs from the Technology probing, interface mock-ups
Figure 3.3 Describing the data analysis method used in the thesis
Table 5.1 Answers to RQ1
Table 5.2 Answers to RQ2
Table 5.3 Summarization of the answers to RQ1 and RQ2

List of abbreviations
ICT Information and Communication Technology
UTAUT Unified Theory of Acceptance and Use of Technology
UTAUT2 A revised version of Unified Theory of Acceptance and Use of Technology within the consumer context.
Motivation for this study

My grandmother Greta passed away in her bed at the service housing she had been living in for the past year. She was 95 years old and she enjoyed a rich and good life. Prior to moving to the service housing she lived in the same home for 60 years and enjoyed sitting in her resting chair overlooking the garden, nipping withered buds from her always-blooming geraniums. When she was becoming forgetful and had a couple of accidental falls the difficult decision was made to move her into a home. While visiting her at the home it became clear that it was not “home” to her and she would always ask when she could go home. The last year of her life I watched on as my grandmother withered much like the buds she had been picking of her geraniums. The fate of my grandmother is my motivation for this study.
1. Introduction

This chapter presents the background, research setting and the purpose of the research. Topic justification, scope and limitations together with the organization of this thesis are also presented.

1.1 Background and research setting

Aging-in-place, the ability to remain in the home in spite of potential changes in health and functioning whilst ageing (Yang et al., 2016) could very well be supported by Information and Communication technology. The Swedish government envision that it will, and have launched a major policy initiative for technology to take larger part in the care and support for senior citizens’ (Wikström and Regnér, 2016). By 2025 Sweden aims to be one of the best in the world at using the opportunities of the digitisation to achieve good, equal health and welfare as well as strengthen and increase independency (Wikström and Regnér, 2016, p. 4). The population in Sweden as well as the rest of the world is changing, the prognosis show that between the years 2015 and 2035 the number of people 80 years or older will increase by 76% (SCB, 2016). This will enviable lead to an increased demand for care and support (Yang et al., 2016). Technical solutions has been proposed to have the ability to cover the gap of an growing older population and increased demand for service (Yang et al., 2016, p. 569). Several studies support the same notion. Connelly et al. (2014) state that there is a need to look at solutions enabling aging-in-place, helping the older adult to live and age at home as long as possible. Reeder et al. (2012) say there is a critical need for public health interventions to support the independence of older adults as the world’s population ages. Deen (2015) states that never before in human history have we been confronted with such a large aging population and failed to develop solid, cost-effective solutions for the well-being, healthcare and social needs of the elderly.

In the Swedish context the senior citizens’ care and living situation has already been subjected to a great deal of changes. Elderly homes and housing with access to care personnel around the clock is becoming sparse (Björck and Bidö 2011). Institutions are being replaced by “Senior housing”, apartment buildings where citizens of a certain age rent or buy their own apartment (Björck and Bidö 2011). For care and assistance the tenant apply and their individual need is investigated by a municipality aid administrator (Björck and Bidö 2011). The role of technology regarding elderly and their living situation was conveyed in a report released by the care administration in one of the municipalities in Dalarna county, Sweden (Joelson, 2016). The report conveyed the plan for providing sustainable and safe accommodation for its senior citizens now, until the year 2030 (Joelson, 2016). Among the many points conveyed were “well adapted information technology solutions” (Joelson, 2016, p. 6). The report states that technology and technical solutions do and will play an important role for elderly to be able to live a safe and independent life (Joelson, 2016). The responsibility of providers of Senior housing is to be technically prepared for installing technical solutions enabling senior citizens to age in place (Joelson, 2016, p. 10).
When information and communication technology is incorporated in a home it is often referred to as a “Smart home” (Chan et al., 2008). Smart home technology is in this thesis used as a collective term for technology incorporated in the home. The development and rise of mobile phones, sensors, and Internet of things (IoT) has led to an increasingly connected world (Foster and Sherrer 2015). This enables sensors to communicate without human interference and to be read, controlled and connected through the Internet or other technologies (Fuster et al., 2015). Finken and Mörtberg (2011) argue that in this way technology and care becomes intertwined and difficult to separate.

Haines et al. (2007) says it is monetary gains that drive innovations in Smart home products and services and not the users’ needs. That it is a commercial desire for technical innovation that are the driving forces behind the development of Smart Home products and services, rather than explicit user requirements (Haines et al., 2007). There is without doubt anticipations that a Smart home for senior citizens’ could allow independent living at home as long as possible, aging-in-place. Chan et al. (2008, p. 76) say that researching the user is what is needed to turn all the existing expectations of what the Smart home can achieve into realisation. Demiris et al. (2008, p. 112) state that for technology to be a viable solution the users’ needs and expectations, it needs to be investigated. Furthermore there are several initiatives and projects focused on the technical possibilities of Smart home technology for senior citizens but not much research done on addressing the end-users’ needs and expectations (Demiris et al., 2008, p. 112). Already in 2008 review of the then present state and future challenges of the Smart home, Chan et al. (2008) saw a need to listen to the user in order to succeed with the hyped concept of a Smart home: “Satisfying the needs of the user is a major challenge in research and development on smart houses”.

This research study intends to explore and better understand the senior citizen users’ perceptions and perceived use and needs of Smart home technology. The research setting is amongst senior citizens’ living in a municipality owned Care housing. Care housing is a type of Senior housing for those 70 years and older. This particular housing is rented out by a municipality owned housing company in Dalarna County, Sweden. As there is no Smart home technology present to support the residents today, the housing company provided an empty apartment to create an artificial Smart home and conduct the research.

1.2 Purpose statement and Research Questions
The purpose of the master thesis is to explore and to better understand how senior citizens living in Senior housing perceive Smart home technology and their use and needs of it aimed at supporting their independency and welfare. Therefore, the research questions that need to be answered are:

- How do senior citizens perceive Smart home technology?
- How do senior citizens describe their use and need of Smart home technology?

This research study aims at exploring and at a better understanding of the senior citizen users’ perceptions and perceived use and needs of Smart
home technology. The latter goal is and how Smart home technology is designed to better meet senior citizens’ needs. This is of interest to researchers, developers and designers of technical solutions aimed at older adult users. The study is of particular interest to municipalities and municipality owned public housing companies looking at technology to support senior citizens’ living in Senior housing.

1.4 Topic Justification
One of the main concepts emerged from the human–computer interaction field is usability and its importance is being more and more recognized (Gulliksen et al., 2006). All technology solutions should come about to meet the users’ needs and not be pushed upon them by those in power. As Gulliksen et al. argue that “usability is a multi-faceted aspect of a system in use and systems are created by means of a systems development process of which usability issues must be an integral part”. Not downplaying the role of management and legislatives, leverage comes from them, but they rarely make the design decisions that lead to a usable system or product (Gulliksen et al., 2006). According to Gulliksen et al. (2006), the only way to achieve that is to design your way to usability. To achieve appropriate design deep insight into the prospective user is needed for technology to be usable. Clark (1996) views the design process as a process for creating knowledge and common ground; with that meaning the knowledge, beliefs and presumptions people share, or might think that they share. Building up sufficient knowledge and understanding of the context of use requires user involvement and only the users themselves can provide that kind of understanding (Gulliksen et al., 2006).

1.5 Scope and Limitations
To explore senior users’ perception of technology is in essence an attempt to understand how and why a phenomenon occurs (Connelly et al., 2014). As such, there are substantial limitations to consider for this study, both in size and scope. The small sample size that the study will involve as well as the limitation of a confined research setting makes the response from the participants not generalizable to any extent (Connelly et al., 2014). Generalization is not the intent of this research study. The research is meant to be an addition to the current knowledge of the senior citizen user of Smart home technology for which further studies will continue to build on. It is also important to clarify that my view of a group of users is not as a collective, but as a group of individuals, each with their very own experiences, standpoint and perceptions.

The scope is to explore the perspectives of the end-user; that is the senior adult 70-85 years old. Other important stakeholders such as agency officials, caregivers or family members cannot be overlooked, however is out of range for this research study. The research study includes participants of both genders, male and female in order to cover both perspectives. But, to investigate differences and similarities between them are out of scope and is a limitation. The reason is due to the interpretative paradigm that I have adopted for this research and not the critical. Additionally, as an interpretive study, the research is subjected to my interpretations as the sole researcher (Connelly et al., 2014).
As there is no Smart home technology available in the research setting for the participants to reflect upon, one was created for the purpose of the research. This can be considered as a limitation as, what was presented to the participants to reflect upon, was a result of my choices and is consequently biased. The presentation of technology consisted of written text and interface mock-ups, there was no actual technology for the participants to try out. The focus was technology with uses to support independency and welfare. Remote monitoring technology for energy, water and telecommunication reporting was excluded and out of scope of the research.

The choice to use a theoretical model as an underpinning framework in qualitative research could be seen as a limitation as it could direct the knowledge you seek out. It might close you up when you need to remain open. In this study the theoretical model was used as a synthesizing tool and a basis for discussion.

1.6 Thesis Organization

The thesis is organized with an introduction (1) to the topic and research problem. The introductory part is followed by a review of current literature in chapter (2). The theory chosen as a theoretical framework, Unified Theory of Acceptance and Use of Technology is then gone through in the theoretical framework (2). After that the methodology of the research is explained in detail in chapter (3). This is followed by a presentation of the empirical findings in chapter (4). After this, the empirical findings are reviewed and the conduction of the research is reflected upon in the discussion in chapter (5). Conclusions and suggestions for future research conclude the master thesis in chapter (6).

Figure 1.1 Organisation of the thesis
2. Literature review and theoretical framework

This chapter presents the basic concepts ICT and ageing. It also provides a definition of Smart home technology and goes through the previous studies conducted on the senior citizen user. The theoretical framework UTAUT2 is presented and also how it was used for this study.

2.1 Search strategy

The literature review were done to form a knowledge base of the topic and to find previous and related studies to discussing the findings. Literature search were conducted in databases OneSearch, Inspec and Emerald. Parameters were set to include peer reviewed material, accessible in full text and published from 2007-2017. Cross-checking searches were made in journals within informatics and information systems to make sure no material were overseen within the subject area. Keywords used were “aging-in-place”, “smart home” or “smart home technology”, “assistance technology”, “welfare technology” in combination with “ICT”, “elderly” or “senior citizens”, “user”, “user acceptance” or “usability” using Boolean search methodology. Searches were also conducted on previous studies using the theoretical framework as used in this study, Unified Theory of Acceptance and Use of Technology. Keywords used were “UTAUT”, “UTAUT2” together with “senior citizen” or “elderly”.

2.2 Information and Communication Technology (ICT)

It is of importance to first provide a brief definition of Information and Communication technologies (ICT) in order to position this research study in the field of Informatics. Technology, firstly, is according to Beynon-Davies (2009, p. 19) “a set of artefacts for doing things”. ICT is any type of technology supporting data gathering, processing, distribution and use (Beynon-Davies 2009). An ICT system is a network consisting of hardware, software, data management technology and data communication technology (Beynon-Davies 2009). Speaking in general terms there are three ways which human activity with the use of ICT form an information system; Support, supplant or innovate (Beynon-Davies 2009). Let’s consider this idea in the context of the topic of this thesis. The senior citizen and all doings that make up their daily life can be seen as human activity. Their continuous independency and welfare when ageing might be supported, supplanted or innovated with the use of ICT (Smart home technology). Then it is has become an information system.

2.3 Ageing

When you think about those over 70 now and how the world has changed during their lifetime, it is a bit mind gobbling. Russell (2011, p. 104) states: “people older than 70 years have lived through many historical, cultural and technological changes, possibly more than any other age group in our time”. That leads you to reflect over the amount of change and adaption ageing involves and what that does to a person and their mind-set. And how those over 70 come to view certain concepts such as aging-in-place with the help of technology. How the age-group view the
Internet and how they use it give some indications. A report investigating Swedes over 65 and their internet usage released in 2014 revealed that a great deal of the Swedish elderly consider themselves to be knowledgeable when it comes to using computers (Findahl, 2014). At the same time many say they know nothing about the internet and do not want to be bothered with it (Findahl, 2014). The opinion amongst those over 75 years is that it feels like the internet is being forced upon them, that it is difficult to use, that they need help with it and that it is not user-friendly (Findahl, 2014).

The most common reasons for not using the internet is: "I am not interested”, “I do not have to” or “I am too old” describes Findahl (2014) in his findings. In 2014, 47% of those over the age of 74 had access to internet in their home, compared to 91% of total population (Findahl, 2014). That indicates a divide in technology use depending on age.

Finken and Mörtberg (2011) raised thought-provoking questions involving ageing as an independent person with the help of technology in their article “Performing Elderliness - Intra-actions with Digital Domestic Care Technologies”. They put forward the idea that care technologies create their own reality through their design and by that being including or excluding (Finken and Mörtberg, 2011). A notion, intra-action, is used in the article for describing how independent living and elderliness has come to be about performance and how that is connected with the use of technology (Finken and Mörtberg, 2011). The authors draw upon the danger of bundling users, assuming that you know their needs and design after that false assumption: “Digital domestic care technologies feed on an idea of a homogenous group of citizens, through which the heterogeneity of older people also gets blurred” (Finken and Mörtberg 2011, p. 314).

2.4 Smart home technology for the senior citizen user

Smart home technology aimed at senior citizens can involve various types of technology. Demiris et al. (2008, p. 111) define it to be information technology using sensors, devices and telecommunication to enhance their safety, monitor health and support their overall well-being. Chan et al. (2008) also see other uses, that the technology have the ability to resolve issues of social isolation as well as providing assistance without limiting or disturbing normal routines. Overall Smart home technology can be divided into two categories: remote management and elderly assistance (Chan et al., 2008).

Remote management is technology used for energy, water and telecommunication monitoring, not only for more convenient reporting of energy use to companies providing these services, but also to provide comfort for the resident (Chan et al., 2008, pp. 55-56). Comfort achieved by remote management involves being able to remotely steer windows, doors, lights, home appliances and entertainment devices (Chan et al., 2008, pp. 55-56).

The other category, Elderly assistance is the use of various devices and sensors that signal assistance services and enhance the elderly care in some way (Chan et al., 2008, p. 56). Courtney et al. (2008) mention several technologies for elderly assistance for instance bed sensing, a device is put under the mattress in order to detect heart rate, respiration and restlessness. Others include motion sensing, devices that detect and register motion within the home or apartment and provide data regarding
the resident’s location (Courtney et al., 2008). Kitchen safety sensoring combines a motion sensor with a heat sensor in order to alert the resident (and other) if the stove is turned on and left unattended for an abnormal amount of time (Courtney et al., 2008). There are several applications for video-based collecting techniques, fall detection is one (Courtney et al., 2008). There are also audio-based collecting techniques that detect for instance door-openings, cough, cries or falls (De Silva et al. 2012). Video, audio or sensors can also be used to detect unusual events and actions (De Silva et al., 2012), events that might invoke an alert to a caregiver or family.

As expressed, there are various ways that ICT can achieve a Smart home. The resident’s access to internet with their personal computer, mobile phone or tablets for instance. The rapid development of wireless sensors, making sensors smaller, better and cheaper have made it much easier to make use of them in assistance technology (Chan et al., 2008). Passive and active tags (wireless mini-chips) that can be attached to a device or human body can collect and transmit data and they can be connected and be used to achieve a Smart home environment (Chan et al., 2008).

A definition and overview of Smart home technology for the Senior citizen amounted by the literature review can be found in figure 2.1. The top, or roof, is the needs the technology aims to fill for the user; monitoring, enhancement, and support. The body, or outer walls, is what the technology does, remote management and elderly assistance. The bottom, or foundation, is the ICT that makes it all possible.

Figure 2.1 Smart home technology for the senior citizen user (Source: Author)
2.5 The senior citizen user of Smart home technology

Studies on senior citizen user of Smart home technology show various traits. Chernbumroong et al. (2010) did a survey to explore the perceptions of six different Smart home technologies. It showed positive feedback toward the technologies, although participants were concerned about issues such as lack of human responders, user friendliness of the device, and the need of learning new technology. On that note, a literature review performed by Jacelon and Hanson (2013) proposed that the design contributions of the older users have not been explicated enough. The review were done to determine how older adults’ ideas are being incorporated into the design of smart environments and findings indicate that older adults are open to living in technically advanced environments if doing so would improve their quality of life and help them stay in their own homes (Jacelon and Hanson, 2013). Incorporating older adults’ ideas about smart environments would improve the desirability of smart homes (Jacelon and Hanson, 2013).

There have also been other attempts to build on the knowledge of the senior citizen user in closely related technologies. Burrows et al. (2015) performed interviews acknowledging the complex task of designing effective home healthcare systems. The study introduces 15 empirically derived attributes to help designers to build a more detailed understanding of the potential users (Burrows et al., 2015). Courtney et al. (2008) found that the older adult user perceived need of Smart home technology could override issues such as privacy concerns. Authors anticipate an increased demand on continuing care retirement communities and used the study to explore the use of Smart home information-based technologies to enhance resident quality of life and safety (Courtney et al., 2008). The authors also found that acceptance of the technology were connected with the users’ acknowledgement of their own frailty (Courtney et al., 2008). Resistance towards the technology could be connected with denial and defence mechanisms towards the participants own self-image (Courtney et al., 2008). Conclusions were that little evaluation research exists on older adults’ acceptance and use of smart home technologies and that further exploration of the factors influencing older adults’ perceptions is needed (Courtney et al., 2008).

A qualitative study claimed that it was important to develop more non-obtrusive assistive technologies for enhancing the quality of life (Courtney et al., 2007). To do so the authors tested a conceptual framework in order to find standard definition and a way to measure obtrusiveness (Courtney et al., 2007). They concluded that whether technology is perceived as obtrusive or not can only be established by understanding the user and acknowledging their perspective (Courtney et al., 2007). They found the existing data contained examples of each dimension (physical, usability, privacy, function, human interaction, self-concept, routine, and sustainability) and most of the subcategories proposed by the obtrusiveness framework (Courtney et al., 2007). The result provided general support for the framework, but said further prospective validation research is needed (Courtney et al., 2007).

The senior citizen users’ attitude and whether they will adopt the technology was the topic in a recent study by Wong and Leung (2016). Authors developed and modelled the structure of the relationships between
the various factors influencing the adoption of Smart home technology amongst elderly in Hong Kong. Results indicate that strong government support, efficient backup service support, and user interface devices design are the driving factors encouraging the adoption of technology (Wong and Leung, 2016). Ehrenhard et al. (2014) did try to explore why Smart home technology is so scarcely implemented despite its benefits to an aging population. The authors saw potential to improve comfort, healthcare, safety and security as well as foster users’ independence. The study revealed key market barriers in Smart Home value networks (Ehrenhard et al., 2014). Based on a case a generic value network for Smart Homes is put forward proposing opportunities to improve market adoption of Smart Home technologies (Ehrenhard et al., 2014).

2.6 Theoretical framework
As underpinning theoretical framework an extended version of Unified Theory of Acceptance and Use of Technology, UTAUT2 was used. The theoretical model was chosen because its usefulness when exploring the possibility for success with new technology (Morris et al., 2003). In addition, Morris et al. (2003) suggest that it is a theory well equipped for understanding the factors of acceptance, especially for users that are less inclined to accept new technology.

2.6.1 Unified Theory of Acceptance and Use of Technology (UTAUT)
There have been several models and theories formulated with the intent to understand the user and the factors involved for a user to accept and use information technology. To mention a few: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model and Theory of Planned Behaviour.

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Viswanath Venkatesh and presented in the research article “User Acceptance of Information Technology – a unified view” in the scientific journal MIS Quarterly (Morris et al., 2003). Venkatesh used eight existing models and theories including those three theories mentioned above and tested them with empirical data, compared and accessed them and formulated a unified model - Unified Theory of Acceptance and Use of Technology (Morris et al., 2003). UTAUT were then cross validated with additional empirical data and were found to outperform each of the eight original models (Morris et al., 2003). The model can be seen in image 2.2.
The basis of UTAUT is that four constructs are directly determining a user’s behaviour and acceptance of the technology: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Gender, Age, Experience and Voluntariness of Use are seen to be moderators affecting the determinants (Morris et al., 2003). Performance Expectancy is the degree of which an individual believes that using the system will help him or her to gain in performance (Morris et al., 2003). This is moderated by the user’s gender and age (Morris et al., 2003). Effort Expectancy is the degree of ease associated with the use of the system moderated by the user’s gender, age and experience (Morris et al., 2003). Social Influence is the degree of which an individual perceives that important others believe s/he should use the new system (Morris et al., 2003). According to the theory, social influence is moderated by the user’s gender, age, experience and voluntariness of use (Morris et al., 2003). The Facilitating Conditions, the degree to which an individual believes whether organizational and technical infrastructure exist to support the system (Morris et al., 2003). Moderating factors are the users age and experience (Morris et al., 2003). When performance and effort expectancy is present - as it is in UTAUT - the facilitating conditions are seen to have a direct impact on the use behaviour without being influenced by the behavioural intent (Morris et al., 2003). Central in the theory is that the Behavioural Intention influence the Use Behavioural (Morris et al., 2003).

2.6.2 Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)
Since its emergence UTAUT have been applied as a whole or in parts to a number of studies, both in organizational and non-organizational settings (Venkatesh et al., 2012). UTAUT have been extended and integrated into
several contexts where new technology have been implemented such as the health information system area (Venkatesh et al., 2012). The testing and extending of UTAUT amounted in a revised model, UTAUT2 (see Figure 2.3), where the consumer use is more in focus than in the original model (Venkatesh et al., 2012).

UTAUT2 takes in consideration Hedonic Motivation, Price/cost and Habit when assessing user acceptance and use of technology (Venkatesh et al., 2012). Hedonic Motivation can be defined as the fun or the pleasure a user might or might not experience from using technology (Venkatesh et al., 2012). Venkatesh et al. (2012, p. 161) refer to this as “perceived enjoyment” and evidence shows this is an important influencer in accepting technology. Price Value was introduced as additional determinant to make up for the difference between technology offered to an employee and technology offered to a consumer (Venkatesh et al., 2012). A consumer bears the cost for technology while an employee does not (Venkatesh et al., 2012). UTAUT2 disregards the moderating factor Voluntariness of Use, since consumers action are seen to be voluntary (Venkatesh et al., 2012). In that sense, UTAUT2 is better equipped to help those designing and marketing consumer technology to form a better understanding of the user (Venkatesh et al., 2012).

![UTAUT2 diagram](image)

Figure 2.3 Unified Theory of Acceptance and Use of Technology 2 (Venkatesh et al., 2012, p. 160)
2.6.3 The use of UTAUT2 in the Master thesis

UTAUT2 was chosen for this research study due to the nature of the technology and the context of the users. Smart home technology in Senior housing rental apartments seem to have more in common with consumer technology (voluntary) than IT solutions offered to an employee (non-voluntary). Vassli (2016) suggests that UTAUT focus is more on an organizational context, while UTAUT2 emphasis is on the consumer context. The difference between the two models is that the determinants in Price value, Hedonistic motivation and Habit are considered, and moderator Voluntariness of Use is removed. The importance of the remaining moderators; Age, Gender and Experience, were considered but not investigated thoroughly in this research study. I did not want to disclose the specific gender and age of the participants in order to protect their anonymity.

The theoretical framework in this research study was used as Klein and Myers suggest theory to be used in qualitative research, as a "sensitizing device" (1999, p. 75). In other words it was used as lens of which the research and data were viewed through. Although theoretical models such as UTAUT and UTAUT2 is predominantly associated with quantitative research methods, its utility to qualitative research can also be argued for. Stewart et al. (2016, p. 615) suggests that the use of theory for both quantitative and qualitative research is that it provides rationale for the study and defines the aim and research questions. It is also of use to develop data collection and provide a framework for analysis and interpretation of the data (Stewart et al. 2016, p. 615). The ability of theory to connect pieces of research data and generate findings that can be fitted into a larger framework of other studies is the same for quantitative and qualitative research (Stewart et al. 2016, p. 615). This means by using theory it is possible to compare your findings to other, similar studies.

2.6.4 Similar studies that use UTAUT and UTAUT2

A study done on E-health and elderly users ages 57-77 years and their acceptance towards using the internet for healthcare utilizing UTAUT were conducted by De Veer et al. (2015). The result showed that the elderly were open-minded towards E-health but still not all of them would use it (De Veer et al., 2015). Gender, age, education and previous internet experience did play a role in how open-minded they were. They also found that the respondents were increasingly accepting towards E-Health when they got information of benefits and by being introduced to the application (De Veer et al., 2015).

Arenas-Gaitán et al. (2015) applied UTAUT2 on a study on elderly users and internet banking. They found that some of the moderators proposed by UTAUT2 played a role for user acceptance but some were completely obsolete. Habit, performance expectancy, price value and effort expectancy played a significant role while social influence, facilitating conditions and hedonic behaviour did not seem to matter at all (Arenas-Gaitán et al., 2015). Neither were gender found to play any part in whether the elderly user, over 55 years, chose to adopt internet banking or not (Arenas-Gaitán et al., 2015).
A study conducted on the adoption of E-health amongst elderly focused on the social influence construct (Bozan et al., 2016). The technology in question was a patient portal designed to communicate visits with health professionals, medications, injections, allergies and lab results to those over 65 years old. The study was a survey towards 117 respondents and resulted in a revised version of UTAUT model (Bozan et al., 2016). The authors added parts from institutional theory as some studies show that elderly could be particularly recipient to outside pressure when it comes to accepting or not accepting technology (Bozan et al., 2016).

A survey done on users acceptance of telemedicine implied that attitude of the user is crucial for a successful adoption and implementation (Kohnke et al., 2014). The author chose to modify the UTAUT model for the purpose of the study and tested attitude, anxiety, and self-efficacy as moderators instead of what the model originally suggests: gender, age, experience and voluntariness of use (Kohnke et al., 2014). Self-efficacy was also found to be an important factor for successful user adoption (Kohnke et al., 2014). Self-efficacy being the users expectation that their interaction with the technology is clear and understandable, that it is easy to use, easy to learn and that they expect themselves to become skilled in using the equipment (Kohnke et al., 2014).
3. Methodology

This chapter explains the methodology and methods that were used to collect data. The participants and how they were invited are presented first, followed by how the data collection and analysis were conducted. Validity, reliability and ethical considerations of the research are also presented and discussed in this chapter.

3.1 Philosophical paradigm

There are three different paradigms of which an information system research study can set out: positivist, critical and interpretive (Klein and Myers, 1999). Positivist research is research with a starting point of assumptions, propositions, quantifiable measures of variables and where the phenomenon is investigated through a representative sample to a stated population (Orlikowski and Baroudi, 1991). Critical is the research when the main task is social critique and where restrictive and alienating conditions are seen to be needed to brought to light (Klein and Myers, 1999). Critical research also has an emancipatory element (Klein and Myers, 1999). The researcher sees her/himself as a sort of liberator that through her/his interference is freeing the research object from existing power structures (Klein and Myers, 1999).

Interpretive research is used in order to understand the context of the information system and the information systems influence on the context (Klein and Myers, 1999). Seeking meaning in context is one of the key tasks of interpretive research. In interpretive research which context to retell is very much up to the researcher and what story s/he wants to tell to the audience (Klein and Myers, 1999). The core of this research study is about exploring and better understanding the views of a particular group of users - 70-85 years old - on how they perceive technology use and how their needs would be helped or disrupted by using it. In interpretive research the participants are also interpreters of reality, and their actions and pieces of information, that are contributing with, have been influenced, changed and altered just by participating in the study (Klein and Myers, 1999). Klein and Myers (1999) suggest that interpretive research is understanding human thought and action. Also, to attain deep insights to how information systems come about and is sustained, a view that suits this research study's purpose and aim. Therefore it was with the worldview of an interpretivist researcher I set out to answer the research questions of this master thesis.

The acknowledgement of research as subjective is central for interpretive research and one which I embrace. That can be seen as a more honest way to view research, as no research can be said to be totally without any bias. Interpretive research can be viewed as a researcher being like a captain on a vessel setting out on a journey to the unknown. Interpretive research is starting with an empty vessel with no clear sense on where the journey will take you. The captain, the researcher, has purposely chosen the type of vessel but has an open mind on where the vessel will take her. Along the journey, experiences are collected and put into the vessel and it is first when you have arrived at the destination that the collected pieces are being unpacked, carefully unwrapped, reflected on and put down into writing. This is how this research study was carried out.
3.2 Research approach
When attempting to answer a research question there are two different approaches with concurring data collection techniques a researcher can use, qualitative or quantitative (Myers, 1997). There could also be a mix of the two combining methods from both approaches (Myers, 1997). The quantitative approach was originally developed for the natural sciences and utilized methods such as surveys, experiments or mathematical modelling (Myers, 1997). Social sciences have instead used the qualitative approach with methods such as case studies and fieldwork (Myers, 1997). The data would then derive from interviews, documents, and importantly – from the researcher her/himself through their interpretation (Myers, 1997).

Due to the interpretive paradigm that I adopted and the nature of the research questions, this research study adopted a qualitative research approach. Interviews together with technology probes were used as data collection methods. This research-aim requires a deeper insight into the reality of others, and using a quantitative research approach would not fulfil that aim.

3.3 Methods for data collection
The methods of data collecting was selected based on the interpretive paradigm and the qualitative research approach. Methods for collecting data are technology probes and interviews. Firstly I will present how I invited the participants and who the participants are. Then, I will present how I used technology probing, creating a Smart home to introduce the participants to Smart home technology. Lastly, I will present how and why I chose semi-structured interviews as my data collection method.

3.3.1 Inviting participants
The choosing of who to invite to participate in a research study is very different depending on which research approach the researcher has taken on. With a quantitative approach selection is done using statistical methods to attain a representative and random sample of the population, “probability sampling” (Lewis and Ritchie 2003, p. 77) With the qualitative approach the sample is more the case of what you chose to study and what perspective or whose story you chose to tell. This is also called “non-probability sampling” and is more appropriate for the qualitative research approach (Lewis and Ritchie 2003, p. 78). In non-probability sampling participants are purposively chosen to “reflect particular features within the sampled population” (Lewis and Ritchie 2003, p. 78). The sampling, or choosing of participants, in qualitative research is not meant to be statistically representative, instead the sample is chosen due to (or thanks) to their characteristics (Lewis and Ritchie 2003).

As this research study aims to explore and better understand the senior citizens and their perspectives, the sampling for this research has been done purposively. Purposive sampling means that the sample (participants) are chosen because of their specific features or characteristics that enable detailed exploration and understanding of the themes and puzzles which the researcher wants to study (Lewis and
In this research study, the sample was purposively chosen to consist of senior citizens, 70-85 years old, currently living in Care housing rented out by a municipality owned housing company. I chose not to invite tenants over 85 in an effort to avoid those with a weakening health status. It is very difficult for an outsider to access those suffering of early states of dementia and the risk increases with age. I wished to include and invite participants of both genders even though gender itself was not regarded to be central for the scope of the research study. The sample can be seen by the qualitative researcher to be a “symbolic representation” (Lewis and Ritchie 2003, p. 83) that will provide answers to what the researcher seeks out to explore.

The sample size for this study were at an early stage set to 6-8 participants. Ritchie and Lewis (2003, pp. 83-84) mention three reasons to justify keeping sample size small in qualitative research. Firstly, phenomena only need to appear once to be part of the analysis so an increasing sample might not contribute that much more. Secondly, frequency is not an area of interest in qualitative research. Thirdly, the type of information that the researcher collects through qualitative methods are so rich in detail that a larger sample would not be possible to manage and process.

Due to the age of the chosen sample group it was for ethical reasons crucial to frame the sample and make sure that those invited were adequately fit (physically and mentally) to participate. I therefore conferred with the housing company caretaker where the participants lived. After explaining the purpose and conduction of the research study, I requested the names of 20 tenants that to the caretaker’s knowledge would be fit to participate. Four of the 20 names were disregarded before invitation due to them being over 85 years. It was presumed that approximately 50% of those invited would agree to participate so I invited 16 tenants. The 16 consisted of ten women and six men and they were invited through a written letter where the purpose and details of the study was stated (see Appendix A). For the sake of transparency I disclosed in the invitation letter that I was on leave from my employment at the housing company to study for a master’s degree at Linnaeus University. Those invited and willing to participate, were asked to answer an introductory form and return it together with their name and telephone number.

### 3.3.2 The participants
Six of the invited agreed on participating in the research, I call them #A, #B, #C, #D, #E and #F. The participants aged 70-85 years live in the same Care housing building in a municipality in Dalarna County, Sweden. The participants were asked to answer an introductory form prior to the technology probe and interview which set the characteristics of the sample:

- The age of the participants were 70, 72, 75, 77, 84 and 84 years old at the time of the research.
- Three were male, three were female. There were two couples amongst the participants. It was decided that those interviews would be conducted together, in couples.
- One participant had a disability and used home services. None of the participants have ever suffered a stroke.
• Three of the participants own and use computer, tablet and mobile phone, two had a computer and a mobile phone and one participant had a mobile phone.

3.3.3 Technology probing

Probing is a method used for when facing new design tasks and a tool for facilitating design collaboration (Mattelmäki 2008, p. 65). As a data collection method it is used for sensitising the participants to observe, to reflect upon and thereafter to report their experiences (Mattelmäki 2008, p. 66). That makes probing a valuable tool in order to gather data from users or participants (Mattelmäki 2008, p. 66). A non-occupied, furnished apartment in the same building as the participants lived was used for the technology probing. In the apartment Smart home technology aimed at senior citizens supporting their independency and welfare was created and exposed to the participants.

An interview followed directly after the technology probing in order to capture the participants’ reflections. The choice of conducting the research in the same building as the participants lived was a methodical choice. I wanted to simulate a home environment similar to the participants’ own home and not bring them too far away from their own reality. The choice of technologies to include in the probing was based on the literature review and through consulting the IT department managers at the municipality care administration and at the housing company. I consulted the IT managers to establish what technology the municipality and municipality owned housing company is considering to be of use for senior citizens today or in the future. I wanted to create both a realistic and futuristic technology probe for the participants to reflect upon.

The technology probing consisted of orange dot-shaped signs (see examples in Appendix D) placed in and around the apartment. The signs were placed where the technology would be incorporated; the sign about a stove guard was placed by the stove and so on. On the back of the orange dot was an explanatory text of what the technology does and how it facilitates a user. To accompany the signs I designed interface mock-ups showing the “My Smart Home” system (see Appendix E). The system was for the tenant to control and oversee the various sensors, devices, appliances and technology spread out in the apartment. Selected main functions for the “My Smart Home”-system was: door, visitor, health, light, alarm, water, food, laundry and calendar. The system was shown on a mobile phone, a computer and a tablet. Other devices include a wearable armband (to measure health, motion, detect falls and movement) and a RFID tag to use as entrance and apartment door key. See Figure 3.1 and Table 3.1 for description of the technology and devices.
In the hall there was a brief presentation of the Smart home system and its device independency. The apartment door can be locked and unlocked with your mobile phone. That means you can let someone in when you are not home. The apartment door can be programmed to automatically lock itself the time when you usually go to bed. If someone rings you up by the telephone in the main entrance you can see who it is on the screen next to the apartment door and chose to let them in or not.

This is a tag allowing the apartment door to be automatically opened when you approach the door. If the key is lost it can be found through a function in the My Smart home system.

There is a mounted camera instead of a peephole and any visitor can be viewed before letting them in. You can also share this information with a family member or caregiver that has the Smart home system installed.

In the bathroom a timer for appliances (in case you forgot your curling iron on for instance). There is also a water guard that can sense possible damage to the water pipes and that automatically turn of the water if it seems like you forgot.

Introducing a smarter toilet. After your “errands” a wash and blow dry can be performed in case you become immobile and it is getting hard to reach. The toilet also measures the amount of fluid you let go and if this changes over time. You can follow this yourself in the Smart home system.

Digital medicine dosage, if you need to take prescription medicine this digital dosage device helps you. It reports if and when you take your medicine and gives you (and family or caregiver if you wish) a reminder in case you forgot.

In the kitchen there is a fire guard using smoke detectors and automatically alerting the fire protection in case of fire. A water guard is also installed.

**Table 3.1 The Smart home technology in the technology probing**

<table>
<thead>
<tr>
<th>Sign</th>
<th>Smart home Technology</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the hall there was a brief presentation of the Smart home system and its device independency. The apartment door can be locked and unlocked with your mobile phone. That means you can let someone in when you are not home. The apartment door can be programmed to automatically lock itself the time when you usually go to bed. If someone rings you up by the telephone in the main entrance you can see who it is on the screen next to the apartment door and chose to let them in or not.</td>
<td>Mobile phone</td>
</tr>
<tr>
<td>2</td>
<td>This is a tag allowing the apartment door to be automatically opened when you approach the door. If the key is lost it can be found through a function in the My Smart home system.</td>
<td>Tablet RFID Tag</td>
</tr>
<tr>
<td>3</td>
<td>There is a mounted camera instead of a peephole and any visitor can be viewed before letting them in. You can also share this information with a family member or caregiver that has the Smart home system installed.</td>
<td>Mobile phone</td>
</tr>
<tr>
<td>4</td>
<td>In the bathroom a timer for appliances (in case you forgot your curling iron on for instance). There is also a water guard that can sense possible damage to the water pipes and that automatically turn of the water if it seems like you forgot.</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Introducing a smarter toilet. After your “errands” a wash and blow dry can be performed in case you become immobile and it is getting hard to reach. The toilet also measures the amount of fluid you let go and if this changes over time. You can follow this yourself in the Smart home system.</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Digital medicine dosage, if you need to take prescription medicine this digital dosage device helps you. It reports if and when you take your medicine and gives you (and family or caregiver if you wish) a reminder in case you forgot.</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>In the kitchen there is a fire guard using smoke detectors and automatically alerting the fire protection in case of fire. A water guard is also installed</td>
<td>Tablet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>8</td>
<td>With the Smart home system you can bring your refrigerator with you at all time. Everytime you open and close the refrigerator door a camera takes a picture of the contents. You can see the latest picture at any time with the help of a mobile phone. The refrigerator door alerts you if you left it open for unusual long time and the freezer is defrosting itself.</td>
<td>Mobile phone</td>
</tr>
<tr>
<td>9</td>
<td>There is a stove guard automatically turning the stove off if it is on for an unusual long time. If you step outside of the apartment and lock the door the stove is turned off immediately for your safety. For the rest of the appliances there is a timer making sure they are not on too long.</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>This is a kitchen fan that lets you know when it needs to be cleaned. A fire hazard is when grease clogs the kitchen fan/ventilation. This fan lets you know when you need to clean the filter to prevent fire.</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>The Smart home system can help you organize your recipes and plan grocery shopping. If you do not want to carry heavy groceries they can be delivered to you. At this apartment buildings entrance level there is refrigerated delivery boxes ready to store your food deliveries so you pick them up at your convenience. There is also a calendar function in the system helping you to stay organized.</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>In the bedroom, under the mattress there is a sensor that registers when you go to bed and when you go up. It also measures heat, moist and how you sleep. If you have epilepsy it registers if you have seizures during the night and family or caregivers can be alerted. Under the rug below the bed there is a light switch. If you need to go to the bathroom while it is dark, guiding lights come on. This room is also prepared in case you need to be watched over during the night by caregivers using camera surveillance.</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>In the living room table there is an armband and a laptop. You are right now having a health support call with your nurse. The nurse have checked your values that has been reported through you wearing the armband. She has taken a look at your pulse, blood pressure, weight, your activity level, what you ate, how you slept and how your breathing pattern is. If you happen to be diabetic she has also been monitoring your blood sugar. You can also see all those values yourself using your Smart home system. If you want to, your family or other caregivers can also see how you feel.</td>
<td>Mobile phone and Laptop</td>
</tr>
<tr>
<td>14</td>
<td>The wearable does not only measure your health. It also registers if you happen to fall and reports this to a family member or caregiver. If you are outdoors and happen to get lost the armband have a built in GPS and it can locate you and alert your family or caregiver.</td>
<td>Mobile phone and as Wearable activity fitband</td>
</tr>
<tr>
<td>15</td>
<td>The lights in the apartment can be steered from the Smart home system. That means you can turn off lights for instance with your mobile phone and you can check if any lights are on while you are out of town.</td>
<td>-</td>
</tr>
<tr>
<td>16</td>
<td>This iron turns itself of if it is on for an unusual long amount of time.</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>When you need to do some clothes washing you can book the laundry room conveniently from you mobile phone. You also get a reminder the day before that you have a booked appointment so you do not miss it. While you are washing get an alert when the wash cycle is done and it is time to hang the laundry.</td>
<td>Mobile phone</td>
</tr>
<tr>
<td>18</td>
<td>All the windows in the apartment have automatic sunscreens that go up and down after the sun and outside temperature. In the bedroom window the blinder can be programmed to go down automatically when you usually go to bed.</td>
<td>-</td>
</tr>
</tbody>
</table>

*Note: Some elements may not be visible in the provided image.*
**3.3.4 Interviews**

Semi-structured interviews were used in order to capture the participants’ reactions and reflections after the technology probing. In most interpretive research studies interviews do play an important part for the data collection (Walsham, 2006, p. 323).

An interview guide was prepared prior to the interviews (see Appendix C). The guide was seen, as Myers and Newman (2007, p. 4) articulates it as an “incomplete script”. I prepared some questions but the participants were the writers of the script. As this research study was employing UTAUT2 as a theoretical framework the determinants were guiding some of the questions asked to the participants. An example would be the determinant Effort Expectancy amounting in the question “Do you think it would be difficult to learn how to use the technology shown?”. The interview guide also included questions on the participants’ general perception on the technology shown to them, how comfortable they are using technology in general and their thoughts on possible privacy issues. There were also a question exploring dreams and wishes they had of Smart home technology, today or in the future.

Interviews is a common way of obtaining data, probably one of the most common methods in qualitative IS research. They have also been proven useful when exploring and understanding users and searching out subjective opinions about technology, its use and potential barriers (Connelly et al. 2014, p. 284). Myers and Newman (2007) argue that you should not take interviews for granted and to be as uncomplicated and straightforward as it sometimes is conveyed. It is, for instance, an artificial situation as it involves a researcher talking to someone who is a complete stranger (Myers and Newman 2007, p. 3). The technology probing used in this research might add to the artificiality of the interview situation. It meant the interviews was conducted in a made-up home and that might lead the participants to say things they would not say. In structured or semi-structured interviews the researcher is asking the interviewee to answer (or to create an answer) to particular questions formed by the researcher (Myers and Newman 2007, p. 3). In this research study those questions are probably even more subjected to the problematic since some of the questions have grounds in a pre-set theoretical model.

Myers and Newman (2007, p. 3) also argue that because of the intrusion of the researcher/interviewer in the social setting it might interfere and influence peoples’ behaviour. This can be seen as particularly risky with using interviews in this research study. Since I am an employee with the housing company the participants might see me as having double agendas and that might direct or influence their answers. I dealt with this by being transparent and honest and was open and clear to the participants with my position. I am an employee of the housing company, on leave for studies. My role was as an independent researcher and not as a representative of the company.

**3.4 Data collection**

The data collection was done under a period of three days in April 2017. The participants had a pre-booked appointment of 2 hours for technology probing and following interview. Upon arrival to the apartment each participant was welcome and again informed about the study purpose.
They were then asked to sign an informed consent form (see Appendix B). The participant was then asked to walk around in the apartment at their own pace for the technology probing. Figure 3.1 shows how the orange dot signs were placed around the apartment and Figure 3.2 shows how interface mock-ups and devices were placed. The technology probing took the participants 10-25 minutes to complete.

Figure 3.1 Photographs taken at the technology probing. It shows the orange dots and their placement.

Figure 3.2 Photographs taken at the technology probing. Interface mock-ups and devices.
The design of the technology probing did have some flaws. I had taken for granted that all participators could walk and move around in the apartment to read the signs. For two participants this was not possible, one just had surgery and one could not walk and stand for longer period of time due to bad knees. I solved this by picking down the signs and letting them read at the kitchen table.

After the technology probing, we sat down to conduct the interview. As the participants were Swedes the interviews were conducted in Swedish. Each interview took about 45 minutes. The participants had been informed in writing that the audio from the interviews would be recorded, and this was repeated before the interviews were conducted. The interviews were recorded on my mobile phone using the built in recorder app. Audiotaped interviews were then replayed and transcribed with the help of the transcribing software Transcribe. To protect the anonymity and identity of the participants they were named #A, #B, #C, #D, #E and #F in the transcripts. For the same reason, the findings will be reported without revealing the name, gender identity, and age of the participant.

3.5 Data analysis
For finding meaning in the collected data I used thematic analysis as proposed by Lichtman (2013). It is a method to analyse data through the process of three C:s, going from Codes to Categories and eventually ending up with Concepts (Lichtman, 2013). When the collected data derives from interviews it is not numbers that is under scrutiny, it is words and they are in their nature quite different from numbers. A number, for instance, has a decided worth that cannot be interpreted in the various ways a word can. A word can mean very different things, depending on who is saying it, to whom, in what way, together with what other words, what context and in what situation. The need to work systematically in the data analysis of words for validity and reliability of the result is crucial. Lichtman (2013) proposed a structured six step process which was used in this research study: 1. Initial coding, 2. Re-examining initial coding, 3. Developing an initial list of categories, 4. Modifying initial list based on additional rereading, 5. Revisiting your categories and subcategories, and 6. Moving from categories to concepts.

Because of the relatively small amount of data a manual method (instead of using software) could be used for coding and categorizing the collected data. The transcripts were deconstructed, cut a part into strips with scissors and sorted into category piles. The categories found were then written down on post-it notes and put up together with the adherent paper strips on a wall. When no new categories and no data could be sorted into categories from the transcripts they were put aside. The wall was then investigated and reflected upon during several days in order to move from categories into concepts (see Figure 3.3).
3.6 Reliability and Validity

Researchers within the interpretive paradigm have struggled with questions of reliability and validity of their research (Klein and Myers, 1999). As an reaction and an attempt to validate the interpretive paradigm seven principles were proposed for conducting and evaluating interpretive research (Klein and Myers, 1999). As according to Klein and Myers (1999) the principles can be used interdependently and without any specific order, I chose to adopt three of the principles to ensure reliability and validity of this research: the principle of interaction between the researcher and the subjects, the principle of dialogical reasoning, and the principle of suspicion.

The principle of interaction between the researcher and the subjects: critical reflection is needed on how the data is being socially constructed in the interaction between the two parties (Klein and Myers, 1999, p. 72). At the same time as I was conducting the research, I was also employed at the housing company where the research was taking place. It was, therefore, of upmost importance to be aware and observant that the participants view me first as a researcher and secondly as an employee at the housing company. There might also be positive effects of my connection with the participants. In the ideas of Walsham (2006, p. 321) the participants might see me, through my relation to their living situation, as trying to make a valid contribution to their situation, rather than “taking the data away and writing it up solely for the literature”. That might lead the participants to be more candid and more engaged.

The principle of dialogical reasoning: it requires sensitivity to what possible contradictions might occur between the theoretical preconceptions and the findings with revision as a subsequence (Klein and Myers, 1999, p. 72). It might be problematic to choose UTAUT2 as a theoretical framework for a qualitative research approach if you were to assume the theory as truth of which you should prove or discard. I chose to see the theory more as a lens through which I approached and interpreted the
collected data. But this is something to be aware of and reflect on throughout the conduction of the study to make sure to keep an open mind and not be steered by theory.

The principle of suspicion: sensitivity is required towards bias and distortions in the narratives collected from the participants (Klein and Myers, 1999, p. 72). This is again related to my employment at the housing company. I had more insight and knowledge into municipality owned housing compared to someone without my background. That makes me biased and tainted and important to be aware of. Walsham (2006, p. 321) although acknowledges that neutrality in research is an impossible equation as “we are all biased by our own background, knowledge and prejudices to see things in certain ways and not others”. It is although a possibility that my position might have influenced what the participants chose to share or not to share. Important to point out for the validity and reliability is that I had no stake or gain in a specific outcome of the research. This was a research study driven out of curiosity and aimed to convey the users’ perspectives as it was put forward by the participants.

3.7 Ethical Considerations

Due to the participants’ high age they can be considered to be in a particularly vulnerable state. Plus, I did not know the participants in beforehand so I needed to ensure that those invited understood it was voluntary and that they were physically and mentally fit to participate. I conferred with the caretaker of the building to ensure those that I invited were fit to participate. The participants were informed of the purpose of the study and that it was voluntary before agreeing to participate. They were informed in writing that the audio from the interviews would be recorded and this was repeated orally before the interviews were conducted.

While conducting this research study, I was also employed by the housing company that renting out the apartments to the participants. That I was an employee, was informed to the participants in the invitation letter and repeated at the probing and interview. I met with representatives of the municipality owned company and I informed them of the study purpose. I asked for their permission to contact the tenants and conduct the research at their premises.

For the protection of anonymity and confidentiality, the name or exact location of the participants will not be disclosed. That includes gender and age of each participant as it might endanger their anonymity. During the research, I ensured that the data would be accessible to myself, my supervisor, and my examiner. Upon master thesis’ completion, all audio recorded data and transcripts will be deleted.
4. Empirical findings

In this chapter I present the findings of my research. The findings are presented in six concepts that emerged from the collected data through thematic analysis.

The concepts that emerged from the research study are:

1. Technology is something that is taught.
2. Senior housing needs to be suited for senior tenants.
3. If the technology is going to help me, I need to trust it and I need support.
4. According to yourself, you are always on top of the world.
5. The need is individual.
6. If the doctor tells me to use the technology, I will.

1. Technology is something that is taught

I began every interview with talking about technology in general, drawing to the example of buying tickets at a train ticket machine instead of buying tickets by a person. This yielded different reactions from the participants. None of the participants had bought tickets from a machine but answered very differently to whether they would consider trying it.

Participant #C replied with confidence: “If I wanted to”.

While Participant #A said: “I am dreading the day I have to travel by train”, followed by “I am not so knowledgeable that I can handle all the technology nowadays”.

Participant #B suggested that learning the technology was a question of habit: “I think future generations will not struggle but those old today are having difficulties”.

On the question why, Participant #B said: “…because they are not used to it”.

Participant #C on the other hand said: “it takes a certain technique to follow along, even in the digital world”.

Participant #B stressed on the need for adapted training if technology in the home are to be implemented: “Older people are unable to act, they dismiss it, they can’t, they dare not so if this is how it should be there has to be some training. So that they can practice, all this is very good”.

When teaching new technology to the senior citizen user it seems important that the teacher is patient and does not get stressed as Participant #F said: “Not like my children and grandchildren that say ‘I have showed you once’, no, but show me three times more. I think I know some already, but there is still much more I would like to learn”.

Participant #C view was very absolute about senior citizen and learning new technology: “either they have the knowledge or they think I do not want to!”

The need to be taught the technology in order to be used by it was conveyed by Participant #C: “All technology aimed at helping the tenants is positive, but there are people that do not want to acquaint themselves with the technology. And they are not helped by it”.

Participant #B said: “Otherwise you cannot use the technology, no, you have to be able to handle it”.

2. Senior housing needs to be suited for senior tenants
Several of the participants put forward the importance of Senior housing being suited or adapted to its senior tenants.

Participant #C simply stated: “Care housing is no more safe than you can receive in any apartment building” giving the example of home care services that could visit any type of apartment or private home in the municipality. Participant #C was of the opinion that a Care housing should be completed with Service personnel in the building.

There were other expressions of what Care housing is perceived to be and what type of tenants and needs it should cater for.

Participant #F reflected on the age of the senior tenants and the need of more adaptations in the apartments and mentioned handle bars in the shower: “Nowadays there is a lot older tenants, a lot older. Since it became Care housing. So a lot of help is needed.”.

About the state of the tenants Participant #C said: “I should not get tenants, or allow tenants that need too much technology or you should not live here. In a generic building you cannot demand the same as you can in a building intended for Care housing”.

This last expression is a little bit difficult to interpret, it can be seen as critique for the housing company (or possibly to the municipality) for allowing tenants at the Care housing with too complex care needs. It might also be critique towards other tenants for not realising that they need more care and support than Care housing currently offer. While discussing the technology, the participants brought up ideas of physical alternations simultaneously.

Participant #F proposed that the shower area should be equipped with supporting handles so there are something to hold in order to prevent falls as mentioned: “I have experienced problems with dizziness and got handles installed in the shower. That gives such a feeling of safety when you feel you have to move around. That it is there. Everybody should have that. This is Care housing you know”.


One participant said the shower faucet was inappropriate and that you could burn yourself while showering. Another said the window blinders was much too difficult to reach for elderly. Same with the kitchen cupboards.

Participant #B said: “The kitchen cupboards are really high. I do not think anyone who lives here can reach into those cupboards”.

When it comes to having to pay a higher rent for Smart home technology the participants were very coherent: hesitant. The reasons were an already low pension and that the rent is already expensive.

Participant #B did not want to pay more in rent but implied it might be a matter of need: “But of course, it depends, how important you feel that it is. If it is very important you might not have a choice”.

3. If technology is going to help me, I need to trust it

All of the participants in this research study expressed a fear of accidental falls. It was perceived as the most serious risk of living by your own. There were also other fears and threats. One participant expressed a fear of becoming seriously ill without anyone coming to aid her/him. Another participant did not shower when their partner was out of the apartment because of their mutual fear of her/him falling in the shower.

Participant #C conveyed the need to trust the technology in these serious situations as: “…when you are lying there with a broken leg or femur…that is the most serious condition I could be in” and “I do not have the mobile phone on me when I am lying down. As long as I can crawl it is alright, but if I am lying there I have to put all my trust in an armband, an alarm…”.

Another thing that emerged was that the participant who did have access to a safety alarm armband, but did not always wear it; it consequently became of no use.

Participant #D replied to the question if s/he wear an alarm armband: “Yes, it is on the hall table”.

Another side affecting trust in technology seems to be that sufficient support is in place. The participants were in agreement that the landlord have a responsibility in supporting the tenants regarding the technology. Regarding already existing technology, Wi-Fi and television options, in the apartment there were a perceived need to receive more training and support from the landlord.

Participant #B said: “Well, I think that it is hard to make use of everything that already is in the apartment. You have this…Wi-Fi…but I do not know how to use it! And who, I do not know who to ask, no idea. I asked the landlord, but have not gotten any answer”. The same participant proposed an innovative solution by letting one of the IT knowledgeable senior tenants to hold courses in technology for the other tenants.
4. “According to yourself, you are always on top of the world”

At the same time as expressing use of the technology, the participants said they were either too young or too healthy for it.

Participant #B said: “Much of this is for if you become disabled”.

Participant #F: “I am a little too young for some things, to imagine, or am I not? Too healthy…”.

Participant #C shared the following insight on becoming old and the difficulty to assess your own needs: “Everything that tends to us old is welcome, but, the old human changes in time. There comes a stage when you are at one's wit’s end. Then you have to be judged by others and not on what you believe yourself. Because going to yourself, you always consider yourself to be on top of the world”.

The same Participant #C also said about the technology and its use: “There is truth in all the measurements here. If you need them or not is for the severity of the moment to decide. If it is there and I know how to use it, then all is good”.

5. The need is individual

The need for technology is perceived from the participants to be individual. Participant #F claimed that s/he would never consider using food deliveries ordering online, while Participant #B saw this as crucial and would use it immediately if s/he knew how to do it. When discussing dreams and wishes for Smart home technology Participant #A, whose life companion had a disability affecting their ability to dress her/himself, wished for a robot helping to put on socks.

Participant #F shared during the interview that s/he for the first time in her/his or life recently asked for help to change the window curtains. To avoid falling from the two chairs Participant #F use to balance on while attempting to reach and dismantle the curtain rod. That is the only way to get the curtain down from the wide window in the kitchen in one piece. Participant #F: “I am so independent I want to do it myself. It is not that I do not want to bother others…well you do not want to do that either even though they do it, if you ask for it. No, it is just that…it is fun to take care of it yourself”.

6. If the doctor tells me to use the technology, I will

All the participants agreed that they would use the technology if their doctor or caregiver told them to, even to the degree that one’s privacy comes second. For instance Participant #F was first very quiet and reluctant to the idea of a sensor under the mattress to measure sleep patterns and movement. But if the doctor advised to use it, Participant #F would: “…you listen to your doctor”.

34
The reason for the doctor’s influence seems to be connected to one’s health and well-being.

Participant #A said: “Yes, if the doctor told you, you would. If it is for your health”.

Participant #C conveyed the trust s/he feels for health professionals by saying: “If I am in a condition that they think I should use it, then I am in bad shape”, but adding “if one was completely healthy, one might hesitate”.

Family and friends did not have the same coherent effect on the participants.

Participant #A said without hesitation on whether s/he would use technology if her/his family said so: “No. You do what you want to”. 
5. Discussion

In this chapter the findings and how they relate to the theoretical framework UTAUT2 will be discussed. In addition the findings will be discussed and briefly compared to the previous literature.

5.1 The findings viewed through the lens of UTAUT2

It was conveyed by the participants that technology requires training and that sometimes is a struggle. In UTAUT2 the degree of ease associated with learning technology, Effort Expectancy is a determinant. A determinant that seems to be of importance in this case and one that might be influenced by the participants’ age. For them it was conveyed that you, at their age, either must have an interest in technology a strong motivation or a will to learn it. Effort Expectancy could then also be suggested to be moderated by Age and Experience.

Several of the participants described a sense of distancing themselves from becoming old and frail. It is difficult to acknowledge and realize that you are in the state of needing help with taking care of yourself or doing tasks you used to do. This notion might have influence on the determinant Performance Expectancy. If you do not realize you need aid, by humans or technology, it is difficult to feel that it would serve you. The participants did generally said that Smart home technology could be of some use, and one participant suggested that the reason for her/his positive attitude towards the technology shown was because s/he were very interested and open to technology in general. That implies that the moderator Experience could have influence.

The importance of having sufficient support from the technology was coherent amongst the participants, indicating that Facilitating Conditions is a determining factor. Some of the technology use is quite serious, like getting help if you are not capable to get help yourself. If the users do not feel there is support, or Facilitating conditions, for instance a fall detection alarm, one would probably not trust it enough to use it.

Paying for Smart home technology in Senior housing generated a hesitant response from the participants. Whether the user is willing to pay, or rather, feel that the technology and its use is worth paying for is a determinant, Price Value. In the case of Smart home technology this could be strongly connected to the level of need. If you are in serious need, you pay, as the case for home aid services. The hesitance amongst the participants might also indicate that the technology is not seen as valuable as more traditional solutions such as home aid services.

Caregivers and health professionals seem to have influence on the senior citizens and their potential use of Smart home technology. UTAUT2 refers to this as Social Influence. All participants agreed on if your doctor said to use the technology, you would. The reason was quite coherent, because if they said so, it is because it is best for my health.

The telling story from one of the participants wanting to change curtains by her/himself as it felt good to be independent could be an indicator of the determinant Hedonic Motivation. If using the technology could give the user a pleasurable feeling of being independent it would according to UTAUT2 motivate use of the technology.
5.2 Findings compared to previous researches

When comparing the findings to previous researches, I found some concepts/themes that are reoccurring. Chernbumroong et al. (2010) found the older adult to be positive towards the technology, but concerned about the lack of human responders. In the same subject Wong and Leung (2016) found that efficient backup service support was one of the driving factors encouraging the adoption by the elderly user. This can be compared with the fear of not having sufficient support (Facilitating conditions) for the technology, as my findings suggest.

Chernbumroong et al. (2010) showed the older adult user to be concerned of the need to learn new technology. A concern for the participants in this research study as well. The matter of self-efficiency was also found to be an important factor for successful user adoption in Kohnke et al. (2014) study of users acceptance of telemedicine.

Courtney et al. (2008) brought up that the need of Smart home technology could override issues such as privacy and this was coherent with the participants’ view of the doctor, and that their health came before privacy. Another study on the adoption of E-health amongst elderly focused solely on the social influence construct (Bozan et al., 2016) and suggested elderly could be particularly recipient to outside pressure. That is supported by the findings of this study where the doctor was suggested to have an influence on the senior citizen use of Smart home technology.

Courtney et al. (2008) also showed how acceptance of technology was connected with the users acknowledgement of their own frailty, a theme my findings seem to support.

A previous study utilizing UTAUT to explore elderly users of E-health by De Veer et al. (2015) showed that the elderly were open-minded towards the use of technology but still not all of them would use it. De Veer et al. found that experience did play a role in how open-minded they were and that notion is supported by this study.

5.3 The research questions answered

Below I conclude the findings with providing answers to the two Research questions asked in the beginning of the thesis.

Table 5.1 Answers to RQ1

<table>
<thead>
<tr>
<th>RQ1: How do senior citizens perceive Smart home technology?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Technology is something that must be taught and takes effort.</td>
</tr>
<tr>
<td>2. Technology is positive if it is of assistance.</td>
</tr>
<tr>
<td>3. Technology needs to be trusted.</td>
</tr>
</tbody>
</table>
Table 5.2 Answers to RQ2

RQ2: How do senior citizens describe their use and need of Smart home technology?

1. Technology is in its use and need a part of a whole for senior citizens.
2. Technology use is linked to acknowledging your own state and need.
3. Technology use and need is individual.

Table 5.3 Summarization of the answers to RQ1 and RQ2

1. The technology is something that must be taught. The amount of effort involved depends on your previous experience, age, habit and attitude.
2. Senior citizens are positive towards what the technology aims to do but that does not automatically mean they will use it.
3. To be able to trust the technology is crucial. Trust involves feeling sufficient support is in place for the technology.
4. Technology is a part of a whole in that it should be supplemented with adequate design of the physical environment.
5. The use and need of technology is connected with a realization of your own state. Health professional do have influence on the users adoption of technology.
6. The need of technology is individual and cannot be assigned to a whole user group. A want or wish to live independently could although be a use many can appreciate.
6. Conclusion and future research

This chapter offers conclusive remarks, suggestions for further research, the contribution of the study and reflections on the research process

6.1 Conclusive remarks and further research
To how senior citizens perceive and describe their use and need of Smart home technology the six participants, aged 70-85, provided rich and insightful answers. Using the interpretive qualitative research methodology with data collection methods probing and interviews, the research study resulted in six concepts through a thematic data analysis which answered the research questions RQ1. How do senior citizens perceive Smart home technology? and RQ2. How do senior citizens describe their use and need of Smart home technology? The research setting of municipality owned Care housing provided opportunity to use an unoccupied apartment for technology probing. As the research was underpinned by the theoretical model Unified Theory of Acceptance and Use of Technology (UTAUT2) provided basis for discussion and a lens for which the findings were viewed through.

The findings showed that technology is perceived to be something that is taught and takes effort. Senior housing need to be designed for its senior tenants, adaptations in the physical environment is required in combination with technology use. If the use is to ensure safety, detect and prevent falls for instance, the user needs to feel trust and that sufficient support are in place for the technology. It is difficult to assess your own need and to realize when additional support is needed, for instance technology. The use was perceived as being individual and in such, the need for technology cannot be treated collectively. The need and use of Smart home technology for senior citizens’ can be concluded in being independent, feeling safe and being relieved of everyday tasks that become more difficult as you are getting older. Health professionals do have some influence on the senior citizen and their use of technology.

Regardless of technical development and user expectations there is an on-going shift in the living situation of senior citizens: from living in Service housing with personnel on-site to independent living in Senior housing. As an immediate sign of this, the housing company featured in this research study is currently converting a former Service housing into Care housing. In line with the municipality’s vision for an increased use of technology the apartments are prepared for incorporating technology. When technology is in place, it will provide more concrete suggestions for further research of the senior citizen user of Smart home technology in municipality owned Senior housing. However, a suggestion is to repeat the same research when the apartments of Senior housing are equipped with real technology -not technology probes- in order to evaluate the results of this research study. Additionally, a similar research study guided by a different theoretical framework would be interesting.

6.2 Reflections
To reflect upon the findings and contribution of this research study it is important to discuss its methodology and research design. The research study was conducted in accordance with the interpretive qualitative
approach. Consequently the researcher functions as a sort of synthesizer. This can feel both empowering and suppressing to the researcher. In the analysis phase, I sometimes found myself to be not only a mediator, but also a director and editor of the data. This made me constantly question if what I was conveying was the genuine essence of the participants’ words. But as Lichtman (2013) suggests, when conducting interpretive research there is nothing that says that the researcher’s interpretations is any better or more valid than how anyone else would interpret the data. Still, the findings were extracted from interpretations. The view of the participants in interpretive research is that they are also interpreters and that their actions and pieces of information have been influenced, changed and altered just by participating in the research study (Klein and Myers, 1999). The concepts found can therefore be seen as insights into how six individuals between the ages of 70-85, living in municipality owned Care housing, perceive and describe their needs and use of various types of Smart home technology. The findings are not generalizable or to be taken as truth.

Using UTAUT2 as an underpinning theoretical framework provided structure to the interviews and offered a possibility to view what was conveyed by the participants through a lens that others used in previous studies. This offered a way to compare importance of different factors in the use and acceptance of technology and also a ground for discussing the findings. Although it can be seen to be confining to use a theoretical model in interpretative, qualitative research I found comfort in having a structure and something to lean on. I did not feel that using a theoretical model confined be and closed me off from seeing what the participants were truly conveying. But that does not mean it wasn’t.

The manual method that I went about into finding meaning, by cutting up and deconstructing the transcripts, sorting in piles and later putting everything up on a wall did invite me to be reflective in the analysis process. It also gave a good oversight over the available data but at the same time it was easy to lock in on the initial thought and what were already on the wall. Because of this, I did go back to the transcripts to read them from beginning to end, after I formulated the concepts to make sure that I had caught the participants’ story as they were telling it. Another notion important to address is how data in the form of language is sensitive and run the risk of being misrepresented. This is maybe a risk for this research study as the interviews were conducted in Swedish, the senior participants’ native language. Quotes and meaning were then translated into English without the possibility to double-check potential misrepresentation with the participants.

This degree project was a challenging but self-developing learning experience. Now that my ship has come to shore and I have unravelled what I gathered during the journey I do see how qualitative research bring value to user research. Usability and acknowledging the view of the user to improve IS/IT is something I am very passionate about, it is a topic I will continue to explore even after the completion of my master thesis.
References


This letter was sent out in Swedish and have been translated into English.

Invitation to participate in a study involving Smart home technology for senior citizens

My name is Magdalena Gudmundsson and I live outside Falun. I work as a communication officer at Kopparstaden and am currently on leave to attend a one-year Master-program in Information systems at Linnaeus University. Through this letter I am inviting you to participate in a voluntary study on how technology in the home can be used to support senior citizens.

The purpose of the study is about investigating how you as a potential user perceive the technology and its use – I am interested in your thoughts and opinions. Examples of home technology for senior citizens is for instance a stove guard that automatically turns off the stove if it is on for an unusual long amount of time or an automatic lock on the apartment door that locks the door in case it was forgotten. It could also be a device that detects accidental falls and can send an automatic alert to a relative or caregiver.

If you chose to participate, there will be two parts, each part takes about 2 hours. The study is being performed 10-12 April, in the daytime:

- **Part 1** you will be given an introduction on what Smart home technology is.
- **Part 2** is an audiotaped interview performed in your home.

As a participator you are anonymous, your age will be in the report but not your name or where you live. Your words and opinions will be used as part of the research result. I hope you choose to participate in this voluntary study, there is no monetary compensation but for taking up your time two “Trisslotter” will be given to you once the interview is completed.

If you wish to join the study please fill out the questionnaire on page 2-3, put it in the enclosed envelope and place it in the Kopparstaden mailbox at the entrance level, at the latest Tuesday 4th of April. I will then contact you 5-6 April to schedule time for carrying out the study. When we meet I will ask you to sign a written consent of your participation in the study. If you do not wish to join the study you do not have let me know or do anything else.

Regards
Magdalena Gudmundsson
magdalenagudmundsson@gmail.com
070-530 15 51
Below are some questions on your general health and use of technology. For the YES/NO questions circle your answer, for the other questions there is a scale 1-7 where you put a cross in the box which you think suits you the best. Your answers are treated confidentially.

1. Have you ever suffered a stroke? YES NO
2. Do you have any disabilities that prohibit you from performing everyday activities on your own? YES NO
3. Are you receiving any home help from the municipality? YES NO
   In that case how often? ........................................................................................................
4. Do you feel comfortable asking for help to manage everyday activities?
   Not at all Pretty comfortable Absolutely
   [ ] [ ] [ ]
5. Would you feel more comfortable if it was technology like a computer, tablet or mobile phone that assisted you with everyday activities and not a person?
   Not at all Maybe Absolutely
   [ ] [ ] [ ]
6. How important is it for you to live independently and to carry out your everyday activities on your own?
   Not at all Pretty important Very important
   [ ] [ ] [ ]
7. Do you have a computer?  YES  NO  
If you have a computer, do you feel comfortable using it?  
<table>
<thead>
<tr>
<th>Not at all</th>
<th>Pretty comfortable</th>
<th>Absolutely</th>
</tr>
</thead>
</table>

8. Do you have a mobile phone?  YES  NO  
If you have a mobile phone, do you feel comfortable using it?  
<table>
<thead>
<tr>
<th>Not at all</th>
<th>Pretty comfortable</th>
<th>Absolutely</th>
</tr>
</thead>
</table>

9. Do you have a tablet?  YES  NO  
If you have a tablet, do you feel comfortable using it?  
<table>
<thead>
<tr>
<th>Not at all</th>
<th>Pretty comfortable</th>
<th>Absolutely</th>
</tr>
</thead>
</table>
The consent was given in Swedish and was later translated into English.

Written consent

With my signature I give my written consent to participate in the study performed by Magdalena Gudmundsson, Master student in Information system at Linnaeus University. The purpose of the study is about investigating how senior citizens perceive smart home technology and its use.

The study has two parts, each part takes about 2 hours. The study is being performed during week 15:
- **Part 1**, an introduction on what Smart home technology is.
- **Part 2**, an audiotaped interview performed in your home.

As a participator I am anonymous, my age will be in the report but not my name or where I live. My words and opinions will be used as part of the research result. There is no monetary compensation but two “Trisslotter” will be given to me once the interview is completed.

Date and location: ________________________________

Signature: _________________________________________

Name clarification: ________________________________
Appendix C (1)

Author: Magdalena Gudmundsson
Subject: Informatics
Level: Master

Interview guide

Participant: #
Date and time:

Purpose: to explore senior citizens perceptions on Smart home technology and user acceptance towards technology with intended use care and support. The interviews are conducted in order to grasp the interviewee’s own perception and description of their use of Smart home technology.

I would first like to ask some questions about yourself and then about how you think and feel about what you experienced in the Smart home technology introduction the other day. You can stop me and ask questions or comments anytime during the interview. Is that ok?

1. Presentation:

I would like to get you now you a little more before we start. Could you tell me a few things about yourself, how old are you, how long have you been staying with Kopparstaden, what is your educational background, do you have children etc.

1. I would like to get an idea of your familiarity and comfort level with technology.
   a) Do you use a computer?
   b) Do you use a cellphone?
   c) Do you use a tablet?

2. How comfortable are you using or trying any kind of technology?

3. Describe how every day life is like for you being over 70 years old, do you experience any difficulties or are in need of assistance to perform every day tasks?

2. Perception of the technology in the Smart home introduction

1. What did you think of the technology shown to you in the introduction?

2. Did any technology stood out to you in particular?

Performance Expectancy

3. Do you think the technology shown to you in the Smart home introduction would be helpful to you, today or anytime in the future? If so, how?

Effort Expectancy

4. Do you think it would be difficult to learn how to use the technology shown?
   How come or why not?
Appendix C (2)

Author: Magdalena Gudmundsson
Subject: Informatics
Level: Master

Social Influence
5. Do you think you would be more inclined to use the technology if your relatives told you to use it?
   What about if your caregiver or doctor told you to use it?
   If your friends or neighbours got the technology and appreciated it, would you then give it a try?

Facilitating Conditions:
6. Do you think that the manufacturer would help you with the technology if you are in need?
7. Do you think your landlord would help you with the technology if you are in need?

Hedonistic Motivation:
8. Do you think any of the technology you saw that would be fun/enjoyable to have and use?

Price Value
9. Would you be willing to pay higher rent in order for your apartment to be equipped with the technology?

3. Privacy
1. What do you think your relatives or caregiver being informed on what you are doing, where you are, how you are feeling or who is coming to visit you? Do you think that is a breach on your privacy?

2. Is there anything else you want to share with me on the technology shown to you?

4. Perception of technology in an imagined Smart dream home setting
I would like to learn more about what Smart home technology you wish existed.

1. When walking around in the smart technology apartment did you get any other ideas on smart home technology that you wish or dream existed?
2. We have come to the end of the interview, is there anything else you want to share or add?

Thank you very much for your participation!
Hallen


Dags att tvätta?

Månaden som gått:
Hälsostatus god, något låg vätskenivå. Försök att andas mer, gärna 2 liter vatten per dag.

Nuvarande hälsotillstånd:

**PULS:** 78  
**ANDNING:** 20  
**BLODTRYCK:** 110/90  
**VÄTSKA:** 36%  

Distriktssköterska Åsa:  
Hej, hoppas att tekniken fungerar och att du ser och hör mig. Såg till om jag ska höja volymen!