



Framework for Creating Ethical Older People Personas for the Development of Ambient Assisted Living Technologies

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2021 Laurea



Laurea University of Applied Sciences

**Framework for Creating Ethical Older
People Personas for the Development of
Ambient Assisted Living Technologies**

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Degree Programme in Service
Innovation and Design
Master's Thesis
May, 2021

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Year 2021

Pages

66

As the population in the EU ages, there will soon be more people over the age of 65 than working-age inhabitants. This will be a challenge to the economy as there will not be enough people to take care of the older population. Ambient assisted living (AAL) technologies, that encompass everything from smart homes to wearable sensors, are seen as a solution to help older people live longer in the comfort of their own homes. However, these technologies are recognized to contain many ethical issues. Therefore, the ethical factors should be considered when developing AAL technologies for the older adults. The persona method is used in service design to visualize often complex and vast amounts of data about the end user to help the developers create empathy toward the users. The use of personas is one way for developers to make informed design decisions for the benefit of the older adults on the developed technology.

The goal of this thesis is to create a framework for adding ethical requirements to older people personas that help guide developers in making ethical design decisions for the developed digital product or service. This thesis is connected to the EU-funded project called SHAPES (Smart and Healthy Ageing through People Engaging in Supportive Systems) which Laurea University of Applied Sciences is taking part in. The thesis contributes to the SHAPES project by investigating how to combine the ethical requirements in the persona, so that it aids the SHAPES developers to take into consideration the persona-specific ethical requirements when developing digital solutions and innovations for the SHAPES Integrated Care Platform.

The theoretical framework is derived from the literature on customer-dominant logic, service design, personas and AAL technologies. As the service design process, the study followed the double diamond model, specifically focusing on the define and develop phases. Qualitative content analysis was carried out on the D8.4-SHAPES Ethical Framework study to identify the main ethical requirements that should be featured in the ethical older people personas. Then, a workshop was held with two product and service developers to gain an understanding on how the ethical requirements should be presented in the persona to help them make ethical design decisions for the benefit of the end user.

As a result, a framework for an ethical older people persona for developing AAL technologies was created. Six ethical requirements were identified to be featured in the older people personas that include: 1. digital mistrust, 2. the feeling of safety and security, 3. accessibility limitations, 4. demand for inclusion and non-discrimination, 5. supported decision making, and 6. affordability of care. Furthermore, it was found that highlighting the ethical requirements with different colors in the text of the persona card helped developers pay attention to the requirements. However, further research and testing still needs to be carried out because the study focused only on the define and develop phases of the double diamond. Thus, it is recommended to further test the created ethical older people persona to finalize the persona framework.

Keywords: personas, older people, ethical, ambient assisted living technologies

Lydia Pertovaara

Eettinen viitekehys ikääntyneiden ihmisten persoonille avustetun asumisen teknologioiden kehittämiseen

Vuosi 2021

Sivumäärä 66

Väestön ikääntyessä on EU:ssa pian enemmän yli 65-vuotiaita kuin työikäisiä. Tämä tulee olemaan haaste taloudelle, koska ei ole tarpeeksi ihmisiä huolehtimaan vanhemmasta väestöstä. Avustetun asumisen teknologiat, jotka kattavat kaiken älykkäistä kodeista puettaviin sensoreihin, nähdään ratkaisuna, joka voi auttaa ikääntyviä ihmisiä elämään pidempään omassa kodissaan. Avustetun asumisen teknologioiden on kuitenkin tunnistettu sisältävän monia eettisiä ongelmia ja siksi eettiset kysymykset tulisi ottaa huomioon, kun teknologioita kehitetään ikääntyneille aikuisille. Persoonat on palvelumuotoilussa käytetty menetelmä, jolla voidaan visualisoida monimutkaista ja runsasta tietoa, jota on kerätty loppukäyttäjistä. Persoonien käyttö on yksi tapa, jonka avulla kehittäjät voivat tehdä tietoon perustuvia suunnittelupäätöksiä kehitettävästä teknologiasta ikääntyneiden ihmisten hyväksi.

Tämän opinnäytetyön tavoitteena on luoda kehys eettisten vaatimusten lisäämiselle ikääntyneitä ihmisiä kuvaaville persoonille, jotka auttavat kehittäjiä tekemään eettisiä suunnittelupäätöksiä kehitettävälle digitaaliselle tuotteelle tai palvelulle. Tämä opinnäytetyö kytkeytyy EU:n rahoittamaan SHAPES-hankkeeseen (Smart and Healthy Ageing through People Engaging in Supportive Systems), jossa Laurea-ammattikorkeakoulu on mukana. Opinnäytetyössä tutkitaan, kuinka sisällyttää eettiset vaatimukset persooniin siten, että ne auttavat SHAPES-kehittäjiä ottamaan huomioon persoonakohtaiset eettiset vaatimukset uusissa digitaalisissa ratkaisuissa ja innovaatioissa, jotka on tarkoitettu SHAPES-integroidulle hoitoalustalle.

Teoreettinen viitekehys on johdettu asiakaslogiikasta, palvelumuotoilusta, persoonista ja avustetun asumisen teknologioista. Tutkimuksessa noudatettiin palvelumuotoiluprosessina kaksoistimanttimaailmaa, jossa keskityttiin erityisesti määrittelyn ja kehittämisen vaiheeseen. Ensiksi tehtiin laadullinen sisältöanalyysi D8.4-SHAPES Ethical Framework -tutkimukselle, josta tunnistettiin tärkeimmät eettiset vaatimukset, joiden tulisi olla osana ikääntyneitä ihmisiä kuvaavissa persoonissa. Sitten järjestettiin työpaja kahden tuote- ja palvelukehittäjän kanssa. Työpajan tarkoituksena oli ymmärtää, miten eettiset vaatimukset tulisi esittää persoonissa, jotta kehittäjät pystyisivät tekemään eettisiä suunnittelupäätöksiä loppukäyttäjän eduksi.

Tutkimuksen tuloksena luotiin kehys eettisten ikääntyneiden ihmisten persoonien luomiselle avustetun asumisen teknologioiden kehittämiseksi. Opinnäytetyössä tunnistettiin kuusi eettistä vaatimusta, jotka tulisi sisällyttää ikääntyneitä ihmisiä kuvaaviin persooniin. Tunnistetut eettiset vaatimukset ovat: 1. epäluottamus digitalisuutta kohtaan, 2. turvallisuuden tunne, 3. esteettömyysrajoitukset, 4. osallistaminen ja syrjimättömyys, 5. tuettu päätöksenteko ja 6. hoidon kohtuuhintaisuus. Lisäksi tutkimuksessa ilmeni, että eettisten vaatimusten korostaminen persoonakortin tekstissä eri väreillä auttoi kehittäjiä kiinnittämään huomiota eettisiin vaatimuksiin. Lisätutkimuksia ja -testejä on kuitenkin vielä tehtävä persoonakehityksen viimeisteleminen, koska opinnäytetyössä keskityttiin vain kaksoistimantin määrittelyn ja kehittämisen vaiheeseen.

Asiasanat: persoonat, ikääntyneet ihmiset, eettinen, avustetun asumisen teknologiat

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1 Introduction

It is forecasted that by 2050 there will be 129,8 million inhabitants in Europe of which 29,4% will count for people aged 65 years or older. The ageing of the population is mainly due to the decrease in fertility rates and the increase in life expectancy. The rising number of older people in the EU presents a challenge to the economy as there will be more older people than working-age inhabitants being able to take care of them. Some analysts see this negatively affecting government finances, causing a downward economic growth, and increasing age-associated social costs. Contrariwise, other analysts see this as a positive boost for creating novel services and products such as housing and transportation catered to the needs of the older population. (Corselli-Nordblad & Strandell 2020)

Ambient assisted living (AAL) technologies are seen as a solution to take care of the growing number of older people (Blackman et al. 2016). These assistive technologies include everything from inexpensive devices to more complicated home monitoring technologies (Robinson et al. 2013), all developed with the purpose of aiding older people to live longer in their own home (Queirós et al. 2015). However, the use of these technologies contain several ethical challenges for older people such as cost effectiveness, privacy, autonomy, informed consent, dignity, safety, and trust (Sánchez et al. 2017). Robinson et al. (2013) argue that designers, companies, and researchers should take part in co-development exercises with older people to be able to make knowledgeable decisions of the developed assistive technologies so that the technology is designed to be desirable and beneficial to the end user.

The use of personas is one way of informing the decision making of the developers of the technology. Personas is a method used in service design to visualize often complex and vast amounts of data so that it becomes easy to understand and helps to create empathy with the subjects who are being researched (Stickdorn et al. 2018). It is a synthesis method where a (semi)-fictional character is created to personify the common characteristics, trends and other behaviours that have been identified in a user group during the course of field work (Both n.d.). Despite the personas being fictional, the drivers and behaviours they display are based on real data (Schneider & Stickdorn 2012). Thus, personas help teams to see the individuals behind the data and guide them when making design decisions for the end-users (Moritz 2005).

Although, personas have been used to guide the development of health technologies in accordance with the requirements of older people (LeRouge et al. 2013), no ethical aspects are included in any of the older people personas featured in literature (Lee et al. 2021; Schulz & Skeide Fuglerud 2012; Bhattacharyya et al. 2019; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017), even though health technologies are recognized to have several ethical issues (Sánchez et al. 2017). Hence, there is a gap in the literature on creating

personas that take into consideration the ethical requirements of the older people when developing health technologies. Furthermore, while personas are instructed to be written in a way that helps to create empathy towards the end user and to aid the designers to make informed design decisions, there is little literature on how to do this. Most of the academic literature emphasizes involving the right stakeholders such as family and health care personnel in creating the personas to ensure that the older people personas are realistic (Bhattacharyya et al. 2019; Subrahmaniyan et al. 2018; Kneale et al. 2017; LeRouge et al. 2013). However, there are no studies on testing the personas with the designers or other stakeholders who have not been involved in creating the personas to understand whether the persona descriptions are presented in a format that helps to make design decisions on the developed product or service.

1.1 Context of the thesis

In November 2019, an EU Horizon 2020 programme funded project called SHAPES (Smart and Healthy Ageing through People Engaging in Supportive Systems) was launched. The project is set to run for four years and it involves 36 partners from 14 different countries. The aim of the project is to develop a new digital service ecosystem that helps to sustain the welfare of older people residing at home. The focus of the SHAPES project is to design services that enable the ageing individuals to live a good life at home or in a similar environment while taking into consideration the older adult's rights. Therefore, ethics and ethical proficiency have a vocal role in the project, all the way from preparation to execution and appraisal. Laurea University of Applied Sciences is responsible for the ethical competence part in the project and contributes to the project in means of service design, co-creation, eco-system modelling and through substantive competence in the welfare of the older population. (Laurea University of Applied Sciences 2019)

As part of the SHAPES project, Laurea University of Applied Sciences has created the deliverable: D8.4-SHAPES Ethical Framework (Sarlio-Siintola et al. 2020). The ethical requirements featured in the framework are derived from literature and analysis of different documents and were created to be used as a guideline when developing different solutions for the SHAPES Integrated Care Platform. This is because it was recognized that in addition to user requirements, the ethical requirements are also of importance when designing solutions that are interconnected with fundamental rights and that are aimed to be used by older people. At the same time, the initial SHAPES personas were created by the project partners. In total, seven older people personas were developed between the ages of 68 to 93 years old, all inhabitants of different European countries, with various health, family and living conditions. The purpose of these evidence-based personas is to provide a better understanding of the end users so that their needs and requirements can be taken into consideration when developing SHAPES digital solutions and innovations. These SHAPES personas are considered to be the

first versions and as such act as the base frame for further developing the personas (Tavel et al. 2020).

The next step in the SHAPES project was to find a way to combine the ethical requirements featured in the D8.4-SHAPES Ethical Framework with the SHAPES personas. Thus, this research paper seeks to contribute to the SHAPES project by investigating how to combine the ethical requirements in the persona, so that it aids the SHAPES developers to take into consideration the ethical requirements relevant to the persona when developing digital solutions and innovations for the SHAPES Integrated Care Platform.

1.2 The purpose, goal, and approach of the thesis

The purpose of this qualitative study is to examine the inclusion of ethical requirements in the process of developing digital services and products. Thus, the goal of this thesis is to create a framework for adding ethical requirements to older people personas that help guide developers in making ethical design decisions for the developed digital service or product. The study can be coined to be a qualitative case study as the unit of analysis for deriving the ethical requirements was bounded to the D8.4-SHAPES Ethical Framework study (Merriam & Tisdell 2015). The study followed the double diamond model (Davies & Wilson n.d.), a popular service design approach. The double diamond model provided a process to further develop the initial older people personas created in the SHAPES project and to identify what ethical requirements should be included in the personas and how the requirements should be then presented in the personas. Consequently, two research questions, shown in Figure 1, were formed to help guide the development.

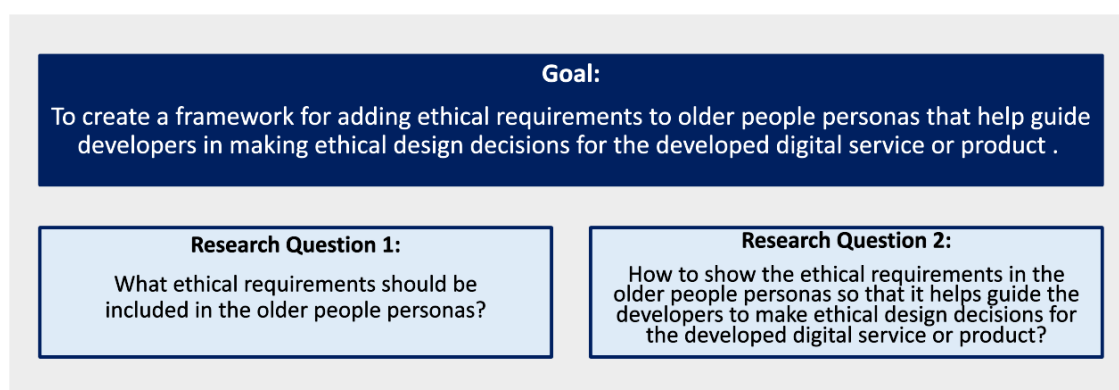


Figure 1: The goal and research questions of the study

Two factors led to the forming of research question 1. First, because the study contributes to the SHAPES project, the initiative to research what ethical requirements ought to be featured in the older people personas, came from the project. Secondly, in literature it was noticed that despite the health technologies having been recognized to have many ethical issues,

none of the current older people personas used to develop these technologies took ethical aspects into account. Thus, to answer research question 1: *“What ethical requirements should be included in the older people personas?”*, qualitative content analysis was conducted on the document D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020) to identify the main ethical requirements that should be featured in the ethical older people personas. Research question 2 was formulated due to there being little literature explaining how to write personas in a way that creates empathy towards the user and that helps guide the developers in making informed design decisions. Moreover, in the literature there was a lot of emphasis put on creating the personas together with people who have a close relationship or contact with the older people in order to make the personas feel as realistic as possible. However, there was no literature on testing whether the created personas were written in a way that helps developers, who had not been involved in creating the actual personas, to actually make informed design decisions for the benefit of the older adults. Hence, to answer research question 2: *“How to show the ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital service or product?”*, a workshop was held with two product and service developers to comprehend how the ethical requirements should be shown in the persona so that they are taken into consideration when making design decisions for the benefit of the end user. The research findings contribute to the SHAPES project mentioned above and to the existing literature written about personas, ethics and AAL technologies.

1.3 The structure of the thesis

The thesis is made up of five sections. The first section starts by setting the context to the study, which is followed by giving an overview on the background of the study. Then, the purpose, goal, and approach of the thesis is described. Section two deals with theory. It first begins by presenting the literature written on customer-dominant logic, service design and personas. It then moves on to describe what has been written about AAL technologies and the ethical implications that their use may have. Section two ends in explaining how the two research questions were derived from literature and how the theoretical framework was formed. Section three outlines the methods. First, the development process, the double diamond model, is introduced and how it was used in the study. Then, the methods used to answer the two research questions are described. Section four summarizes the results gotten from the qualitative content analysis to answer research question 1 and the results gotten from the workshop to answer research question 2. The section ends in depicting the framework for creating an ethical older people persona for developing AAL technologies. Section five gives the conclusion to the study. It begins by summarizing the conducted study, then it moves on to give answers to research question 1 and 2. This is then followed by discussing the results. After this, the reliability and validity of the study are reviewed. The section ends by giving suggestions for further research.

2 Forming the theoretical framework for creating ethical older people personas

The theory section will begin by presenting the literature written on customer-dominant logic and service design. This is done to build an understanding on why it is important to have a comprehensive understanding of the end user, or in this study of the older person, and why it is crucial to involve the end user in the development process when creating digital services or products. As the purpose of the study is to examine the inclusion of ethical requirements in the process of developing digital services and products, in the theory section this will be looked at from the lens of adding ethical requirements to personas to develop AAL technologies. Thus, literature on personas is described such as what is a persona, how to create one, and the criticism that has been given about personas. This is followed by a section on older people personas created to develop health technologies. The section then moves on to describe what has been written about AAL technologies and the ethical implications their use may have. Then, the formation of the two research questions based on literature are explained. The section ends in describing the theoretical framework of the study.

2.1 Customer-dominant logic of service

Placing the customer as the focal point of development is not a new concept (Heinonen et al. 2010). A research paper by Levitt (1960) already claimed that companies should be customer-centric instead of fixated on improving their production processes. However, according to Heinonen et al. (2010) studies such as by Levitt (1960) give customers an inactive role, supposing that customers are only involved in the purchasing and using of the offering. Consequently, the customer-dominant logic (CDL) of service only emerged later as a reassessment of goods-dominant logic (GDL) and service-dominant logic (SDL). The GDL for marketing arose in the nineteenth century, during the Industrial Revolution, when a lot of focus was put on producing cost-effectively tangible goods. At the time, the unit of analysis was the unit of output in other words the good. Thus, marketing concentrated mostly on goods as being the unit of exchange (Vargo & Lusch 2004). The GDL encompassed the following five matters (Vargo & Lusch 2004, 5):

1. To be economically active is to produce and deliver items that can be purchased.
2. For the items to be purchased, they must be useful and be better than what the competitors have to offer.
3. The company should base its decision making on being able to get the maximum profit from the sales of the goods.
4. To maximize production and to be cost-effective, the goods ought to be standardized and manufactured remote from the market.

5. The good can be stored and once a need for it arises, it can be delivered and sold to the customer for a profit.

As time passed, the focus started to shift from the producer to the consumer, from tangibles towards intangibles. In SDL, the goods are seen as an addition to the service instead of the main point of focus. Thus, the unit of analysis is no longer a static tangible good but rather an intangible matter such as expert knowledge for the advantage of the recipient. In SDL the aim is to customize the offering. As such, the customer is seen as a coproducer who should be greatly involved in the customizing process so that the offering ends up serving their needs better. A company following SDL would consider that all the employees are identified to be service providers and therefore their main purpose in work is to fulfil the customers' needs. The transaction between the company and the customer is not seen as the most important thing but rather the relationship that is built before and after the transaction is regarded to be more pivotal. (Vargo & Lusch 2004)

Contrary to SDL where the focus is on companies developing services that customers will desire, in CDL the emphasis is on the customer instead of the service. Heinonen et al. (2010) argue that SDL only takes into account pursuits and occurrences that are connected to the service. Furthermore, Heinonen et al. (2010) criticize that SDL stresses co-creation and interaction but fails to fully be customer focused. In CDL, the customer's logic, meaning their life and tasks, is the basis for creating the offering. It is understood that the customer never consumes the service in isolation and that the company's perspective is very different to that of the customer (Heinonen et al. 2010). Figure 2 illustrates how CDL differs from SDL.

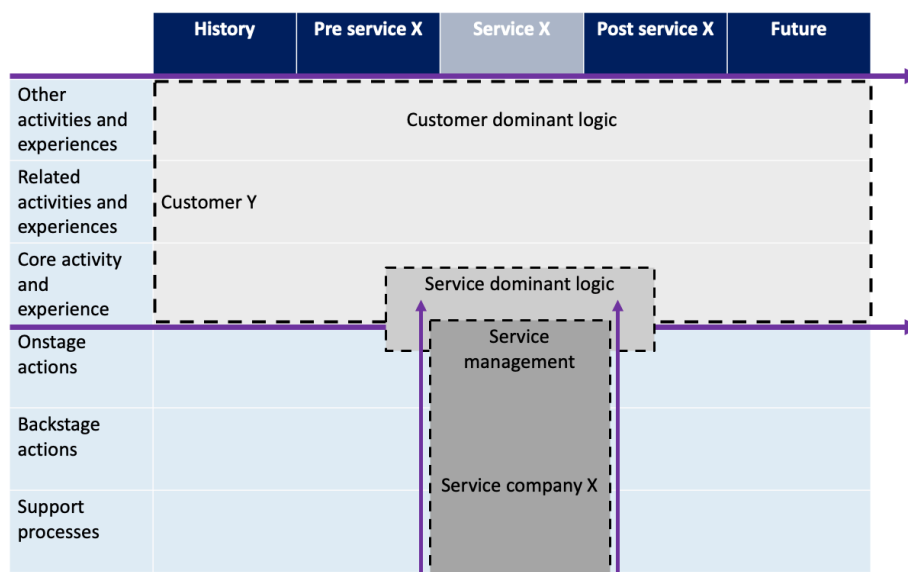


Figure 2: The difference between CDL and SDL (Heinonen et al. 2010, 535)

Hence, companies following CDL aim to discover how they can create customer satisfaction, then design processes that achieve to do so and as the last step recognize the required resources. More precisely CDL driven companies seek to understand what the customer is aiming to get done and how a certain service can then cater to it. As a result, companies are able to operate the frontstage and backstage tasks in a way that maintains the group of customers' individually arranged actions (Heinonen et al. 2010). Thus, the digital services and products developed by a company for older adults, should stem from understanding the older person's life, responsibilities, and the context they act in.

2.1.1 Customer value formation process

In CDL, the guiding principle is that for a company to flourish, there first must be a customer. This is because CDL underlines that the customer is the point of focus rather than the service, or the service system. Instead of focusing on the customer and provider interactions, CDL concentrates on how the customer utilizes various service features in their everyday life or business. Thus, it is important to clarify a few terms first before explaining the customer value formation process. The term 'provider' refers to a seller, supplier, company/organization, or an individual who supplies an offering to a customer. The word 'offering' encompasses products, service(s), solutions, value, propositions, and relationships, basically anything that the provider might be vending. 'Customer' is an umbrella term for an actor, buyer, consumer, client, or user that buys and uses the offering. (Heinonen & Strandvik 2015)

CDL considers value to be formed rather than created (Heinonen et al. 2013). Value transpires through the customers social and psychological procedures of interpreting, experiencing, and incorporating offerings in their daily lives or businesses, be that with positive or negative consequences (Heinonen & Strandvik 2015). Therefore, value is not necessarily intentionally created by the company or through a system of exchange relationships. Just as the customer's value formation is not always a conscious process (Heinonen et al. 2013). In contrast, the provider value formation is about the provider's changing procedures of planning, creating, and realizing offerings in accordance with its abilities and understanding of customer logic, be that with positive or negative consequences (Heinonen & Strandvik 2015).

Value can be seen as multi-contextual and as such the way in which the customer experiences and forms value is constantly being affected by these various contexts throughout time. Heinonen et al. (2013) explain the customer's value formation process through the example of a visit to a dentist. Going to the dentist is not a one-off interaction or service but rather a reoccurring event that can often be a mental and emotional experience which involves a lot of memories and accounts, all of which effect how the value experience is formed. Value is formed over time because one usually has several visits to the dentist. As each visit has its own memories, they end up setting certain expectations towards the next visit. The value

formation is also influenced by other contexts. For example, visiting the same dentist a week before with a child affects the value formation for the upcoming visit depending on the value outcome of the visit. Additionally, the attitudes, stories or behaviours by family members or friends can also influence the value formation. Therefore, it can be said that the customer value formation is a very complex process. (Heinonen et al. 2013)

Customers', or in this study's case, older people's preferences are swayed by several things such as their health conditions, values, lifestyle to name a few which influence their purchasing behaviour in various situations. For example, depending on how limber the older adult is physically and digitally, affects which service or distribution channel they choose. Similarly, an older person with a busy life will have different demands for the service process than an older adult that has an abundance of time. Therefore, the focus should be put on understanding the older adult's life and their ecosystems. Moreover, it is important to assess who the older person is and what their emotional foundation is built on, in addition to concentrating on what the older adult says and does. (Heinonen et al. 2013)

2.1.2 Customer-dominant challenges

Customer value-in-use is a crucial matter for companies that want to control their value formation processes. Even though the customer or provider value formation cannot be fully managed, they can both be carefully followed. Providers can sway the customers using different tactics but as they rival with other providers, it is imperative that the offerings are relevant to their customers. As a result, providers are faced with several questions about their presence and participation in the customers' lives with regards to the value formation such as when, where, and how they ought to be present and what kind of issues their level of involvement may end up causing (Heinonen & Strandvik 2015). Therefore, companies must stop examining the customer just from the individual perspective but broaden the view to consider the social and collective unit. Consequently, the challenge becomes for the companies to understand "who" the customers are and what kind of attitude they have in the present day. Companies should not concentrate on conventional service provider focused challenges but on novel customer centered challenges that are outlined in Table 1 (Heinonen et al. 2013).

Customer-dominant challenges	
How do the customers live their life? What routines do the customers have?	HOW
What delights/irritates the customers in their everyday life? What do the customers enjoy and have an interest for?	
What are the internal and external living contexts of the customers? How mobile are the customers?	WHERE
What are the customers' life situations? What are the customers' time-frames?	WHEN
How hectic is the life of the customers? What do the customers feel?	WHAT
What do the customers have a passion for and dream of? What are the challenges in the life of the customers?	
Who are the customers? What roles do the customers have in their everyday lives?	WHO
How are the customers' social life structured? What do the customers believe in?	
What customer life profiles may be identified?	

Table 1: Customer-dominant challenges (Heinonen et al. 2013, 115)

In CDL it is important to understand how customers live daily because the customers' habits and interests shed light to how they act in their own life context and ecosystem. Understanding these different elements and how they affect the customers' hopes and dreams, can provide the companies answers to what might motivate the customers and how they possibly would want to participate in the value formation. (Heinonen et al. 2013)

The value formation of older people can be influenced by many things such as their environment, living situation, and their health condition all of which can contain many challenges. For example, older people living in the rural area can enjoy the natural environment, but they will have a limited offering of services. Whereas an older person living in the city has access to various services, housing options and a good public transportation network. The living situations of older people also differ from one to the other. Most older people in the EU are found to live in private housing, either alone, with their partner, or with some other person. Some older adults end up living in a retirement home either by choice, as a solution not to have to live alone, or due to circumstance if they are not capable of living by themselves due to a health condition for example. Ageing is also associated with encountering various kinds of health conditions and decrease in mobility. The degree of these differs from person to person and is dependent on the health care services that are made available to them (Corselli-Nordblad & Strandell 2020). Hence, companies that understand the value formation of older people not just from the individual but also from the social and collective perspective are able to develop useful and wanted digital services and products for older adults.

2.2 Service Design

The service sector takes up the biggest slice of the economy, but services are not as well setup or providing the best service to the customer as they could be (Moritz 2005). As a result, it has become a prerequisite to design solutions according to the users' needs. Thus, service design is seen as the solution to this problem as it provides businesses, organizations and public bodies tools and methods that help them to create new concepts and solutions that are based on user research and that visually and through prototypes make it possible to share ideas with the various actors (Foglieni et al. 2018). According to Moritz (2005), service design assists to design new and existing services that are useful, usable, desirable for the end users while being operational and valuable for organizations. Stickdorn et al. (2018, p.26) further distinguishes that service design thinking encompasses six principles that are:

1. **Human-centred:** meaning that all the people's experiences who are touched by the service ought to be considered.
2. **Collaborative:** meaning that all the different stakeholders from different backgrounds and functions ought to be involved in the service design process.
3. **Iterative:** meaning that service design is an investigative, adaptive, and experimental, iterating all the way to execution.
4. **Sequential:** meaning that the service ought to be pictured as a series of interconnected actions.
5. **Real:** meaning that everything should be done in reality be that studying needs, prototyping ideas, or intangible values evidenced as physical or digital reality.
6. **Holistic:** meaning that services ought to consider the needs of all the stakeholders all through the service and thru the business.

As described above, service design is a holistic, multidisciplinary, and consolidative discipline (Moritz 2005). It is not solely focused on designing for the user but makes a point to involve the user and the people who create the service in the design process unlike in conventional user-centred design or marketing. This is because services are made up of relationships between the providers and the customers which are often complicated involving people inside and outside the service organization. Therefore, it is crucial not just to recognize the people as individuals but also what kind of relationships they have between each other to better comprehend how the service ought to work (Polaine et al. 2013).

Service design is a fitting approach for developing digital services and products for older people because many factors come into play when developing them. For example, it is

recognized that online shopping could help older people with mobility issues lessen the need to make trips to the store. At the same time people of the age of 65 or older in the EU are less likely to make online purchases and a growing number of older adults live by themselves of which men are most likely to have no-one to ask for help from (Corselli-Nordblad & Strandell 2020). So, if the aim of a company was to develop a digital grocery service for an older male adult, with mobility issues living by themselves, it would be vital to not only involve the end user in the development but also e.g. the grocery store, the city and other relevant stakeholders that are involved in providing the service. In short, service design provides a holistic and user centred approach that not only ensures that the service creates value to the older adult but is also feasible to the company and other stakeholders providing the service.

2.2.1 Service design is human-centered

Previously the role of the customer was seen isolated, unaware, and passive regarding the company. The company and the customer were seen to have separate roles and the main functions that a market performed was exchanging and obtaining value (Prahalad & Ramaswamy 2004). This traditional market view is most prevalent in manufacturing companies that tend to develop new products by first conducting research on the consumer's interests but then leave the customer to the side lines for the remainder of the development process (Chesbrough 2011). Thus, a company that wishes to survive in the future must involve their customers in value co-creation by making the customer an active agent of the business system (Prahalad & Ramaswamy 2004). However, due to the emergence of a new reality of value co-creation, consumers now a days expect to be involved in co-creating value together with the company. Hence, a company that wishes to survive in the future must involve their customers in value co-creation by making the customer an active agent of the business system (Prahalad & Ramaswamy 2004). Therefore, companies developing digital service and products for older adults ought to co-create with older people to ensure they are designing valued and helpful solutions to their target users (Robinson et al. 2013).

Service design does just this as it is a human-centred approach (Stickdorn et al. 2018). To design human driven services, it is pivotal to understand who the end-users are. In service design the focus is on gathering data on the user's needs, behaviours, and motivations as this will help to identify the design problem that should be tackled. To do this, qualitative data is often collected as it aids to grasp better the outwardly illogical ways of behaviour and emotions of the user. The collected data will then give insights to what the users need and when they need it (Polaine et al. 2013).

2.2.2 The service design process is iterative and nonlinear

The service design process can be described to be iterative and like many other design processes, it is nonlinear. However, this does not mean that the process does not have any

structure (Schneider & Stickdorn 2012). On the contrary, depending on the service design process that is being followed, the process may have as little as three phases as described in the 3 I model (Brown 2008) to as many as six phases as defined in the design thinking model by Hasso-Planttner-Institute (Hasso-Plattner-Institute n.d.). In general, it can be said that the service design process goes through four phases that include exploration, creation, reflection, and implementation. As the process is iterative, it entails that one might have to take a step back or even start again from a blank slate. The most important thing is that one always learns from the mistakes that were encountered in the previous iteration (Schneider & Stickdorn 2012). As service design aims to solve the right problem, the process usually begins by studying the needs of the end user or customer. This is usually done by conducting qualitative research. The next phase is to carry out rapid experiments and prototypes to see how possible solutions might work. This is a quick and cheap way to gather insights and ideas. Through iterations, the prototypes transform to pilots and finally to new offerings. In short, service design takes the pressure away from getting it right at the first go, as the approach encourages to learn from mistakes and iterate accordingly (Stickdorn et al. 2018).

2.2.3 Service design tools and methods

First, it is important to clarify what is meant by a tool and what is meant by a method as these two terms are often discussed interchangeably. According to Stickdorn et al. (2018) a tool is the “what we use” such as a concrete model or a template that follows a particular structure or is built around a certain template. An example of a tool is the story board template. A method, on the other hand, is a procedure to investigate or to achieve something. An example of a method could be doing interviews as a research method (Stickdorn et al. 2018). The use of different tools and methods help to comprehend what needs to be accomplished at the various stages of a service design project. There are plenty of tools and methods that can be used and choosing the most appropriate ones depends on the context and circumstances (Moritz 2005). Furthermore, the tools and methods help to recognize crucial taxing moments and to bring to light how the user perceives their interaction with an organization (Penin 2018).

In design research, there are several tactics to synthesize and analyse data. One of the ways is the academic approach where qualitative data is examined by means of content analysis which involves codifying the data. Then, there is the practitioner’s approach that is more used in service design. This involves visualizing the data. The benefit of visualization is that it helps bring structure to complex and vast amount of data. Moreover, it aids to identify patterns, discover prevailing gaps, deepen the understanding of the topic, and create empathy towards the people being researched. How one visualizes the data is dependent on the aim. For example, to demonstrate different groups of older adults recognized from the research data, one might use personas to do this (Stickdorn et al. 2018). The older people personas can

then be used as reference point to develop user driven digital services and products for older people. The persona method is described in more detail in the following subsection.

2.3 Personas

The goal of this thesis is to create a framework for adding ethical requirements to older people personas that help guide developers in making ethical design decisions for the developed digital service or product. Therefore, this subsection will give a comprehensive overview of personas that ends in an overview on how the method is used in developing health technologies. The following subsection deals with AAL technologies that have been developed for older people and the ethical issues that they are associated with. Together these subsections set the context for creating the framework.

Personas are descriptive characterisations based on real users that have been encountered in research. They are built on the recognized behavioural patterns of the users and are used to communicate how a group of people behave and think as well as to describe what motivates them. Personas help to comprehend the user's goals in a specific context and can be used in ideating and validating design concepts (Cooper et al. 2014). Personas aid the designers and developers to establish and prioritize which are the most important problems that need to be solved for the user and to recognize that the user's needs and preferences can differ from their own (Miaskiewicz & Kozar 2011). Essentially, personas act as a guide for designers and developers in making decisions on the most beneficial features and functionalities for the persona's particular use cases (Subrahmaniyan et al. 2018). Personas can also be used to communicate to others about the design and how different users will use it. Furthermore, personas can be combined with other design tools such as use-cases or used to develop a new feature (Holden et al. 2020).

Many companies use personas as a method to help keep the users at the centre of the entire development process (Nielsen 2019). Personas are especially useful when frequent contact with the end users is difficult (Marshall et al. 2015), like when developing digital services and products for older adults during the COVID-19 pandemic. Personas are good point of reference throughout the whole design process (Stickdorn et al. 2018) as they can be used to ideate, develop, assess, and launch a new product or service (Pruitt & Adlin 2006). For example, a service design project usually starts with designers researching the project's subject matter to gain a better overall understanding as well as to recognize gaps, problems, and opportunities (Penin 2018). The aim is to look at the problem broadly and not to get fixed on the most obvious first set of solutions. Designers refer to this as divergent thinking (Liedtka & Ogilvie 2011). Then, according to the research findings, parameters are set for the project. This is then followed by an ideation phase which is done together with the organization and its customers (Penin 2018). Thus, at the beginning of a service design project, personas can be used

to imagine what users may require from a service or product. Then, they can also be used to come up with and iterate possible solutions (Goodwin 2009).

After having generated new solutions, the designers need to start narrowing them down to the most promising ones. This is referred to as convergent thinking (Liedtka & Ogilvie 2011). Thus, in the next phase, possible new concepts are studied and tested by prototyping. Finally, one main concept is chosen for further development and implementation (Penin 2018). In this phase, personas can be used as a reference point to recruit the right target users for usability tests, interviews and focus groups. They can also be used to create test scenarios and questionnaires. Furthermore, the personas can be used as a decisive data point to choose one solution over another (Nielsen 2019).

2.3.1 Creating a persona

There is no one set way established in academia how to build personas. Data collection varies from conducting qualitative research (Bhattacharyya et al. 2019; Burrows et al. 2015; LeRouge et al. 2013), to creating personas based on quantitative data (Schäfer et al. 2019; Holden et al. 2017), to using a mixture of quantitative and qualitative methods (Powell-Wiley et al. 2019), though qualitative research is the most commonly used approach (Holden et al. 2017). Whether one should use qualitative or quantitative methods is dependent on the study, how much time and resources one has as well as the reason for collecting the data (Nielsen 2019).

The benefit of collecting qualitative data is gaining an in-depth understanding of the circumstances, needs and desires of the studied people (Nielsen 2019). In comparison, using quantitative methods is more efficient to gather, analyse and cluster data. This is because the same approach can be utilized through samples, and to collect or compare between different groups (Holden et al. 2017) which in return helps to save time and money (Schäfer et al. 2019). The weakness of using solely quantitative methods in persona creation is not being able to gain a deep understanding of the context and the different variables and their relation. Consequently, the design considerations can end up being generic (Holden et al. 2017). Therefore, Holden et al. (2017) suggests collecting both quantitative and qualitative data to be able to create rich and contextualized persona descriptions. This is supported by Nielsen (2019) who describes that sometimes it can be important to collect both qualitative and quantitative data to understand the attitudes and needs as well as how big of section of a certain category the persona represents.

2.3.2 Criticism on using personas

The way in which personas are created and used has received criticism. Goodwin (2009) explains that often people new to personas may get carried away with fictitious character

biographies instead of using actual data as the baseline. On the other hand, a researcher might think that adding a picture and name to a list of researched facts is enough to create a persona. For personas to be compelling, they should be based on actual researched data which is then transformed into a story that creates empathy with the reader (Goodwin 2009). Therefore, one of the main criticisms that the persona method has received is the use of fictitious elements in the descriptions which as a result, prevents the method to be seen as scientific because the results cannot be replicated (Nielsen 2019). To tackle this issue, Holden et al. (2017) suggest describing in detail the methods and steps that were used to make the personas. Schulz and Skeide Fuglerud (2012) further emphasize that personas should not be used as a substitute for involving actual users and as such one should never create personas out of one's own assumptions. This is because people often have misconceptions of the users and they might end up creating a persona that has strengths or disadvantages that are not accurate (Schulz & Skeide Fuglerud 2012).

Another limitation with personas is that they represent a snapshot from a particular time and of a particular group of people that should be regularly updated to keep them relevant (Schäfer et al. 2019). Case in point, older people of today may not have grown up with computers and smartphones and thus they may have difficulties in adapting to use such devices. However, older people in the future are less likely to have such issues (Nunes et al. 2010). There can also be issues in the way the personas are used. Cooper et al. (2007) give the example of a company that has a portfolio of several products and then wanting to use the same personas to develop them. The issue in this is that for personas to be effective, they have to be context specific. The persona should be concentrated around the behaviours and goals related to the specific product and therefore cannot be used across different product groups (Cooper et al. 2007). Further limitations include the possibility of developing caricatures of the personas that highlight the differences instead of the similarities and the limitation of generalizability if the personas are created from a small sample (Holden et al. 2020).

2.3.3 Older people personas for the development of health technologies

Personas have been used to develop health technologies for older people. This is because the use of personas helps the different stakeholders involved in the design process make user-centered decision on the requirements, priorities, and the scope of the technology (Peek et al. 2013). It is an effective tool to increase user participation in the design process and it also makes designers think of the social and health outlooks in the design that would otherwise be easily overlooked (LeRouge et al. 2013). Yet, healthcare researchers and practitioners can be apprehensive to use personas, due to the cost and effort required to create the personas and for the perception of the method lacking scientific basis (Holden et al. 2017). Despite this, personas have been used to develop a digital advisor for the frail older people (Bhattacharyya et al. 2019), to create new medical devices for older adults in Germany (Schäfer et al. 2019),

and to improve the mobile phone usage of older adults with vision impairments and other disabilities (Schulz & Skeide Fuglerud 2012). There are also examples of personas that have been created to develop health technologies for older people with a certain health condition such as heart failure (Holden et al. 2017) and diabetes (LeRouge et al. 2013).

All of the older people personas depicted in literature vary from each other dependent on the purpose they were created for and how the information for the persona was collected. For example, the older people personas created by Bhattacharyya et al. (2019) only feature the persona's name and two descriptive sentences of the persona whereas the older people personas created by Sakaguchi-Tang et al. (2019) include a description of the older adult persona together with scenario descriptions of their connected personas such as family, friends and/or health care providers. Regardless of this, several common features could be identified amongst the older people personas presented in the literature as shown in Figure 3 that follow a similar pattern to that of typical persona. According to Nielsen (2019) the archetypal persona has a picture, name and quote of them to give a feel of their character. These are then followed by text that is divided into different sections, starting by giving a general view of the persona's personality and habits which is then followed by sections containing more specific information of the persona related to the particular project (Nielsen 2019).

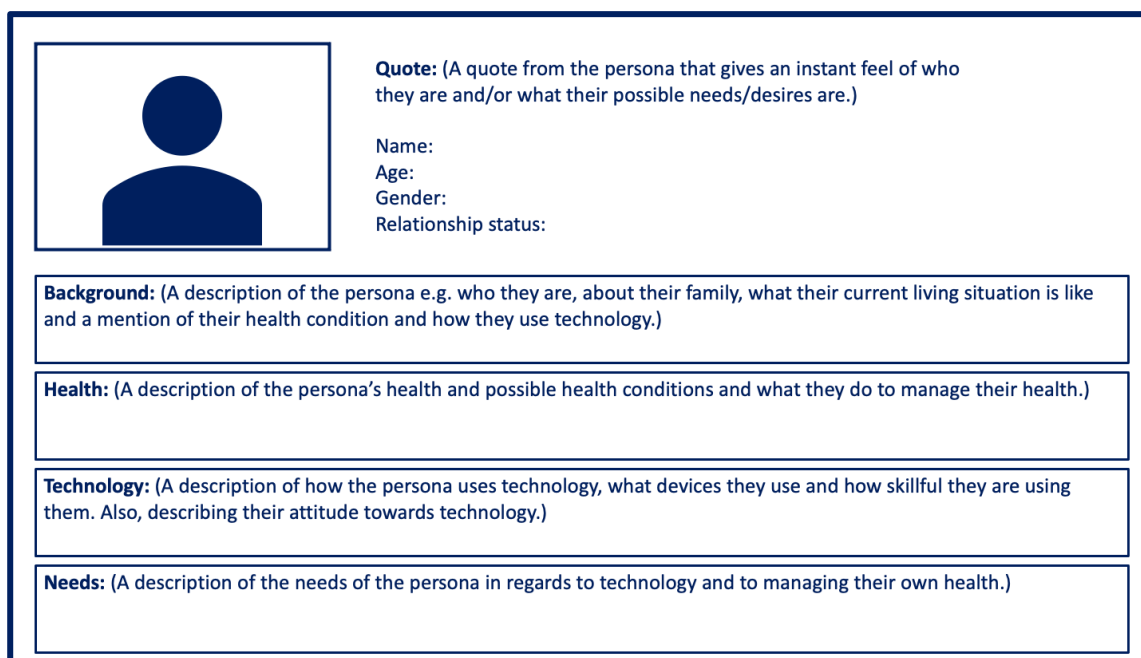


Figure 3: Common features included in the older people personas for developing health technologies that were identified from the literature (Lee et al. 2021; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017; LeRouge et al. 2013)

Most of the older people personas documented in literature featured a picture of and in some cases a quote by the persona that gave an instant feel of who they are or what their needs or

desires were. This was then accompanied with the persona's name, age, often gender and some indication to their relationship status (Lee et al. 2021; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017; LeRouge et al. 2013). Nielsen (2019) explains that including these details in the persona helps the reader to distinguish and remember the personas better. Additionally, most of the older people personas included a background description that explained who they were, what their current living situation was like, something about their family and talk about their health and experience with technology. The personas also included separate sections about their health with details on whether they had any health conditions and how they were managing their health. A technology section was also included that described how the persona used technology, the type of devices they used and what their attitude towards technology was. Then, a section on the personas needs in regard to technology and to managing their own health was also often included (Lee et al. 2021; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017; LeRouge et al. 2013). The benefit of having a narrative description instead of just showing bullet points of the persona is that it effectively helps to evoke the reader's intelligence and empathy (Goodwin 2009). Nielsen (2019) points out that the background information of the persona is usually only read once to establish a connection towards the persona. However, the additional information geared towards the particular project is read more often. Other featured sections in the persona are used in differing frequency depending on the reader and what it is used for (Nielsen 2019).

2.4 Ambient assisted living technologies for older people

When people get older, their cognitive, physical and sensory functions tend to weaken at various degrees (Newell et al. 2011). Some older people stay in good mental and physical shape to the very old age, others require support in taking care of daily task at home while some need to be fully taken care of. Also, dementia or some degree of memory loss is commonly encountered with older people. Thus, older people often need help with physical chores, reminders to complete certain tasks, a safe living environment, human interaction and a sense of being cared for (Sharkey & Sharkey 2012). As a result, older people are often portrayed as non-productive members of society that consume a lot of resources and are a burden to the rest of the population (Blackman et al. 2016).

Ambient assisted living (AAL) technologies are seen as the answer to the issues related to older people (Blackman et al. 2016). This is because AAL technologies are designed to help older people to live longer in their own home (Queirós et al. 2015) which in return decreases the use of scarce healthcare and social resources and reduces the need of admittance to hospitals and eldercare (Blackman et al. 2016). AAL technologies include everything from smart homes, assistive robotics, e-textiles, mobiles to wearable sensors that are created to prevent, treat and better the health conditions and wellbeing of the older person (Rashidi & Mihailidis

2013). AAL is seen as a cost-effective solution to taking care of older people and for providing assistance to the caregivers (Novitzky et al. 2015).

2.4.1 Ethical issues with ambient assisted living technologies

Even though the core goal of AAL technologies is to help older people to actively live their life with dignity and sense of security while still keeping in contact with their communities and providing their caregivers access to monitor and prevent unnecessary problems in their continuous healthcare (Blackman et al. 2016), ethical issues prevail in the use of AAL. Mort et al. (2015) argue that these types of technologies have for the most part been created in an industry or service context that place focus on effectiveness and efficiency and overlook the social and ethical consequences that the developed systems may have. The solutions often neglect to comprehend the context in which the issues are encountered because the older people's needs are usually seen as shortfalls, diseases, and dependencies (Blackman et al. 2016). The solutions may for example end up extending the older person's life of solitude at home when being cared for at a retirement home might have been more appropriate (Mort et al. 2015), make the person feel stigmatized instead of gaining a sense of mastery, or result in shifting the power in the relationship from the older person to the caregiver (Blackman et al. 2016).

One of the most prevalent ethical issues with the use AAL technologies is the protection of privacy. AAL technology that is used for medical purposes tends to record health related matters of the user. Collecting this type of information in the home environment can be challenging as constant monitoring and surveillance can be intrusive and unescapable for the person in question (Novitzky et al. 2015). It can also make the person feel alienated and unsafe (Hofmann 2013). Ienca et al. (2018) point out that conversely, minimizing intrusiveness can lead to the device sensing, tracking, and collecting user data less accurately and thus, the intended benefits are not attained. Therefore, a case-by-case approach involving the designers, ethicists, end users and their care givers should be conducted to weigh the pros and cons of using the particular device. Additionally, people involved in the older persons care such as relatives and service providers often have access to their sensitive information which raises ethical concerns in the older person's right to privacy and confidentiality (Hofmann 2013). If the information is gotten into the wrong hands, it can end up causing considerable physical, psychological, and social damage to the older person (Ienca & Haselager 2016).

Despite, humans appearing to be well adapted to technology these days and wellbeing and happiness seeming to be greatly connected to it, technology has a tendency to concentrate on productivity and efficiency. As a result, the focus shifts away from phenomena important to human wellbeing and questions fundamental ideas of humanity such as vulnerability, dignity, and care (Hofmann 2013). There is also a socio-economic risk that only older adults who

can afford the technology can take advantage of it. This is due to lack of researchers failing to address this issue and due to the low number of inexpensive and open-source devices available. To tackle this, health policy plans and government incentives, to name a few, should be set up to prevent adverse societal consequences from happening (Ienca et al. 2018). Furthermore, as the development of these technologies involve many stakeholders, it poses two relevant questions 1) who will gain from the use of the technology and 2) who will be in charge of implementing, using and maintaining the technology? (Hofmann 2013). Therefore, Landau (2013) recommends that when developing AAL technologies it is important that the older people are included in the development of the technologies and that they are not made to feel obligated to use them against their own will. The technologies should be developed in a way that takes into account the different stakeholders' interests such as the older person, their caregivers and the public and the aim should be in providing a solution for a balanced mind and body. At the same time the necessary guidelines and legislation about the use of these technologies for the older people should be developed (Landau 2013).

2.5 Forming research question 1

Health technologies are deeply entangled with ethical issues. This is because the purpose of the technologies are to better the life of the individual which prompts the ethical question: "what is considered a good life?" (Hofmann 2008). Even though, personas are created to help make informed design decisions for the benefit of the older people on the developed health technology (LeRouge et al. 2013), ethical considerations are not featured in any of the current older people personas (Lee et al. 2021; Schulz & Skeide Fuglerud 2012; Bhattacharyya et al. 2019; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017). The only ethical considerations that have been mentioned are related to how the data was collected during the persona creation (Powell-Wiley et al. 2019). Thus, there is a gap in the literature on building personas that help to guide the designers and other stakeholders in making the most ethical design decisions for the older people in relation to health technologies with the use of personas. This leads to the forming of research question 1: "*What ethical requirements should be included in the older people personas?*". This question will be studied and answered in later sections of the paper.

2.6 Forming research question 2

Personas are good source of reference when designing anything related to a human being, be that a service, product, website, process, or course, just to name a few. This is because the use of personas prevents designers to make decisions according to their own preferences that bare no relations to the user's needs or desires (Goodwin 2009). Moreover, personas aid to limit the range of end users the designers develop the product for because if the designers aim to design for everyone, it often turns out that the design then serves no one. Thus, personas help to guide the designers in recognizing the most important target users and as a

result what the most essential requirements for the service or product should be (Miaskiewicz & Kozar 2011). For the personas to guide the designers and other relevant stakeholders to make informed design decisions, the descriptions presented in the personas should be written in such a manner that the reader is able to identify the persona's requirements, use situations and their circumstances. Furthermore, the descriptions should be written in a format that generates empathy and insights to the user (Nielsen 2019). Cooper (2004) elaborates that for the reader to be able to pinpoint the scope and character of the design problem, the descriptions in the personas should be written as precisely as possible.

Despite the emphasis that personas should be written in a way that triggers empathy, insights and helps to guide the designer's decision making, there is little academic literature on this matter. The focus has mostly been on involving the relevant stakeholders to create the persona itself, to ensure that the persona reflects the described users as much as possible. For example, as health care is often a symbiosis between the patient, the health care provider, the patient's caregivers such as their family and friends, tools and resources, a multiple perspective approach is applied when developing systems for the elderly (LeRouge et al. 2013). Many of the personas described in academic literature have included the family, health care specialist and/or care givers in the development process of the older person persona through means of collecting background information (Bhattacharyya et al. 2019; LeRouge et al. 2013) to validating the personas with them (Subrahmaniyan et al. 2018; Kneale et al. 2017). In the study by Subrahmaniyan et al. (2018) the representativeness of the created personas with ALS were validated with specialists who worked with people with ALS, spouses of ALS and individuals with ALS themselves. Yet, there seems to be no literature that describes testing the personas with the designers or other stakeholders who have not taken part in the actual making of the persona but who are going to be using them in developing services and products, to ensure that the descriptions in the personas are written in a way that helps to guide their work. This prompted researcher question 2: *"How to show the identified ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital service or product?"*.

2.7 The theoretical framework of this study

This subchapter summarizes the main points of CDL, service design, personas and how they are combined to form the theoretical framework for the study. The subchapter ends in describing how the theoretical framework relates to the goal of the study.

CDL considers that the customer's logic is the foundation for developing the offering for a company. It recognizes that the customer, or in the case of this study, the older person does not use the service in isolation and that the company's perspective can be quite different from that of the customer (Heinonen et al. 2010). The customer value formation is a very

complex process because it is affected by the customer's lifestyle, preferences, previous experiences and by different contexts. For companies that developed digital services and products for older adults to be able to influence the value formation process of older people, it becomes essential for them to understand the older person's turbulent and chaotic world in which the older person has individual and collective roles. Furthermore, the digitalization of services has made the customer "invisible" to the company and thus, companies should put even more effort to comprehend who their customers, in this case the older people, are, what kind of life they live, and what is the ecosystem that surrounds them. However, conventional research techniques lack the ability to analyze the customers' ever evolving lives as they only aim to examine the service encounter or the extended service context. Therefore, a different approach is needed to better study the life and ecosystem of the customer (Heinonen et al. 2013).

Service design is about designing new and existing services that are useful, usable, desirable for the end users while being operational and valuable for organizations (Moritz 2005). Service design is a human-centred approach that typically starts by researching the needs, behaviours and motivations of the end-user or customer such as an older person which will then help to identify the design problem that should be solved (Stickdorn et al. 2018; Polaine et al. 2013). Moreover, service design provides businesses, organizations and public bodies tools and methods that can be used to design new concepts and solutions that are based on user research (Foglieni et al. 2018). The tools and methods help to recognize critical moments in the service and to understand how the user identifies their relationship with an organization (Penin 2018).

Personas is a method used to visualize the different groups of people identified from user research (Stickdorn et al. 2018) such as different types of older adults. Personas are formed based on the recognized behavioural patterns of the users and are utilized to convey how a group of people behave, think and to portray their motivations. Personas also aid to understand the user's goals in a specific context and can be employed to ideate and validate design concepts (Cooper et al. 2014). Personas help designers and developers to prioritize the most important problems for the user and to distinguish that the user's needs and preferences can be different from theirs (Miaskiewicz & Kozar 2011). For example, older people personas can be utilized to develop digital services and products that are relevant for older adults.

From the above-described theories, I formed the following conclusion. CDL and service design are both user centric and both approaches see it vital to examine and understand the user in order to be able to create value to them in form of service. CDL considers being able to influence the value formation by understanding the customer's lifestyle, health condition, values, habits, and interests. Whereas service design believes in solving the right problem by understanding the end-user's needs, behaviors, and motivations. However, as a result of my

examination, I came to find that the difference between CDL and service design is that CDL is more focused on understanding the customer's life and their ecosystem. While, service design, despite being human-centered is not only focused on the end-user but looks at the design of services more holistically. According to my analysis, for both approaches it is crucial to gain a comprehensive understanding on the users and thus, the personas method is a way to do this. This is because personas are descriptive characterizations of real users based on research that help to understand the user's behaviors, thoughts, motivations, and goals. As shown in Figure 4, both approaches can utilize the benefits of the persona tool as a way to understand their customer or end-user better.

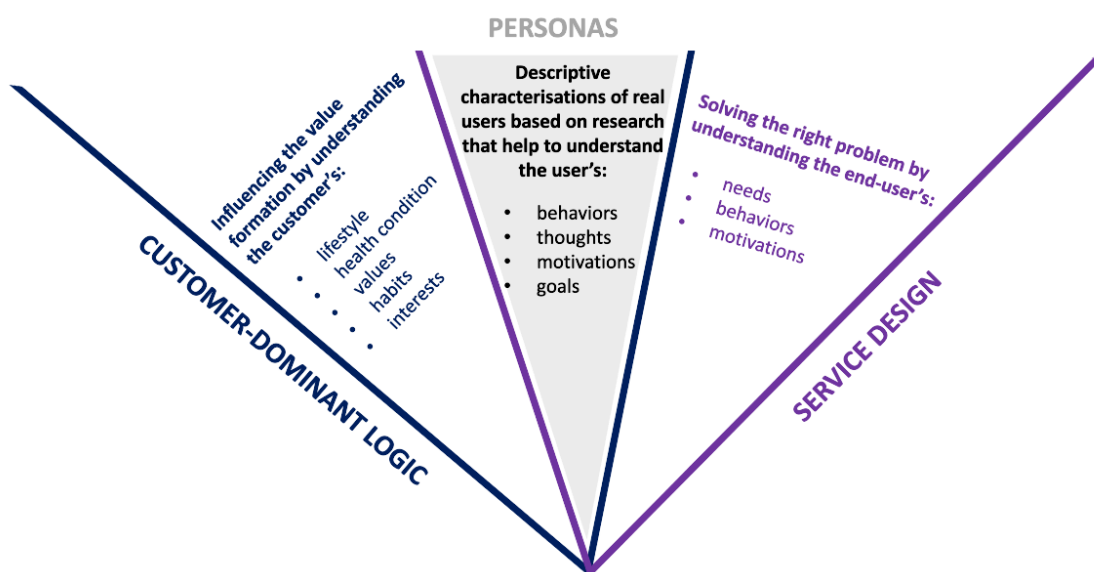


Figure 4: The theoretical framework of the study

To conclude, this study's goal is to create a framework for adding ethical requirements to older people personas that help guide developers in making ethical design decisions for the developed digital product or service. This is because it was recognized that current older people personas do not include any ethical dimensions that would help guide the work of developers creating AAL technologies. Adding the ethical dimensions to the personas was found to be crucial as many of the AAL technologies, that help older people live longer in their own homes, were recognized to have ethical issues. If the ethical issues are not taken into consideration during the development process, it can differ the older people from using the AAL technologies. In short, whether looking at it from the CDL or service design perspective, knowing the older people and their ethical requirements becomes a pivotal factor in creating AAL technologies that create value to the older adults.

3 Following the service design process to develop the ethical older people personas

In this section, the methods used to conduct the study will be described. The section will start by explaining why the double diamond model was chosen as the service design process. It will then go on to clarify the different stages involved in the double diamond model and how they relate to the conducted study. After this, qualitative research which is the base of the study will be explained. Then, the methods used to answer the two research questions will be described. First, qualitative content analysis used to answer research question 1 will be introduced and how the method was utilized in the study. Then, the rationale for organizing an online workshop to answer research question 2 will be given and what kind of sampling method was used to select the participants. The section will end by recounting how the workshop was organized.

3.1 Double diamond as the development process

There are several service design processes that can be used to implement a service design project such as the double diamond model, 3 I model, service design thinking model and the design thinking model by Hasso-Plattner-Institute. What is common in all the mentioned models is that they are all nonlinear and iterative in their approach which encourages to try, fail, improve, and then try again. Additionally, all the models promote to involve different stakeholders in the development process from customers to the company's employees (Brown 2008; Davies & Wilson n.d.; Schneider & Stickdorn 2012; Hasso-Plattner-Institute n.d.). Yet, the double diamond model, created by the UK Design Council (Davies & Wilson n.d.), is one of the most known and used design processes and therefore was chosen as the development process for the study.

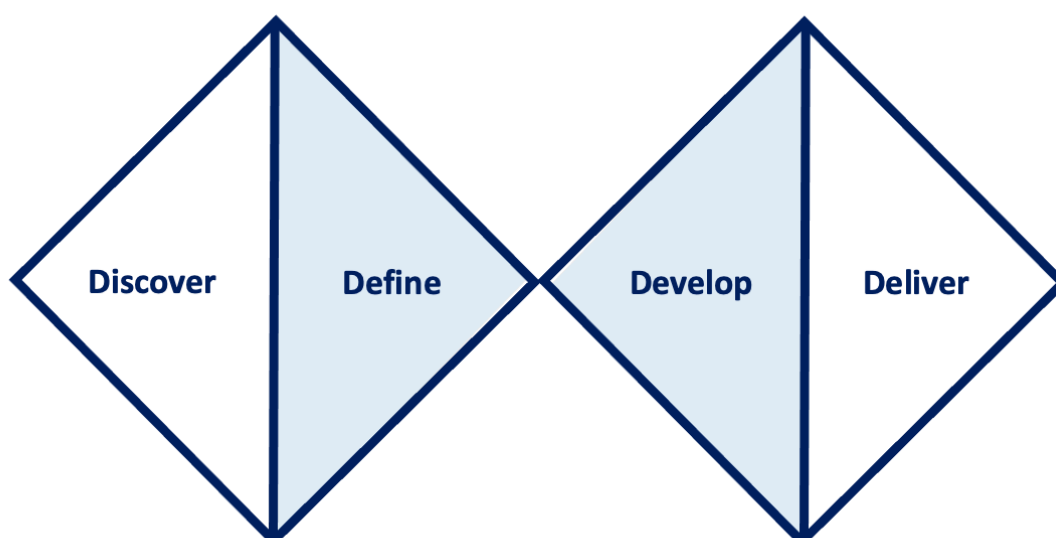


Figure 5: The focus of the study is on the define and develop phases (Davies & Wilson n.d.)

The double diamond is made up of four distinct phases: discover, define, develop, and deliver (Davies & Wilson n.d., 6). The focus of the study is on the define and develop phases as shown in Figure 5. The different phases and their relation to the study will be explained in more detail in the following paragraphs.

3.1.1 Discover

The first quarter of the double diamond, also dubbed as the discover phase, starts by exploring the subject matter through gathering insights and inspiration. This can be done by means of qualitative and quantitative research methods and involving the end users directly and by examining the wider societal and economic trends. It is here where the initial problem, opportunity or need that should be tackled is recognized and the boundaries of the solution space are specified (Davies & Wilson n.d.). For this study, it can be said that the service design project is about creating an ethical older people persona. Thus, the discover phase can be said to encompass the first versions of the older people personas that were created by Tavel et al. (2020) as part of the SHAPES project. The evidence-based personas were created from a mix of data that included using previous persona files, data from a study on active ageing, literature review, expert interviews and discussions with SHAPES experts and members (Tavel et al. 2020). Additionally, an older people persona from Finland was created separately by a SHAPES project worker from Laurea University of Applied Sciences by means of interviews. The Finnish older people persona was structured visually the same way as the previously made personas. The only difference was that the data for the persona was collected in another way. The Finnish older people persona was used as the base for testing the ethical requirements in the develop stage. Furthermore, at this stage the D8.4-SHAPES Ethical Framework (Sarlio-Siintola et al. 2020, 90-101) was created from literature and analysis of different documents. The framework was created to be used as a guideline when developing different solutions for the SHAPES Integrated Care Platform. Hence, the initial problem in the discover phase was formed: *“How to combine the ethical requirements featured in the D8.4-SHAPES Ethical Framework with the SHAPES personas?”*. This also acted as the starting point for the thesis study.

3.1.2 Define

The second quarter of the diamond, the define phase, entails creating the design brief from the information gotten from the discover phase. Here, the great number of ideas and findings are analysed and organized. These are then narrowed down to problem statements that align with the organization’s needs and business objectives. At the end of the define phase, a clear definition of the central challenge or problem that needs to be addressed is established (Davies & Wilson n.d.). Two factors led to the shaping of research questions 1. Firstly, it was determined by the SHAPES project that the ethical requirements featured in the older people personas were to be derived from the D8.4-SHAPES Ethical Framework (Sarlio-Siintola et al.

2020, pp.90-101) as the study was to contribute to the SHAPES project. Secondly, none of the older people persona used to develop health technologies that were described in literature took ethical factors into consideration even though health technologies have been found to have many ethical issues. As a result, research question 1 was formed: *“What ethical requirements should be included in the older people personas?”*. To answer this question, qualitative content analysis was conducted on the document D8.4-SHAPES Ethical Framework study (Sarliio-Siintola et al. 2020), which will be explained in more detail in the upcoming paragraph dedicated to explaining the used method.

3.1.3 Develop

The third quarter of the diamond, the develop phase, is focused on developing and testing the solutions iteratively with the end users. The design team and partners use design and other creative techniques to develop the separate service sections fully and make sure that these come together as a whole and create a holistic experience. Testing with users throughout the process helps to focus the team’s efforts and ensure that a robust service is created (Davies & Wilson n.d.). Once the ethical requirements to be featured in the persona were identified in the define phase, the next step was to test the formed ethical older people personas with the intended end users, in this case, developers of digital services and products. As a result, in the develop stage, the research question 2 was formed: *“How to show the ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital service or product?”*. To answer this question, an online workshop was held with two service and product developers to test the ethical older people persona and to gain feedback on how to improve the persona, so it better served its purpose.

3.1.4 Deliver

In the final quarter of the diamond, the deliver phase, the solution is finalized and launched. Final testing is still done on the final concept and thus, it is vital that systems are in place to collect user feedback. This phase also encompasses sharing with colleagues and partners the user feedback and learnings of the process, insight tools and new ways of working (Davies & Wilson n.d.). From the point of view of the study, the deliver phase entails that further research and testing should be still conducted in accordance to the results gotten from the develop phase. As the study only focused on the define and develop phases, the deliver phase is not covered in this paper.

3.2 Qualitative research as the base of the service design study

As service design aims to design for the people and to involve all the stakeholders that are connected in delivering the service, it is essential to gain insights to the people’s behaviours, motivations, and needs. Therefore, qualitative research is better suited for gathering this

kind of data than quantitative research. This is because in quantitative research one can learn that 70% of citizens do not use bicycles but it does not give insights to what are the reasons behind this (Polaine et al. 2013). For that reason, qualitative research including qualitative content analysis and an online workshop were conducted to answer the two research questions of the study which will be explained more in detail in the later paragraphs. Braun and Clarke (2013) explain that qualitative research uses words as data which can be gathered and analysed in several ways whereas quantitative research uses numbers as data that are analysed by means of statistical techniques. Furthermore, a characteristic of qualitative research is that it is inductive, meaning that the data is gathered to form concepts, hypothesis, or theories just as in the case of this study (Braun & Clarke 2013). As the ethical requirements to be featured in the older people personas were to be derived from the D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020), it made more sense to conduct qualitative content analysis than use quantitative methods.

To understand how the ethical requirements should be shown in the older people persona so that the developers are able to make ethical design decisions for the older person's advantage, qualitative research in form of an online workshop was seen as the best way to gain this information. This is because qualitative research permits people to build their own framework around issues and to use terms familiar to them instead of the researcher creating the framework such as in the case of a questionnaire. Qualitative research enables to gain a rich and deep understanding on a phenomenon than through numbers because qualitative data sheds light on people's complicated meanings and experiences. Qualitative research is also flexible as it can adapt to unexpected ideas brought up by people. Moreover, the collection and analysis of qualitative data can bring about findings that could have not been thought about in advance and that could have not been discovered if conducting quantitative research (Braun & Clarke 2013). These factors of qualitative research were especially valuable from the point of view of the study, because during the workshop the developers were given the chance to create their own version of the persona to better suit their needs without having any constraints.

3.3 Qualitative content analysis to answer research question 1

In the literature review it was recognized that despite health technologies having been found to have several ethical issues, none of the current older people personas used for developing such technologies in academic papers featured any ethical requirements. This led to the forming of research question 1: "*What ethical requirements should be included in the older people personas?*". To find an answer to the question, qualitative content analysis was conducted on the document D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020). Qualitative content analysis is a common method used in analyzing documents which encompasses looking for underlying themes from the materials being examined (Bryman 2016). This

approach was considered to be the most appropriate one as the ethical requirements for the older people personas were to be derived from the D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020) due to the thesis contributing to the EU-funded SHAPES project that Laurea University of Applied Sciences was taking part in. Thus, the approach can be coined as inductive because the key concepts stemmed from the data (Schreier 2012).

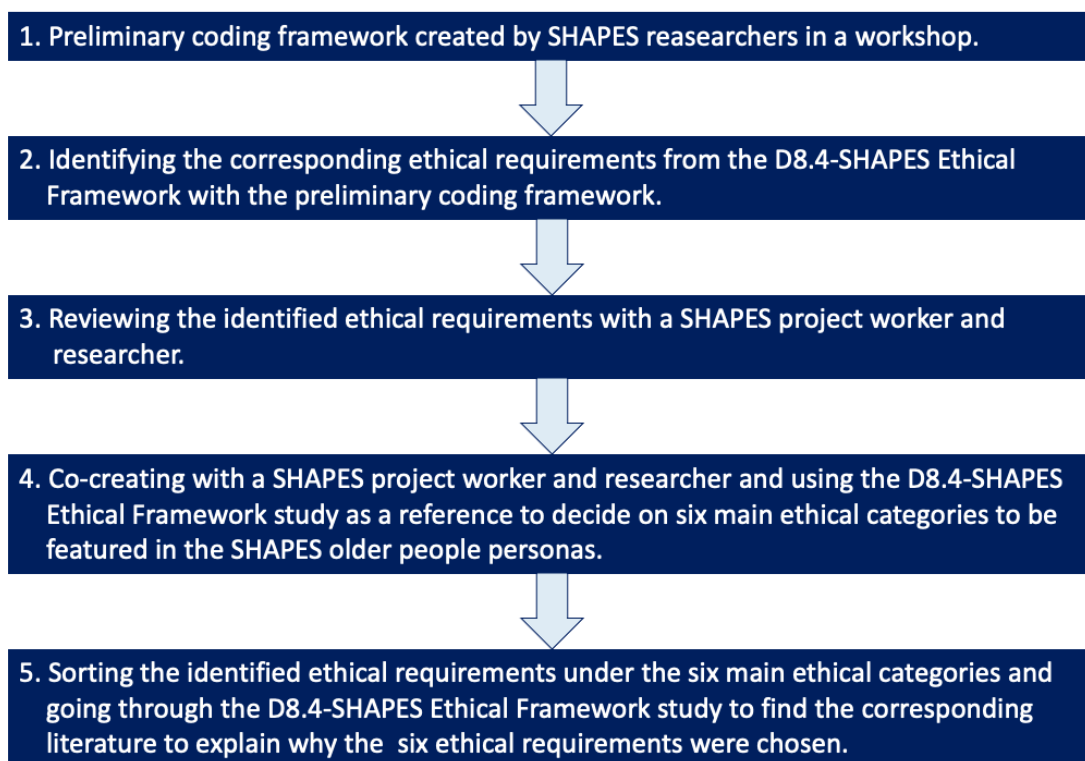


Figure 6: The five steps taken to conduct inductive content analysis to answer research question 1

According to Kyngäs (2020) there are three main stages in inductive qualitative content analysis process that include: data reduction, data grouping and then forming concepts to be able to answer the research question. Conversely, there are no set rules how to analyze the qualitative data and thus, the method is described to be more of a conversation between the researcher and the data (Kyngäs 2020). In this study, five steps were taken to conduct the inductive content analysis as portrayed in Figure 6. These steps will be described in more detail in the upcoming paragraphs.

3.3.1 Data reduction

As mentioned by Kyngäs (2020) inductive qualitative content analysis begins by data reduction and this was the first step taken in this study as well. Schreier (2012) elaborates that to be able to build a coding framework, the analysed material should be reduced so that it is

manageable to handle. There are two ways of doing this, first by parting the data as per source and second by parting the data as per theme (Schreier 2012). In this study there was no need to part the data as per source as it had already been determined that the ethical requirements for the older people personas should be derived from the D8.4-SHAPES Ethical Framework study, specifically from ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ created in the study (Sarlio-Siintola et al. 2020, 90-101). To part the data as per theme, was a necessary step because the ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ featured 102 different ethical requirements, which all could not be included in the persona card. Hence, it was important to find a way to narrow down the ethical requirements to the most relevant ones for the older people personas. Polaine et al. (2013) recommend working together with experts that know about the subject that is being investigated in the service design project to gain best results. To do this, it was deemed best to hold a workshop with the researchers of the D8.4-SHAPES Ethical Framework study as they were most familiar with the ethical requirements. The researcher of this paper could not take part in the actual workshop, which was held by a SHAPES project worker, but she took part in planning it. In the workshop, the SHAPES researchers ended up creating a preliminary coding framework as shown in Figure 7 to help identify the key ethical requirements for the older people personas.

Fundamental ethical requirements (applied as the basis for all personas)	
Persona-specific ethical requirements (persona-specific)	
Challenges (possible conflicts between general and persona-specific requirements)	Opportunities

Figure 7: The preliminary coding framework developed by the SHAPES researchers

In short, the preliminary coding framework would act as the point of reference to select the most relevant ethical requirements from the ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ that could be then featured in the older people personas.

3.3.2 Data grouping

The second and third step (Figure 6, 33) involved grouping the data (Kyngäs 2020). To do this, it was decided that the researcher of this paper would focus on categorizing the ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ (Sarlio-Siintola et al. 2020, 90-

101) under the following headings in the preliminary coding framework (Figure 8): ‘fundamental ethical requirements (applied as the basis for all personas)’ and ‘persona-specific ethical requirements (persona-specific)’ and ignore the other headings featured in the framework as they involved studying further the actual ethical requirements rather than categorizing them.

Fundamental Ethical requirements (applied as the basis for all personas)				Persona-specific ethical requirements (persona-specific)						
<p>GE1 Maximise the level of fundamental rights of older persons and of care given that SHAPES can promote (including balance between older persons' rights and care workers' rights)</p>	<p>GE2 Ensure that SHAPES does not violate any fundamental rights of older persons and/or other stakeholders (e.g., non-discrimination, dignity, integrity and privacy when using robots, web-cameras or home) (SHES)</p>	<p>GE3 Be aware of the four biomedical principles. Apply and promote those within SHAPES (justice, beneficence, non-maleficence and autonomy when using SHAPES services)</p>	<p>GE4 Be aware of the perspectives of care ethics. Apply and promote those within SHAPES (empathy, relationships, uniqueness of the cases)</p>	<p>GE5 Maximise the level of human capabilities of older persons and caregivers that SHAPES can promote.</p>	<p>GE6 Ensure that SHAPES is not detrimental to any human capabilities of older people and/or other stakeholders.</p>	<p>GE7 Be aware of the importance and challenges with the terminology regarding older persons, also in your own language as well as the diversity of older persons as a group. Use non-stigmatising language.</p>	<p>GE8 Develop solutions that offer users different options to act according their own wishes and practical reasoning. Be open to innovations that may not pre-empt commercial commercialities.</p>	<p>GE9 Legal basis: define the legal basis for processing of users' information. Following the ethical principles based on informed consent, if the hardware is not used directly where there is a paper document, process for asking consent from hardware use, consent also cover for the use consent for software to give to right representation.</p>	<p>GE10 Acknowledge the heterogeneity of older persons that materialise in the diversity of how older persons adopt and use digital devices (exclusion and inclusion).</p>	<p>GE11 Legal basis: acknowledge that there are sufficient evidence that older persons are aware of the terms and the content. It is recommended primary to understand the older person's experience and to ensure that the user is able to use the device. It is recommended to use a language that is suitable for the user. It is also recommended to use a language that is suitable for the user. It is also recommended to use a language that is suitable for the user.</p>
				<p>GE9 Acknowledge the barriers and facilitators of older persons usage of digital devices (equipment of health care, user requirements, self-efficacy, sense of self, privacy and confidentiality, costs)</p>	<p>GE10 Acknowledge and understand the diversity and complexity of ageing and incorporate that general understanding into the design process of health technology devices, including the realistic assessment of their usability.</p>	<p>ET2 Consider cultural diversity of users, e.g., create avatars that represent different genders and cultures and let the user choose what to use. (TBC)</p>	<p>ET3 Legal basis: acknowledge that there are sufficient evidence that older persons are aware of the terms and the content. It is recommended primary to understand the older person's experience and to ensure that the user is able to use the device. It is recommended to use a language that is suitable for the user. It is also recommended to use a language that is suitable for the user. It is also recommended to use a language that is suitable for the user.</p>	<p>PE1 Create a detailed process to determine if the older person is able to decide on accessing the service and usability of whether it is able to give informed consent for the collection of the information.</p>	<p>PE2 Provide for the end user (older persons) plain language materials, information is visual form (including information on each service and how it operates and what data is collected).</p>	<p>PE3 Adapt content that is suitable for the user and support of the device. It is recommended to use a language that is suitable for the user. It is also recommended to use a language that is suitable for the user. It is also recommended to use a language that is suitable for the user.</p>

Figure 8: The ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ were categorized under two headings (Sarlio-Siintola et al. 2020, 90-101)

The researcher of this paper went several times through all the 102 ethical requirements featured in the ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ (Sarlio-Siintola et al. 2020, 90-101). The researcher started by first marking the ethical requirements that belonged under the ‘fundamental ethical requirements’. Then, she moved to look for the ethical requirements that would fall under the ‘persona-specific ethical requirements’. The researcher also categorized the remaining ethical requirements under seven different themes that emerged from the data as shown in Figure 9.

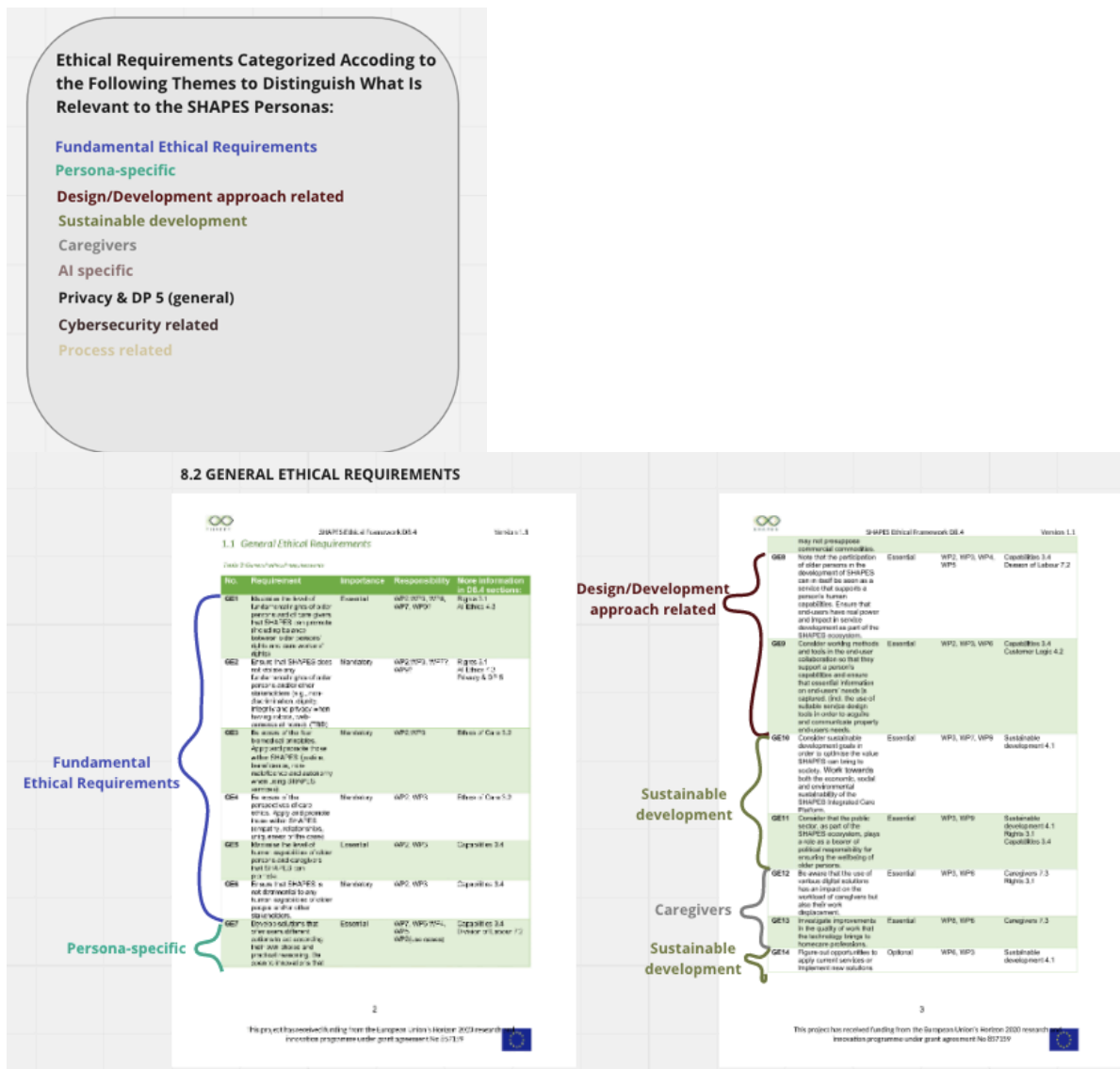


Figure 9: The remaining ethical requirements were categorized under seven different themes that emerged from the data

This was done to make sure that all the ethical requirements were taken into consideration and to ensure that none of the remaining ethical requirements did not fit the two main categories in the framework. In the third step, the researcher presented the identified ethical requirements to a SHAPES researcher and project worker who reviewed them and gave comments and as a result slight changes were made.

3.3.3 Forming concepts

The fourth and fifth step (Figure 6, 33) entailed forming concepts from the data (Kyngäs 2020). The researcher of this paper together with one of the SHAPES researchers and project worker had an online co-creation session where the D8.4-SHAPES Ethical Framework study was

used as a point of reference to decide on six main ethical categories to be featured in the SHAPES older people personas. After this, the researcher of this paper sorted the previously identified ethical requirements under the six main ethical categories. As the final step, the researcher then went through again the D8.4-SHAPES Ethical Framework study to find the corresponding literature to explain why the six ethical requirements were chosen. After completing the analysis, the researcher was then able to answer research question 1.

3.4 Workshop to answer research question 2

In literature, it was emphasized that personas should be written in a manner that ignites empathy towards the end user so that developers are able make informed design decisions for the benefit of the end user. However, there was little literature on how to do this. This gap in the literature prompted the research question 2: *“How to show the ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital service or product?”*. To answer research question 2, an online workshop was held with two service and product development professionals. Developing the personas with the two service and product development professional is in line with Polaine et al. (2013) view that service elements should not only be designed with the customers who end up using them but also the people who end up delivering them. Furthermore, holding a workshop is an effective way to gain solutions or ideas from a group of people in a short time. A workshop enables the various participants to share, inspire and explain ideas and to build on top of each other’s ideas (Choi et al. 2018). The workshop was deemed to be the best way to collect the necessary data as the participants were fulltime working professionals with limited amount of time to give for the study. The workshop was held online to lessen unnecessary face to face contact due to the Covid-19 situation. Microsoft Teams was used as the medium to connect all the participants together through voice and video. Miro, the online collaboration platform, was chosen as the place where to share the workshop materials and for the participants to collaborate. Schwarz (2017) emphasizes that the technology should be chosen according to the size of the group and what is available to them because the chosen technology can greatly affect the opportunities and the challenges that may be faced during the session (Schwarz 2017). Microsoft Teams is a tool that is used by the participants daily at work, however Miro was only previously used by one of the participants. It was decided to still go ahead and use the Miro board as both of the participants are used to using different type of systems and online platforms in their daily work that not much training was seen to be needed for the other participant that had not used Miro before.

3.4.1 Convenience sampling for participant selection

Convenience sampling was used to select the participants for the workshop. Convenience sampling stands for a sample that is easily obtainable for the researcher (Bryman 2016). In this case, the participants were former colleagues of the researcher that worked in

developing products and services, in a business-to-business company located in Finland. All the selected participants had experience from developing digital services and or products and they also had experience from using personas in their work. Thus, the participants fulfilled well the criteria for attending the workshop which aim was to find answers to research question 2: *“How to show the ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital product or service?”*. However, the problem with convenience sampling is that the results are not generalizable because it is unclear how representative the sample is (Bryman 2016). For example, none of the chosen participants had former working experience of developing digital solutions specifically for older people. Furthermore, initially three participants were recruited for the workshop but one of the participants had to cancel last minute which meant that only two people took part in the workshop. There is no set minimum number on how big the sample size should be in qualitative studies (Bryman 2016). A study by Mason (2010) on the sample size of PhD studies using qualitative interviews found that the sample size ranged from 1 to 95 participants. As the service design process encourages to try, fail, improve and then try again (Brown 2008; Davies & Wilson n.d.; Schneider & Stickdorn 2012; Hasso-Plattner-Institute n.d), it can be argued that the results of the workshop, despite having a small number of participants, can be used as indications to iterate the persona and then test it again.

3.4.2 Structure of the workshop

The workshop started by the researcher of this paper explaining to the participants the purpose and agenda of the workshop, how the results would be used and why the participants were chosen for the workshop and how their contribution would be of great value. Wilkinson (2012) stresses that it is critical how one begins a facilitated session as it sets the tone for the rest of the session. It's important to start by informing the participants of the purpose of the session and what is going to be created. This should be backed up by exciting them about the whole process, by describing what the end result will be and how it will benefit them. It is also vital that the participants feel empowered and understand that they play a significant role and that is why they were selected to take part in the session in the first place (Wilkinson 2012). This was then followed up by a short technical exercise to get to know how to use Miro, which also acted as the ice breaker for the session. In contrast to a face-to-face facilitator, an online facilitator has to also adopt a 'technology training role' to help and guide the participants to use the different online tools (Thorpe 2016). The technical exercises were done in a way that helped the participants loosen up and get to know each other better. For example, the participants had to choose from four different pictures their ideal holiday destination by putting a sticky note on top of it, as portrayed in Figure 10. This also worked as a way to get the participants familiar on how to use the sticky note function on the Miro board.

<p>AGENDA</p> <ol style="list-style-type: none"> 1. Agenda and purpose of the workshop 2. Learning to use Miro 3. Group work using the persona 4. Ideation to improve the persona 5. Prototype of the improved persona 6. Ending workshop <p>Duration: 75min</p>	<p>Learning to use Miro</p> <p>Activity 1: Which one of these pictures represents your ideal vacation spot?</p> <ol style="list-style-type: none"> 1. Click on the sticky note icon on the left side of your screen 2. Click on a sticky note, then click on a photo to place your note 3. Type your name on the sticky note 4. Make a duplicate of the sticky note (left click on mouse) and write on the duplicate your lastname.
<p>PURPOSE:</p> <p>Smart and Healthy Ageing through People Engaging in Supportive Systems-hankkeen tavoitteena on kehittää uudenlaista digitaalista palveluekosysteemiä, joka tukee kotona asuvien ikääntyvien ihmisten hyvinvointia. Ratkaisujen suunnittelussa ovat ikääntyvien oikeudet ja heidän mahdollisuudet elää hyvää elämää kotona tai kodinomaisessa ympäristössä. Etiikka ja eettinen osaaminen ovatkin hankkeessa keskeisessä roolissa.</p> <p>Research Question:</p> <p>How to show the ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital product or service?</p>	 <p>The screenshot shows a Miro board with four images of vacation spots: a snowy cabin, a tropical beach, a forest campsite, and a city view with the Eiffel Tower. There are four sticky notes: two pink ones labeled 'Name' and 'Lastname' on the snowy cabin image, and two teal ones labeled 'Name' and 'Lastname' on the tropical beach image.</p>

Figure 10: The agenda, purpose and Miro exercise presented to the workshop participants

After the warmup, the participants were asked to do a design task together as a team as shown in Figure 11. The purpose of this task was to mimic an actual design situation where they would use the developed SHAPES ethical older people persona called Anna. The idea was that the participants could experience how well the persona helped guide them in making design decisions. In order to do this, the participants were asked to further develop the medication reminder (use case), that had been created as part of the SHAPES study (Tavel et al. 2020, 39), in accordance with the requirements of the ethical older people persona Anna. The participants were given three questions to answer to complete the design task which were: *“Why would Anna need the medication reminder?”*, *“What would be Anna’s main concerns using the medication reminder?”* and *“How should the medication reminder be developed so that it fulfils Anna’s ethical requirements?”*. The design task was inspired by usability testing that is often conducted to see how well a designed interface works for the user by giving the participant a task to complete and seeing how well they do it after which feedback is gathered from them. The emphasis in qualitative usability testing is especially on gathering insights and findings on how the users use the product or service or in this case the persona (Moran 2019). During the design task, the researcher of this paper, was observing how the participants completed the task and wrote down notes about how the participants behaved and what comments they gave. Observation can be used to see how a prototype works (Moritz 2005), in this case the prototype of the ethical older people persona Anna, and to better comprehend what the user’s (in this case the participants) pains and gains are (Bland et al. 2020) when using the persona in a design task.

Prototype

Colorcoding instead of just using one red color for the ethical requirements (e.g. traffic lights)



MEET ANNA

Female situation: Less affluent
Digital literacy: High
Health literacy: High
Affinity to technology: High

Motto: One day at a time, hoping for the good ones.

Anna wants to look for an affordable house for her 90-year-old mother. They will live together for a few years. The woman has dementia and needs help with daily activities. Anna is a nurse and works in a hospital. She is a member of the local church and has a good relationship with the priest. She is also a member of the local choir. She is a member of the local church and has a good relationship with the priest. She is also a member of the local choir. She is a member of the local church and has a good relationship with the priest. She is also a member of the local choir.

<p>What is important for Anna:</p> <ul style="list-style-type: none"> - Safe - Ability to use - Being able to use the formal card 	<p>Health concerns and limitations:</p> <ul style="list-style-type: none"> - Anna is getting older - COVID-19 fear - Concerns for her mother's health
<p>Daily living:</p> <ul style="list-style-type: none"> - Needs help with daily tasks - Needs help with daily tasks and eating - Needs help with daily tasks - Needs help with daily tasks 	<p>Health tests/treatment/medication:</p> <ul style="list-style-type: none"> - Needs help with daily tasks - Needs help with daily tasks - Needs help with daily tasks
<p>Own resources, assets, support:</p> <ul style="list-style-type: none"> - Has a good relationship with the priest - Has a good relationship with the priest - Has a good relationship with the priest 	<p>Events, issues, personal concerns, technology:</p> <ul style="list-style-type: none"> - Digital skills - Needs help with daily tasks - Needs help with daily tasks
<p>Hope and dreams:</p> <ul style="list-style-type: none"> - To be able to live independently - To be able to live independently - To be able to live independently 	<p>Unmet needs:</p> <ul style="list-style-type: none"> - Needs help with daily tasks - Needs help with daily tasks - Needs help with daily tasks

Ethical requirements

E_NIC_1 Digital literacy	Low	High
E_NIC_2 Health literacy	Low	High
E_NIC_3 Affinity to technology	Low	High
E_NIC_4 Ability to use	Low	High
E_NIC_5 Safety	Low	High

Figure 12: The workshop participants were asked to create a prototype or mark in the existing persona what they would change about the ethical requirements of the person Anna

According to Moritz (2005) prototypes can take many shapes and forms. For example, a rough prototype can be created with any materials that are readily available to quickly and cheaply build the different parts of the service or in this case a persona. The advantage of prototyping is that it helps to make sure that the team is talking about the same thing and helps them to understand the service or product in practice not just in theory. Doing a rough version like this facilitates to generate new ideas and opportunities (Moritz 2005).

4 The identified ethical requirements and how to present them in the personas

The results section begins by outlining the results to the qualitative content analysis that was done. This will then be followed by describing the results derived from holding the workshop. The section will end in illustrating the framework for creating an ethical older people persona for developing AAL technologies that was developed as result of the research findings.

4.1 Qualitative content analysis results

As a result of the qualitative content analysis, the researcher of this paper first identified seven ‘fundamental ethical requirements’ (GE1, GE2, GE3, GE4, GE5, GE6 and GE47) and then eleven ‘persona-specific requirements’ (GE7, GE37, GE48, GE49, GE50, ET2, ET13, PE1, PE2, PE3 and ME3) out of the 102 ethical requirements featured in the ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ (Sarlio-Siintola et al. 2020, 90-101). This was done by using the preliminary coding framework created by the SHAPES researchers. After this an online co-creation session with a SHAPES researcher and project worker was held, during which the following six main ethical requirements to be featured in the older people personas were identified: 1. digital mistrust, 2. the feeling of safety and security, 3. accessibility limitations, 4. demand for inclusion and non-discrimination, 5. supported decision making, and 6. affordability of care (Table 2).

	Ethical requirements for the older people personas	Connection to the Initial Ethical Requirements for the SHAPES Integrated Care Platform (Sarlio-Siintola et al. 2020, pp.89-99).
E_REQ_1	1. Digital mistrust	GE2, GE3, GE6, GE37, GE49
E_REQ_2	2. The feeling of safety and security	GE2, GE3, GE6
E_REQ_3	3. Accessibility limitations	GE3, GE7, GE47, GE48, GE49, GE50, PE1, ME3
E_REQ_4	4. Demand for inclusion and non-discrimination	E2, GE7, GE47, GE48, GE49, GE50, ET2, PE1, PE2, PE3, ME3
E_REQ_5	5. Supported decision-making	GE1, GE3, GE4, GE5, GE6, GE7, GE37, GE49, ET13, PE1, PE2, PE3, ME3
E_REQ_6	6. Affordability of care	GE49, ME3

Table 2: The six ethical requirements for the older people personas and the connection to the ‘Initial Ethical Requirements for the SHAPES Integrated Care Platform’ (Sarlio-Siintola et al. 2020, 90-101)

The ethical requirements were derived from the D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020) and are explained more in detail in the subsequent paragraphs. Table 2 illustrates the six ethical requirements for the older people personas and their

connection to the Initial Ethical Requirements for the SHAPES Integrated Care Platform (Sarlio-Siintola et al. 2020, 90-101).

4.1.1 Digital mistrust

In the D8.4-SHAPES Ethical Framework study, ‘digital mistrust’ stems from older adults feeling dubious about sharing their private and health information when using health related services and technologies as they question how the data will be used and how their privacy will be maintained (Sarlio-Siintola et al. 2020, 77). Thus, it is of importance that the developed health technologies are designed so that the end users feel that the technology is trustworthy (Sarlio-Siintola et al. 2020, 77) and that it is properly explained how their data will be used (Sarlio-Siintola et al. 2020, 52-53).

4.1.2 The feeling of safety and security

According to the D8.4-SHAPES Ethical Framework study, ‘the feeling of safety and security’ can be achieved by making sure that the necessary security measures are in place to guard personal data (Sarlio-Siintola et al. 2020, 53; 57). Only the people who need to retrieve personal data processed in the system can only do so and it should be made sure that this rule is abided by. Therefore, it should be specified who is allowed to retrieve personal data from the system (Sarlio-Siintola et al. 2020, 57).

4.1.3 Accessibility limitations

The D8.4-SHAPES Ethical Framework study recognizes that ‘accessibility limitations’ prevail in digitalizing services for older people. Even though the idea behind digitalizing services is to make them more available, the contrary may happen, if the older adults do not receive help and guidance in using these technologies. When people age, they become more vulnerable and as such they have to put more energy into learning new technologies. This is due to having less cognitive, physical, financial, and social resources. (Sarlio-Siintola et al. 2020, 74-75)

4.1.4 Demand for inclusion and non-discrimination

There were several factors mentioned in the D8.4-SHAPES Ethical Framework study that relate to the importance of ‘demand for inclusion and non-discrimination’. Cultural factors and possible language barriers should be taken into consideration when developing the health technologies for the older adults. The study also recognized that in Western societies an increasing number of older adults are living by themselves, and to avoid exclusion, appropriate guidance in starting to use of the technology should be provided for the older adults (Sarlio-Siintola et al. 2020, 74-75). Age and disability related discrimination is prohibited, and the promotion of gender equality was of importance. Furthermore, the study recognized that gender does not only include woman and man (Sarlio-Siintola et al. 2020, 10-11).

4.1.5 Supported decision making

‘Supported decision making’ is defined by the D8.4-SHAPES Ethical Framework study as providing various support options from informal to formal support arrangements at differing intensities when carrying out their legal rights. The person with disabilities can pick one or more trustworthy support persons to help them in making legal decisions or for other types of support such as advocacy or helping with communication. The main factor is to ensure that a person with disabilities is supported only when such support is needed and as such great care should be taken in recognizing the right type of support for the particular situation. (Sarlio-Siintola et al. 2020, 18)

4.1.6 Affordability of care

The D8.4-SHAPES Ethical Framework study found that a major factor in older adults deciding whether to use the health technology or not was down to the ‘affordability of care’. If older people think they do not have the means to pay for the technology, they will not use it, despite how much it could help them. (Sarlio-Siintola et al. 2020, 77)

4.2 Workshop results

In this part, the workshop results will be outlined. In short, the workshop consisted of four main parts. The first one being about going through the agenda and purpose of the workshop and having a technical exercise to get the participants better acquainted with Miro which also acted as an ice breaker. This was then followed by the second part, a design task, where the participants were asked to further develop a medication reminder so that it better catered to the ethical older people persona Anna. The third part of the workshop involved the participants giving individual feedback about the persona they had used in the design task and the final and fourth part involved the participants giving suggestions on how to improve the ethical older people persona so that it helps better guide the participants in making ethical design decisions. In the following paragraphs the focus will be on the results gained from the three last parts of the workshop. The final paragraph will depict the framework for creating an ethical older people persona that was created based on the results of the research.

4.2.1 Design task and observation results

The participants were asked to develop together as a team the SHAPES medication reminder use case (Tavel et al. 2020, 39) so that it better catered to the ethical older people persona Anna. To do this, the participants were given three questions to answer to complete the design task. The participants started by reading the persona and use case cards, as was instructed, after which they proceeded to answer the given questions. Answering the first question: “Why would Anna need the medication reminder?” was easy for the participants, as they instantly knew the answer having just read the persona and use case card. When answering

the second question: “What would be Anna’s main concerns in using the medication reminder?”, the participants went back to scan the persona card and one of the participants stated that this should be easy to answer as she scanned through the different headings written in the persona card. The participants were able to find the answer to the second question because of scanning the headings in the persona card.

For the third question: “How should the medical reminder be developed so that it fulfils Anna’s ethical requirements?”, the participants returned to look at the persona card again to seek the specific information for the design task. The participants did not at first notice the ethical requirements that were written in the bottom of the persona card. The participants were more focused on the text highlighted in red in the persona card. After a while, one of the participants made a connection that the highlighted text in red had the ethical requirement number written next to it which connected to the ethical requirements on the bottom. However, the actual highlighted red text in the persona card was used as the base to answer the third question. Furthermore, one of the participants also took notice of the picture on the persona card which showed Anna having glasses. The participant pointed out that Anna’s poor eyesight should also be taken into consideration in the design decisions. All in all, the persona card was well utilized by the participants during the design task.

4.2.2 Feedback on the ethical older people persona Anna

After the completion of the design task, the participants were asked to individually give feedback on the persona. As a whole, the participants felt that the persona was well written, because when asked: *“how satisfied the participants felt about the persona when doing the design task?”*, the participants said that the persona felt realistic, the description was very thorough, and the information was nicely balanced and easy to read. When asked to describe: *“what would the participants change about the persona in general and in terms of how the ethical requirements were presented so that it would help them in the development work?”*, the participants answered the following. In general terms, the participants felt that it would have been useful to have more text on how the persona handles physically the day in terms of movement and daily tasks. Also, the participants felt that more information on the persona’s finances for example how small their pension is would have been useful. In terms of how the ethical requirements were presented, the participants described that they did not initially understand the function of the ethical requirements but liked that it highlighted key factors. This was elaborated more in that the red color, used to highlight the text related to the ethical requirements, guided the participants to focus on the right things.

4.2.3 Improvement suggestions for the ethical older people persona


As the final task in the workshop, the participants were asked to either create an improved prototype of the ethical older people persona or to write in the existing persona how they

would change the persona so that persona worked better in a design task where the participants had to consider ethical requirements when developing a digital product or service. The participants chose the latter and opted to write down next to the existing persona their improvement suggestions. The improvement suggestions were to do with how the information should be presented visually for the participants to grab the important ethical factors easily. The participants liked that the ethical requirements in the persona had been highlighted in the text in red. However, to better understand to which of the six ethical requirements the highlighted text belonged to, the participants suggested using a specific color for each of the ethical requirements. This way, it would be easy to connect that for example the highlighted text in red belongs to ethical requirement number 1 whereas the highlighted text in blue refers to ethical requirement number 3.

The other improvement suggestion made by the participants related to how to show how significant the particular ethical requirement was to the persona. In the current version, the ethical requirements are listed at the bottom of the persona and next to each requirement there is a black rectangle of which left to it there is the word 'low' and on the right end of the rectangle the text 'high'. Inside the black rectangle there is a green ball indicating according to its position in the rectangle whether the ethical requirement is of 'low' or 'high' importance to the persona. The participants found this difficult to read and interpret and suggested that the rectangle should have three different colors to better show where the ball was at. For example, to indicate that the ethical requirement was of low importance, the color green could be used, and to show that it was of high importance the red color would be used and if the ethical requirement was somewhere in the middle, the color yellow could be used. All in all, there would be three different colors inside the rectangle to help better visualize where the ball is placed and thus show how significant the ethical requirement is to the persona. There was some dispute between the participants which colors should be used in the rectangle. For one of the participants the green color indicating 'low' and the red color indicating 'high' made sense, but to the other participant using the colors the opposite way made more sense. Nevertheless, the participants were in an agreement with the basic concept of indicating with different colors where the ball is placed in the rectangle to better understand whether the ethical requirement is on the low or high side.

4.3 The ethical older people persona for developing AAL technologies

Figure 14 illustrates the framework for creating an ethical older people persona for developing AAL technologies. The persona is built around the older people persona that were portrayed in the literature (Lee et al. 2021; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017; LeRouge et al. 2013).



Quote: (A quote from the persona that gives an instant feel of who they are and/or what their possible needs/desires are.)

Name:

Age:

Gender:

Relationship status:

Background: (A description of the persona e.g. who they are, about their family, what their current living situation is like and a mention of their health condition and how they use technology.)

Health: (A description of the persona’s health and possible health conditions and what they do to manage their health.)

Technology: (A description of how the persona uses technology, what devices they use and how skillful they are using them. Also, describing their attitude towards technology.)

Needs: (A description of the needs of the persona in regards to technology and to managing their own health.)

Ethical requirements: (Highlight from the persona text the parts that relate to the ethical requirements (ERQ), using the corresponding highlight color as the ERQ. Mark also whether the ERQ is of low, medium or high importance to the persona.)







E_REQ_1: Digital mistrust	
E_REQ_2: The feeling of safety and security	
E_REQ_3: Accessibility limitations	
E_REQ_4: Demand for inclusion and non-discrimination	
E_REQ_5: Supported decision making	
E_REQ_6: Affordability of care	

Figure 13: Framework for creating an ethical older people persona for the development of AAL technologies

The six ethical requirements featured in the persona are the result of qualitative content analysis that was conducted in the study and the way the ethical requirements are shown in the persona are the result of the feedback received from the workshop.

5 Conclusion and discussion

The section starts by giving a short summary of the conducted study. It will then move on to answer research question 1 and 2. This will be followed by discussing the results of the study and giving an overview of the reliability and validity of the study. The section will end by giving suggestions for further research.

5.1 Summary of the study

The increasing number of adults aged 65 years or older in the EU sets challenges to the economy. This is because there will be more older people than working aged inhabitants that can take care of them (Corselli-Nordblad & Strandell 2020). The use of AAL technologies has been seen as a way to help older adults live longer in their own homes (Queirós et al. 2015) but these technologies have been recognized to have several ethical issues (Sánchez et al. 2017). Personas is a method used by developers to help see the individuals behind the data and guide the decision making to the benefit of the end users (Moritz 2005). However, it was noticed that none of the current older people personas described in the literature took into account ethical requirements. Thus, the purpose of this study was to create a framework for adding ethical requirements to older people personas that help guide developers in making ethical design decisions for the developed digital product or service. To accomplish this, two research questions were formed and to answer them a qualitative study was conducted. As a result, a framework for an ethical older people persona for developing AAL technologies was created. The results of the study contribute to the EU-funded SHAPES programme as well as to the existing literature on personas, ethics and AAL technologies.

5.1.1 Answer to research question 1

To answer research question 1: *“What ethical requirements should be included in the older people personas?”*, qualitative content analysis was carried out on the D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020). The question stemmed from the gap identified in the literature. In the literature review, it was established that personas are narrative portrayals of real end users that have been encountered in research (Cooper et al. 2014). Personas are used to guide designers and developers’ decision-making by helping to prioritize what problems should be first solved for the users and to identify that the user’s requirements and likings can differ from their own (Miaskiewicz & Kozar 2011). It was also established in the literature that older people personas have been used to develop health technologies, coined in this study as ambient assisted living (AAL) technologies. AAL technologies encompass everything from smart homes to wearable sensors (Rashidi & Mihailidis 2013) all with the purpose of letting older people live longer in the comfort of their own homes (Queirós et al. 2015). Conversely, AAL technologies were recognized to have many ethical issues (Hofmann 2008). Yet, none of the current older people personas featured any ethical dimensions

(Lee et al. 2021; Schulz & Skeide Fuglerud 2012; Bhattacharyya et al. 2019; Schäfer et al. 2019; Sakaguchi-Tang et al. 2019; Holden et al. 2017). This was a clear gap in the literature as personas are supposed to act as a point of reference to help make educated design decisions for the advantage of the older people on the developed AAL technology (LeRouge et al. 2013). As a result of the qualitative content analysis, six ethical requirements were identified to be featured in the older people personas that include: 1. digital mistrust, 2. the feeling of safety and security, 3. accessibility limitations, 4. demand for inclusion and non-discrimination, 5. supported decision making, and 6. affordability of care.

5.1.2 Answer to research question 2

Once the six ethical requirements were identified, the next step was to test how to show them in the older people persona so that it helped guide the decision making of the developers. This was because in the literature it was found that for the personas to steer the developers into making knowledgeable design decisions, the descriptions in the personas should be written in a way that the reader is able to recognize the persona's requirements and other relevant circumstances. Moreover, the text should be presented in a way that helps to generate empathy and insights towards the user (Nielsen 2019). Thus, research question 2 was formed: *"How to show the identified ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital service or product?"*. To answer research question 2, an online workshop was held with two product and service developers. In accordance to the results gotten from the workshop, an ethical older people persona was formed that was based on the older people personas depicted in literature (Figure 13, 47). It was evident from the results gotten from the workshop, how important visualizing the ethical factors in the persona was. The main improvement suggestions included highlighting the ethical requirements from the text with the designated color of the ethical requirement, so that they are easy for the developers to find and identify. In actuality, the developers paid more attention to the actual descriptive text of the ethical requirement than to the heading of the ethical requirement which is in line with the literature (Nielsen 2019; Cooper 2004) but understanding what part of the text related to which ethical requirement was not clear. The other improvement suggestion had to do with how to showcase how important the particular ethical requirement was to the persona. Once again, the use of different colors in the "low-high box" that indicated the importance of the ethical requirement was felt to be a good way to show this.

5.2 Discussion

Companies and organizations that want to follow the CDL or service design approach, need to put effort into understanding their customer or end-user to be able to create value to them. One way of doing this is by using personas, a tool that helps to visualize great amount of data collected on the user through research and that helps to develop empathy towards them

(Stickdorn et al. 2018). As the population in the EU is rapidly ageing, developing solutions, such as AAL technologies, for aiding older people to live longer in their own home, has become a great point of focus. Hence, companies and organizations developing AAL technologies could benefit from using personas to ensure that they are developing something that creates value to the older people. Conversely, AAL technologies have been found to have several ethical issues, yet none of the current older people personas featured in literature take these factors into consideration. Therefore, this study looked to identify the ethical requirements that should be featured in the older people personas and how to showcase them in the persona, so that it guides the developers to make informed design decisions for the benefit of older people.

Content analysis was conducted on the D8.4-SHAPES Ethical Framework study (Sarlio-Siintola et al. 2020) and six ethical requirements were distinguished to be included in the older people personas. Ethical requirement 1 is about ‘digital mistrust’, meaning that older people can feel suspicious about sharing their personal and health related information via health technologies if they do not know how the data will be used or who will be able to access it (Sarlio-Siintola et al. 2020). This is not a surprising ethical requirement as Novitzky et al. (2015) found that the protection of privacy is the number one ethical issue with AAL technologies. Ethical requirement 2 deals with ‘the feeling of safety and security’, meaning that it should be clearly stated and monitored who can access the older person’s data in the system (Sarlio-Siintola et al. 2020). In literature, it was recognized that often relatives and other people participating in the care of the older person have access to their private information which can be ethically questionable (Hofmann 2013). Furthermore, if the information is accessed by an unauthorized person, it can lead to physical and psychological hurt for the older adult (Ienca & Haselager 2016). Ethical requirement 3 is about ‘accessibility limitations’, meaning that services can become less attainable if the older people do not receive support and assistance in using the digitalized versions of the service (Sarlio-Siintola et al. 2020). As people age their cognitive, physical, and sensory capabilities subside (Newell et al. 2011) and therefore older people have to put more effort to learn novel technologies (Sarlio-Siintola et al. 2020). Thus, the digital service solutions can easily make the older person feel like they cannot handle it (Blackman et al. 2016). Ethical requirement 4 deals with ‘demand for inclusion and non-discrimination’, meaning that cultural factors, age, gender, or disability should not result in discrimination. Rather, these factors should be taken into consideration when developing health technologies for the older adults (Sarlio-Siintola et al. 2020). However, these matters can easily be forgotten in the development process as the focus on technology is usually on productivity and efficiency (Hofmann 2013). The ethical requirement 5 is about ‘supported decision making’, meaning that the older person with disabilities should only be assisted where assistance is needed, and it should be understood what type of assistance is the most beneficial for the given situation (Sarlio-Siintola et al. 2020). Blackman et al. (2016)

recognize that the developed solution can easily shift the control from the older adult to the caregiver. The ethical requirement 6 deals with 'affordability of care' meaning that if the older people feel that they cannot afford the health technology, they will omit from using it regardless of how much it could help them (Sarliio-Siintola et al. 2020). Therefore, there is a socio-economic risk that only financially well-off older adults can benefit from such technologies (Ienca et al. 2018). Ienca et al. (2018) suggest that health policy plans and government incentives should be put in place to help combat this.

The study also found that the developed ethical older people persona was utilized by the workshop participants (two professional product and service developers) in a similar manner as described in literature. In short, the developers were asked to complete a design task of further developing a medication reminder according to the requirements of the older people persona Anna. Thus, the following findings were made. Just as Miaskiewicz and Kozar (2011) describe, the persona helped the developers to identify the key requirements for the medication reminder so that it served the target user. More precisely, the persona acted as a reference point to making design decisions on what the most valuable features and functionalities should be in the medication reminder so that it best served the older people persona Anna (Subrahmaniyan et al. 2018). The developers read through the persona once thoroughly and then scanned through the persona card several times to find relevant information regarding their design task. This is in line with Nielsen's (2019) findings who describes that background information is typically read only once to gain an overall understanding of the persona, but the supplementary information aimed at the specific project is utilized more frequently. However, it became evident that the older people persona failed to describe the ethical requirements in a manner that would have aided the reader to identify the persona's requirements, use situations and their circumstances to better develop the medication reminder (Nielsen 2019). This is because the developers felt that more information could have been provided on the persona's physical capabilities and financial situation. Furthermore, the developers also felt that the ethical requirements could have been better highlighted from the persona text as the list of the ethical requirements at the bottom of the persona card depicting the importance of each requirement was not enough. This supports Goodwin's (2009) findings that a descriptive text evokes more empathy in the reader than just showing bullet points on the matter related to the persona.

To conclude, the results of this study contribute to the EU-funded SHAPES project which Laurea University of Applied Sciences is a part of. However, the results of this study are not generalizable because further research needs to be conducted to iterate and validate the preliminary results. This is because the double diamond process that the study followed, was only carried out until the develop phase. Keeping this in mind, companies and organizations developing AAL technologies for older people can still benefit from using the framework to create ethical older people personas as a way to take ethical aspects into consideration during the

design process. Testing the framework in real development context can then provide valuable insights how to develop the persona framework further. Also, companies and organizations developing digital products and services for vulnerable populations such as people with disabilities could benefit from the use of the framework for creating ethical personas. Though, careful attention must be paid to the ethical requirements featured in the framework as they might not be representative for other populations than the older people.

5.3 Reliability and validity of the study

Reliability and validity are essential principals to determine and evaluate the quality of a quantitative study, but the two factors are also a relevant way to measure the quality of qualitative study such as this one (Bryman 2016). According to LeCompte and Goetz (1982), reliability means how replicable the findings are in the study. Reliability can be divided into two parts: external reliability and internal reliability. External reliability refers to whether another researcher employing the same methods can get the same results as in the conducted study (LeCompte & Goetz 1982). To better the external reliability of the study, the researcher of this study tried to explain the research process and methods as clearly as possible so that anyone else trying to redo the study, would be able to do so. Internal reliability is about having several researchers conducting the study and them all having the same view of the collected data as the original researcher (LeCompte & Goetz 1982). As such, this study can be said to have low internal validity because for the most part the study was conducted only by the researcher of this paper, apart from validating the ethical requirements for the older people personas with a SHAPES researcher and project worker.

Validity refers to the overall quality of the conducted study more specifically how well the selected methods help to capture what was intended to be captured (Schreier 2012). Validity can also be divided into two parts: external validity and internal validity. External validity refers to how generalizable the results are (LeCompte & Goetz 1982). For both studied research questions, the sample sizes were small. For research question 1, qualitative content analysis was only conducted on the D8.4-SHAPES Ethical Framework study. And for research question 2 a workshop was held only with two participants. However, small samples sizes are typical of qualitative studies. Nevertheless, the results of this study can be considered at best suggestive and therefore further research will need to be done. Internal validity is about how representative are the scientifically gathered observations and measurements (LeCompte & Goetz 1982). Research question 1 was formed due to a noticed gap in the literature. Moreover, the content analysis was performed on a scientifically researched paper, so it can be concluded that the result gained for research question 1 are representative. The results received for research question 2 can also be deemed representative as the workshop participants used the persona in a similar way as was described in the literature. Thus, the study is to some extent internally valid.

5.4 Further research suggestions

As the study focused on creating a framework for adding ethical requirements to older people personas for the development of AAL technologies, it prompts the question of could the framework be used as a base for creating ethical personas of some other vulnerable population for the development of AAL or similar technologies. For example, developers of assistive technologies which help to sustain and better a person's autonomy, health and enable a person to live a dignified life, could benefit from the use of ethical personas in the design process. This is because the target users that the technologies cater to vary from people with disabilities to non-communicable diseases (World Health Organization n.d.). However, this would require examining whether the now identified ethical requirements are adequate for the vulnerable population in question or whether modifications or additions should be made to the requirements. Furthermore, as the study only covered the define and develop phases of the double diamond, further research and testing needs to still be carried out. The final phase of the double diamond, called deliver, encompasses further testing and collecting of user feedback, sharing these with colleagues and partners and then forming the final solution (Davies & Wilson n.d.). Thus, for further research it is recommended to test the now formed ethical older people persona from two aspects 1) to ensure with the SHAPES researchers that the identified ethical requirements in the older people persona are relevant, no important ethical requirements are missing and that the featured ethical requirements are understood in the same matter and 2) to test the portrayal of the ethical requirements in the ethical older people persona with the suggested improvements with more end users in order to ensure that the way the ethical requirements in the persona are portrayed help guide the decision making when developing digital products and services.

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Appendix 1: Online workshop template

AGENDA

1. Agenda and purpose of the workshop
2. Learning to use Miro
3. Group work using the persona
4. Ideation to improve the persona
5. Prototype of the improved persona
6. Ending workshop

Duration: 75min

PURPOSE:

Smart and Healthy Ageing through People Engaging in Supportive Systems-hankkeen tavoitteena on kehittää uudenlaista digitaalista palveluekosysteemiä, joka tukee kotona asuvien ikääntyvien ihmisten hyvinvointia. Ratkaisujen suunnittelussa ovat ikääntyvien oikeudet ja heidän mahdollisuudet elää hyvää elämää kotona tai kodinomaisessa ympäristössä. Etiikka ja eettinen osaaminen ovatkin hankkeessa keskeisessä roolissa.

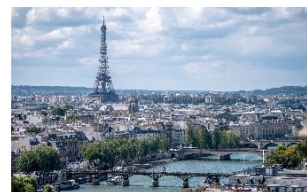
Research Question:

How to show the ethical requirements in the older people personas so that it helps guide the developers to make ethical design decisions for the developed digital product or service?

Learning to use Miro**Activity 1:**

Which one of these pictures represents your ideal vacation spot?

1. Click on the sticky note icon on the left side of your screen
2. Click on a sticky note, then click on a photo to place your note
3. Type your name on the sticky note
4. Make a duplicate of the sticky note (left click on mouse) and write on the duplicate your lastname.



miro

Learning to use Miro**Activity 2:**

Answer the below statements by voting yes or no with the round stickers below.

1. Drag the round sticker near the sticky note, that holds true to you.

1. I have used Miro before.

True

False

2. I have used personas in my work before.

True

False

**Learning to use Miro****Activity 3:**

Answer the below questions by using the text function.

1. Click on the T-letter icon on the left side of your screen.
2. Place the cursor under the question and write your answer.

A. What is your favourite season?

B. What do you usually eat for breakfast?

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Group task

You are a development team further developing the medication reminder so that it better caters to Anna.

- Start by reading the persona card of Anna and then the medication reminder (use case) card.
- Then answer the below questions together as a team.

- Why would Anna need the medication reminder?
- What would be Anna's main concerns in using the medication reminder?
- How should the medication reminder be developed so that it fulfills Anna's ethical requirements?

MEET ANNA



Personality: ● ● ● ● ● ● ●

Digital literacy: ● ● ● ● ● ● ●

Health literacy: ● ● ● ● ● ● ●

Ability to technology: ● ● ● ● ● ● ●

Name: Anna
Age: 70
Gender: Female
Area: Suburban of small city

Motivator: *Her day at a florist, helping for the good ones.*

Health concerns and limitations: *Anna has health issues of the knee, does not experience medication. COVID-19 has impacted her health, she is taking health supplements for her health.*

Health needs/requirements/medication: *Anna has health issues of the knee, does not experience medication. COVID-19 has impacted her health, she is taking health supplements for her health.*

Needs, issues, personal concerns, technology: *Anna has health issues of the knee, does not experience medication. COVID-19 has impacted her health, she is taking health supplements for her health.*

Values and dreams: *Anna has health issues of the knee, does not experience medication. COVID-19 has impacted her health, she is taking health supplements for her health.*

Ethical requirements: *Anna has health issues of the knee, does not experience medication. COVID-19 has impacted her health, she is taking health supplements for her health.*

Smart and Health Aging through People Engaging in supporting Systems

MEDICATION REMINDER (use case)

Description: Older people often show worsened memory as well as insufficient discipline and motivation to follow the doctor's recommendation of medication. There is a need to remind them about their medication in a suitable time.

Digital Solution Proposed

- Digital application that acts as a sound reminder in time when the Reminder Agent (RA) should take their pills or another form of medication.

Actors

- Reminder Agent (RA)
- Registration Operator (RO)

Scope

- To provide the RA with a sound signal in a suitable time for the pill intake or another form of medication.

Components

- Automatic digital timer with a sound system.

Preconditions

- Sound volume is set to the conditions of the RA or more speakers are used to cover the living spaces of the RA.

Main Success Scenario

- RO programs the timing of pill intake within the device - automatic digital timer with a sound system.
- RO installs the device into the home of the RA.
- The device - automatic digital timer with a sound system - performs a sound signal in a suitable time for the pill intake.
- RA hears the sound signal.
- RA takes his/her pills or another form of medication.

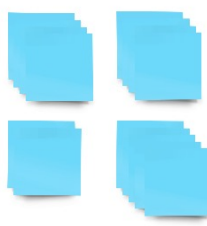
Variations/Extensions

- Device can notify RA repeatedly in case the sound signal is ignored.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857159

Feedback

How satisfied were you with the persona when doing the teamwork?



What would you change about the persona so that it would help you in your development work?

A) in general?	B) in terms of how the ethical requirements were presented?

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Prototype