Signe Berg & Elen Haksø

Design for Elders

Stimulating Inclusive Design for Digitally Lacking, Cognitively Impaired Elders in Digital Services and Products

Master's thesis in Interaction Design
Supervisor: Mari Bjerck
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Signe Berg & Elen Haksø

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NTNU

Kunnskap for en bedre verden

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Abstract

In the years ahead, the long-discussed wave of elder will come, with a significant increase in the number of elderly Norwegians. At the same time, the world is becoming more and more digital with digital services and products on the rise meaning elders are increasingly met with barriers of use when trying to complete simple daily tasks like paying bills or scheduling a doctor's appointment. The challenges these elders experience, are rarely due to incompetent use, but rather due to a lack of knowledge in combination with non-inclusive design that does not take their lack of digital competency or cognitive limitations into consideration. How then, can we protect vulnerable users such as elders and enable designers and innovators to create more accessible and usable digital services and products for digitally lacking, cognitively impaired elders?

In this user-centered, co-design based project we have answered this problem statement by creating the 5 Guidelines for Inclusive Design for Elders as we believe that more accessible and usable digital services and products will emerge when designers are given the opportunity to learn about and develop empathy for elders. They are able to make more informed choices which will lead to fewer pain points and higher usability for elders. We argue that despite the plethora of previously developed guidelines, heuristics and principles, there is still a place for a tool that does not rely on designers' knowledge or understanding of elders' needs to be useful, and that makes design for elders more accessible by gathering and simplifying previous and new knowledge. Finally, we argue that designing for elders instead of designing for the vague idea of "all" allows designers to focus on more concrete challenges, hopefully resulting in more precise and accessible solutions that will benefit all users in the end.

Authors: Signe Berg & Elen Haksø

Supervisor: Mari Bjerck

Field: Interaction Design

Preface

This master thesis is the result of 10 months of hard work and there are many people that have provided us with guidance and feedback throughout this project that we would like to thank.

Firstly, we would like to thank our partners, friends and family for the love, encouragement, patience and guidance. Tom Ensing, Ådne Haugen, Mina Nordby and Rebekka Sofie Bardal Johannessen; You have been our rocks through it all, thank you for putting up with us. A special thanks to our beloved four-legged best friends Saga and Ted for keeping us sane with hikes and cuddles.

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Finally, a special thank you to our grandparents who inspired the topic of this thesis. We hope that our master thesis can contribute to future generations of grandparents not experiencing the same struggles and frustrations as you.
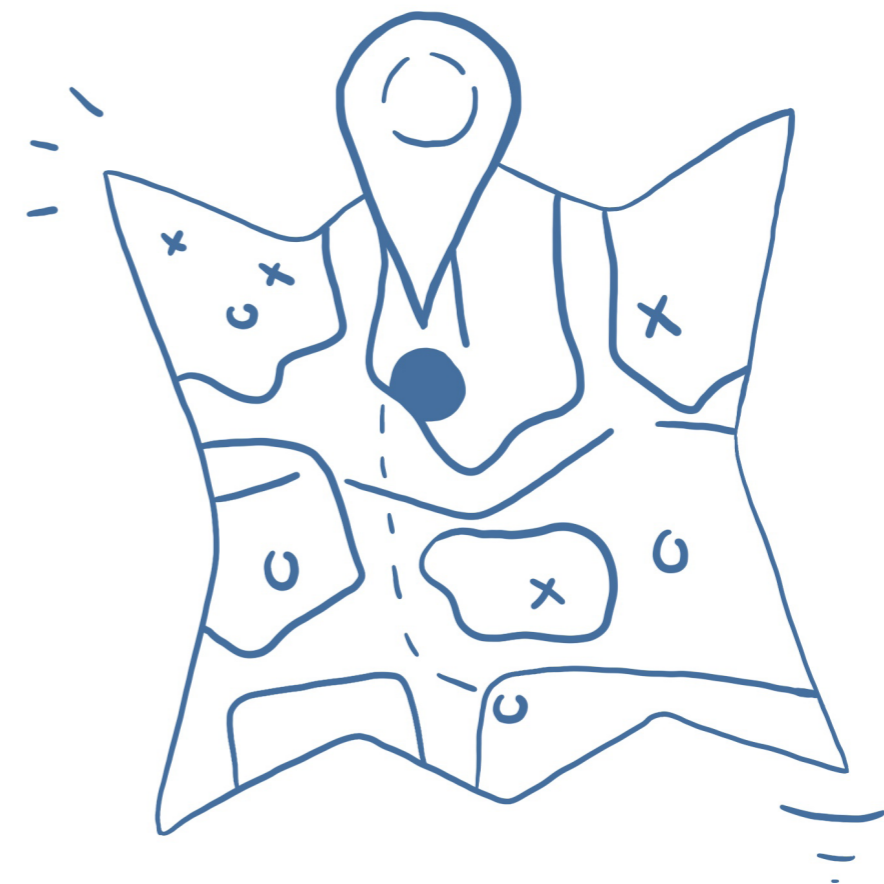
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Glossary

Co-Creation: Any collaborative effort where outside contributors are involved in collaboration.

Co-Design: A co-creative design process where stakeholders and users become active participants in talking about a problem and innovate new solutions.

Co-Production: An umbrella term for co-creative and co-design-based processes used by this thesis' theoretical framework, Røhnebæk & Bjerk, 2021.

Cognitively Impaired Elders / Cognitive Limitations: Elders that have started losing their cognitive abilities such as short-term memory, speed of processing, and problem solving.

Designers and Innovators: A broad term to include all who work with innovation of digital services and products, whether a designer, a project manager, a developer, an economist or other. This group is often referred to as simply 'designers' in this thesis, but all innovators are included in that shorthand.

Design for All: A mindset that encourages innovation that is designed for human diversity, social inclusion and equality.

Digital Competency: One's ability to successfully, confidently and critically use digital services and products.

Digitally Competent Elder: An elder who has gained enough digital competency to complete all tasks they wish to complete online.

Digitally Lacking Elder: Elders who have some level of digital competency, but who struggle to complete tasks that are new or more

complex than they are used to due to a lack of the relevant digital competency.

Digital Services and Products: Any service or product used by users digitally either within the public or commercial sector, for example public transportation applications and online shopping websites. Digital services often contain digital products in various ways. For example, Netflix is a digital service delivering digital products like movies and tv-shows online.

Disabilities / Impairments: Describes a physical or cognitive disadvantage or handicap that limits a person's activities. These words are used interchangeably within this thesis

Elders: Refers in this thesis to individuals over the age of 65.

Heuristic: A generalized, broad rule of thumb that is meant to aid problem-solving within design.

ICT: Abbreviation for information communications technology.

Inclusive Design: A mindset to accommodate a wide range of users, including vulnerable users, throughout the design process.

Indirect End-users: References those who will come into contact with the digital services designed by our primary user group, in this case mostly referring to elders.

Non-digital Elder: Elders who are completely unable to complete digital tasks on their own due to a lack of digital competency.

Physically Impaired Elders / Physical Limitations: Elders that have started losing their physical abilities such as sight, hearing, fine motor skills and similar.

Primary User Group: References this thesis' main primary user group: Designers and innovators.

Stakeholders: A way to reference both the primary user group and the end users at once.

Tech-savvy Elders: References our hypothesis that the future generation of elders would have increased understanding and interest in technology compared to the elders of today. This hypothesis is proved false within this thesis and the phrase 'tech-savvy elders' is used to distinguish between when the thesis discusses the false hypothesis and when it discusses the reality of digital competency.

The Wave of Elders: References the significant increase in the number of elderly predicted in the future general population.

Tool / Guide: References our planned delivery for this thesis, a short guide on how to design for elders.

Universal Design: A set of regulations, requirements and success criteria for ICT solutions, in order to ensure an individual's ability to use and understand a service or product regardless of impairments. When Universal Design is discussed in this thesis we are specifically referring to the laws and regulations set in place by Norwegian Law (Universell utforming).

Vulnerable Users: Users that experience a state of powerlessness in interactions with digital services. In this case, elders.

1

Introduction

Introduction

In the years ahead, the long-discussed wave of elder will come, with a significant increase in the number of elderly Norwegians. At the same time, the world is becoming more and more digital with digital services and products on the rise meaning elders are increasingly met with barriers of use when trying to complete simple daily tasks like paying bills or scheduling a doctor's appointment. The challenges these elders experience, are rarely due to incompetent use, but rather due to a lack of knowledge in combination with non-inclusive design that does not take their lack of digital competency or cognitive limitations into consideration. How then, can we protect and help vulnerable users such as elders and enable designers and innovators to create more accessible and usable digital services and products for digitally lacking, cognitively imparied elders? In this thesis we have aimed to answer that problem statement by creating a guide for designers and innovators that will enable them to create more accessible and usable digital services and products for elders by allowing them to gain key insight and knowledge on this user group.

In the introduction chapter we will first introduce the subject of this thesis, put it into a larger context and discuss how this topic is relevant to interaction design. Then we will look at our theoretical framework and answer why we believe a thesis within inclusive design is valuable. Finally we will discuss our motivation, problem statement and user groups before concluding with our aim for this thesis.

Context and Background

A Huge Wave of Elders

"The world's population is ageing" (United Nations, 2019). Effectively every country in the world is experiencing growth in the proportion and number of elders. The United Nations (2019) estimates through the World Population Prospects: the 2019 Revision, that one in four people living in Europe and Northern America could be age 65 or over by 2050. Globally, the number of elders over 80 years old is expected to triple, from 143 million in 2019 to 426 million in 2050. Within Norway, numbers from Statistics Norway indicate that by 2030 there will be more elders (65+) than children and young adults (Gleditsch, 2020). By 2040 the proportion of elderly in the Norwegian population will increase by 60% compared to today (Rogne & Syse, 2017, in Telle, 2017). Statistics Norway provide several reasons for why this could be.

Firstly, and most obviously, an increase in general life expectancy means the amount of people classified as elders will continue to rise (Gleditsch, 2020). Secondly, as the whole world's population is also aging, those immigrating to Norway will be increasingly of the older generation. By 2060 Statistics Norway anticipates that one-in-four immigrants will be over 70 years of age which adds to the high population of elders in the country (ibid.).

The general population in Norway is also expected to increase at a slower rate than first presumed (Gleditsch, 2020). The corona pandemic is expected to result in decreased immigration and fertility in the short term and Norway's historically low birth rate is predicted

Flere eldre enn barn og unge
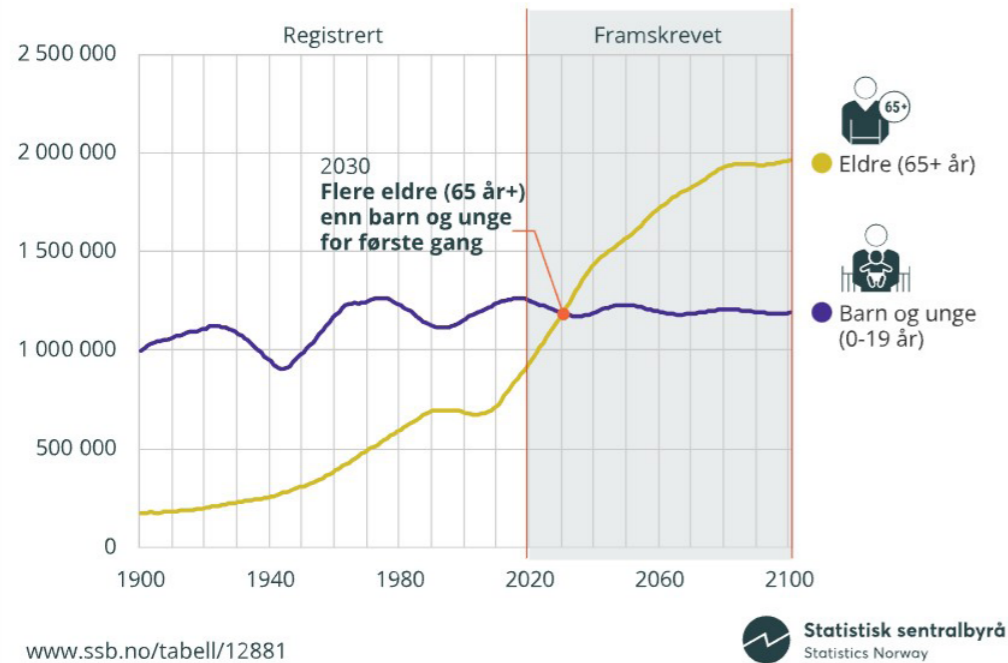
Hovedalternativet (MMM)

Figure 1: Table from Statistics Norways, visualizing that by 2030 there will be more elders (65+) than children and young adults.

to continue at below-average in the long term as more families start having children later and fewer families choose to have more than two children, resulting in fewer children and young adults in the future general population (ibid.).

Perry and Nurmikko-Fuller write that "As life expectancy continues to increase, the growing need for services that adequately address the access requirements of older demographics becomes apparent" (2017). They argue that the needs of the elderly have not been "adequately taken into consideration in the push to adopt the digital as the medium for service provision" (ibid) and that further research on this is required. This is where we believe our thesis and the solution developed can offer a helping hand for any and all designers designing or redesigning the technological future to better consider elders and their needs.

What Happens When We Get Old?

Age naturally impacts us humans, especially when we get older and enter the last phases of life. According to Hanson (2011), aging tends to bring about many gradual changes in a person's perceptual, physical and cognitive ability. Story, Mueller & Mace (1998, p. 12) argue that disability increases with age for natural reasons, and that several elders struggle with these negative changes in ability: "Many people, especially older adults, deny having a disability because of the perceived social stigma identified with being disabled. Disability, however, is a common and normal part of life" (Story, Mueller & Mace, 1998, p. 12). For those who have existing disabilities, these disabilities may worsen with age (Hanson, 2011). These age-related changes can create accessibility and usability problems, for example when using technology and digital services and products, classifying them as vulnerable users.

Vulnerability can be understood as "related to a state of powerlessness in interactions" with digital services (Røhnebæk & Bjerck, 2021, p. 742). Elders are therefore vulnerable users, in that they often experience powerlessness in interactions with digital services, due to cognitive or physical limitations. However, Røhnebæk and Bjerck (2021) argue that the term "vulnerable" should be used cautiously, as it may downgrade and blur the strength and resourcefulness that is also characteristic of this group of citizens and service users.

Today, accessibility and usability for vulnerable users and users with disabilities are often addressed in regards to vision impairments, deafness, hearing loss, limited movement and dexterity. However, Hanson (2011) argues that issues of accessibility and usability in regards to digital services and products are far from solved by addressing degrading vision, hearing, and physical disabilities. Solutions for these physical disabilities have received more attention and are better understood than cognitive changes that happen when getting older (Hanson, 2011). In healthy aging, there are a number of declines in cognition that can affect ability to use technology. Looking

at the population as a whole, these declines begin in middle age and continue throughout the rest of one's life (Hanson, 2011).

Hanson (2011) argues that information processing theories of cognition can be used to understand these different abilities: "Fluid intelligence refers to a set of cognitive abilities that includes short-term memory, speed of processing, and problem solving in new circumstances. Critically for older adults, fluid intelligence is associated with aptitude for learning new technologies." (Hanson, 2011). This explains why fluid intelligence is one of the strongest predictors of digital competency. According to Hanson (2011), elders who measure high on tests of fluid intelligence engage in more types of online activities, like e-mail, playing online games, reading online news, and shopping online, than those who measure low on these tests.

The Future Tech-savvy Generation of Elders

Compared to the age wave we are currently undergoing, the middle-aged of today not only experienced, but fueled and funded the huge technological boom of the last five decades. When beginning work on this thesis, we hypothesized that the majority of the 2030 elders would be classified as a tech-savvy generation.

Already we are seeing signs of elders having increased resourcefulness, understanding and interest in technology. Statistics Norway argues that we can expect a more resourceful older population in the future, as the future generation of elders will be highly educated (Stabell, 2017). According to Statistics Norway, education is a good indicator of resourcefulness, which means that the elderly of the future may be more independent and better able to handle certain challenges in everyday life (Stabell, 2017). Additionally, according to AARP research, older adults dramatically increased their use of technology during the covid-19 pandemic, both in terms of spending more time on the devices they already owned and in terms of buying, learning and engaging with new technology (AARP, 2021). 60% of those 50-plus express that they are feeling confident in their technology-usage, and

54% would like to improve their knowledge (ibid.). This increase in use and interest can lead to more resourceful elders.

Many argue however that it is not guaranteed that the tech-savvy of today will have the ability to use future technology. Vicky Hanson for example writes that "20 years from now it is possible that computers as we know them may have evolved to the state where today's experience with the Web and other computing applications no longer well serves the older users" (Hanson, 2011). Similarly to media, technologies have a certain language (following certain conventions and certain mental-models) that they adhere to (see Buckingham, 2003) and Hanson here argues this language will be so different by the time today's young age that their digital literacy will be of little use. That being said, the user has always been required to familiarize themselves with the technology language when first being introduced to technology and at the start of this project we hypothesized that the large number of media and technology languages future elders will have been exposed to and learned in their earlier years, would create a base of education which could aid them when they meet the technologies and languages of the future, creating the problem statement: "How do we prepare for the tech-savvy generation, and ensure that the technology we design encompasses the needs of this new user group?".

Our hypothesis turned out to be faulty, and will be discussed further in our Results chapter, but it is important to mention here as this was the perspective we entered our insight gathering phase in, coloring our data collection, and is also necessary context for the results and discussions later in the thesis.

How is This Relevant to Interaction Design?

As we have seen from Statistics Norway, by 2030 interaction designers will need to be able to design competently for elders as they will make up a large part of the population (Gleditsch, 2020). In an increasingly

digital society, elders will need to use digital interfaces and services to function as normal members of society and keep their independence. They will still need to deliver their taxes, order and track packages online, access their health records, get groceries, communicate with family and friends, travel with public transport, and much more.

According to the United Nations (2020), digital technologies have advanced more rapidly than any other innovation in our history. In line with increased digitalization, both the public and private sector have migrated the majority of their services online (Perry & Nurmikko-Fuller, 2017). Several services today have therefore been quickly moved to digital and contactless platforms, while many elders still rely heavily on costly and time consuming analog alternatives. Various public transportation services demand their users to pay for tickets in their smartphone application. Customer service is often made more time efficient with chat services and impersonal bots. Most newspapers are almost completely digital. In Norway, taxes are easily delivered with an online form, and personal healthcare records are just a click away on 'Helsenorge'. But despite the constant presence technology has in our daily lives, there are still "barriers that prevent millions of elderly people from accessing it" (No Isolation, 2021b).

Digital exclusion is of course not a unique problem for elders, any number of disabilities can make the digital society difficult to engage with (see amongst others Andersson, 2022) and many are concerned about how this will continue to affect us all. In a survey conducted by the Norwegian technology supplier Elkjøp Nordic (2020), 21% of the respondents said they miss out on things because they lacked access to certain technologies, with 23% missing out on things because they lacked knowledge on said technology. 28% answered that a lack of access to and knowledge on technology has created a digital class system in today's society, with 36% worried that more people would end up excluded from society because of rapid technological development (Elkjøp Nordic, 2020). For elders specifically, research has shown that 40% of technology installed in elders' homes is never used, and more than 50% of elders experience technology issues because of usability problems (No Isolation, 2021b).

Many believe touchscreens are the way to make technology more accessible. However, physical and health factors can create barriers to use, meaning that...

5.6 million

people over the age of 65 in the UK find touchscreens difficult to use.

1.98 million
have dry and/ or thick skin that prevents conduction of electricity.

3.07 million
have other physical barriers to using touchscreens.

2.95 million
are limited by subjective cognitive decline.

Figure 2: Numbers from No Isolation visualizing that there are still barriers that prevent elders from access to the digital world.

The issue of digital exclusion of elders is a very relevant and prevalent problem for the future of digitalization and design, especially considering the increase we will see in the elderly population in just a few years. Our world is getting digital, and it will be the task of interaction designers, among others, to include vulnerable users such as cognitively or physically imparied elders, in order to make our digital world accessible for them as they age and decline. This user centered and co-design-based project aims to stimulate inclusive design by creating a helpful guide for designers that encourages empathic and empowering solutions for the future generation of elders. We argue in this thesis that such a guide will be valuable to the field of interaction design, by giving all designers a helpful tool when tackling a vulnerable user group, in order to help create accessible and inclusive digital solutions.

Hasn't This Been Solved Already?

Within the field of design there are a plethora of design guides, principles and heuristics, in addition to laws and regulations, that aim to increase the usability of digital services and products. There is also previous research done on designing for elders in an academic context both in terms of how elders interact with and use technology, and in terms of specific recommendations for how to design for elders. One could argue therefore that the need for another guide on elders and their needs is obsolete.

Berg and Haksø (2021) looks into the general design principles and heuristics that already existed and were in use by designers today, and explored whether the design industry already is prepared for the elder user group or whether further action was needed. The principles and heuristics explored were the 7 Principles of Universal Design (The Center for Universal Design, 1997), the 10 Usability Heuristics for User Interface Design (Nielsen, 2020), the Web Content Accessibility Guidelines (WCAG), four POUR Principles (W3C, 2021) and the Designing for Accessibility guidelines (UK Home Office, 2021). Each of the mentioned principles, heuristics, and guidelines took different aspects of elders' needs into consideration (Berg & Haksø, 2021). The 7 Principles of Universal Design took a physical perspective with their heuristics and mostly focused on contrast ratios, size and "low physical effort". Other principles, such as the 10 Usability Heuristics took more of a cognitive perspective but did not discuss digital competency or other relevant factors for the elder user group. The Designing for Accessibility posters explored many relevant perspectives, but they did not include any elder-specific posters. The WCAG and POUR principles manage to explore both cognitive and physical perspectives. These last two guides were the only ones to take elders and their needs into consideration throughout (ibid.).

Interestingly, all of the guides required the designer to possess intimate knowledge of elders and their needs to be able to utilize the guidelines and heuristics to facilitate elders' needs (Berg & Haksø, 2021). It was concluded that further work was needed in this area by for example "developing a set of principles that do not rely on designers' knowledge of or ability to remember elders' needs, but that explicitly states how one can improve one's design to benefit elders and why it is important, could be extremely interesting to consider" (ibid.).

For research and design recommendations specifically on designing for elders there is a plethora to learn from. Crews and Zavotka (2006) write on aging, disability and frailty and how this impacts the world of UI design. They discuss the rising age of the world population and argue that universal design will be crucial in future to ensure good quality of life for this increasingly large percentage of people (Crews & Zavotka, 2006). Fua, Gupta, Pautler and Farber (2013) discuss designing serious games for elders as this can have benefits to elders' cognitive abilities. They acknowledge the cognitive, sensory and physical limitations elders may possess and the challenges this can present, but argue that an understanding of cognitive limitations in elders is an "important determinant of success in games targeted at elders" (Fua, Gupta, Pautler & Farber, 2013). Nunes, Kerwin and Silva (2012) offer 13 recommendations for how to design for elderly users on TV applications, arguing that the widely known UI guidelines such as those described above do apply in this context, but are even more crucial to a good user experience (Nunes, Kerwin & Silva, 2021).

Additionally, there is an abundance of blog articles and similar written by individual designers or organizations on how to design for elders. Sergey Polyuk gives recommendations on how to improve interactions for older adults that have issues with motivation, memory, experience and more (Polyuk, 2019). Spire Digital shares their best practices for accessible design for elders (Spire Digital, 2019). Ollie Campbell shares insights on how older people use digital technology differently from younger individuals (Campbell, 2015). And Digital Scientists have given 5 accessibility-related tips to help people design for older adults (Digital Scientists, 2021). Despite all this previous research done on the topic, we still argue there is a place for a tool that makes tips on designing for elders more accessible and usable. Current tips and tricks are spread far and wide across the internet in the form of blog

posts or long winded articles and the current academic literature can be considered quite heavy reading. Additionally, a large amount of the academic research done in this field is behind a paywall and not accessible to most designers. The Nielsen and Norman Groups fantastic book "UX Design for Senior Citizens (Ages 65 and older)" for example is behind a paywall, making it much less accessible and useful for designers.

To conclude, there are a vast number of design principles, heuristics and tips and tricks available to designers who have the resources and knowledge to use them. However, we argue there is still a place for a tool that does not rely on designers' knowledge or understanding of elders' needs to be useful, and that makes design for elders more accessible by gathering and simplifying previous and new knowledge. This is the work we do through the creation of this thesis.

Theoretical Framework

Universal Design

The Center for Universal Design (1997) defines universal design as; "The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design". In many ways, universal design can be understood as an individual's ability to use and understand a service or product regardless of impairments. A condition for universal design is of course accessibility, and the 7 Principles of Universal Design was created by a working group of architects, product designers, engineers and environmental design researchers at The Center for Universal Design in 1997. These principles, in addition to the definition itself, form the base for the mindset of Universal Design. At the time, they set a worldwide standard for accessibility and have been referenced often. These principles focus mainly on the universal design of buildings, environments and physical products, but are exceedingly transferrable to digital products and services in line with the increasing digitalisation of society. Though, universal design benefits more than vulnerable users or users with disabilities. According to the Forrester report, which was commissioned by Microsoft in 2003; 60 % of the adult workforce is likely or very likely to benefit from the use of accessible technology (Stevenson & McQuivey, 2004).

Universal Design Laws and Regulations in Norway
In many countries, including Norway, non-discrimination laws that require a certain level of accessibility are in place (Persson et al, 2015). In Norway, universal design is often referred to as 'Universell utforming', a set of regulations, requirements and success criteria for ICT solutions. These are legal requirements for both the public and

private sector, which aim for a society where everyone can participate. They are an interpretation and operationalisation of the minimum requirements for web solutions that follow from the regulation on universal design of information and communication technology (ICT) solutions. In other words, 'Universell utforming' for web solutions are the Web Content Accessibility Guidelines (WCAG) 2.0 levels A and AA, with some exceptions (Uutilsynet, 2021a). The authority for universal design of ICT is responsible for following up regulations on universal design of ICT solutions, which is linked to the Equality and Anti-Discrimination Act in Norway (Uutilsynet, 2021b). If necessary, organizations can be ordered to make corrections and be imposed daily fines. However, inspections are usually prioritized at organizations and solutions with many users that are deemed important for individuals' right to participate equally in society (Uutilsynet, 2021c).

Uutilsynet (2021d) expresses that disabilities, language barriers and old age can still make it difficult to access information, goods and services online, and that the set of regulations, requirements and success criteria for 'Universell utforming' contributes to everyone being able to participate. However, as we explored previously, the WCAG principles that 'Universell utforming' is based on requires the designer to possess intimate knowledge of elders and their needs to successfully utilize the guidelines. 'Universell utforming' are considered minimum requirements for web solutions that are justifiable to put into law and do not, or cannot, include all possibilities for inclusion in the same way mindsets like universal design or inclusive design can. When universal design is discussed in this thesis we are specifically referring to these laws and regulations set in place by Norwegian law, often referred to as 'Universell utforming'.

Inclusive Design

While both inclusive design and universal design are different names of approaches to increase accessibility of interactive systems, inclusive design is conversely not a fixed set of regulations, requirements or success criteria, but a constantly evolving philosophy (Persson et al,

2015). Additionally, universal design can often be seen enforcing "a single design solution without need for adaptations or specialized design" (Joyce, 2022) while inclusive design is more open to "multiple design variations so long as they achieve the desired outcome" (ibid.).

Inclusive design can be understood as a mindset for inclusion of a wide range of diverse users, including socioeconomic factors, gender, age, ethnicity and language. According to Persson (et al, 2015), the goal of inclusive design is creating beautiful and functional interactive systems that can be used equally by everyone, regardless of age, gender, or disability. This requires that the design process must be constantly expanding to accommodate a diverse range of users, as we develop greater understanding of their requirements, desires and expectations (Persson et al, 2015). However, in contrast to universal design, there is no testable success criteria with inclusive design in order to pass or fail certain regulations or requirements. In many ways, inclusive design can be viewed more as a mindset used throughout the design process, in order to accommodate a wide range of users, including vulnerable users, such as elders.

This thesis establishes itself as a continuation of the work done within inclusive design. The concepts of universal design and inclusive design in an international setting are in many ways very similar. However, in Norway, and to Norwegian designers, the idea of universal design is firmly planted in the laws and regulations of "universell utforming" (see Bendixen, K. & Benktzon, M., 2015). Therefore, discussing any inclusivity beyond these laws and regulations became very challenging within a universal design-based context. Opening up the thesis to be concerned with inclusive design instead of universal design allowed for a much deeper, more meaningful exploration to take place. This is also why we believe that stimulating inclusive design as opposed to universal design in our solution will encourage empathic and empowering solutions for a digitally lacking, cognitively imparied generation of elders in a Norwegian setting, as it opens up to go above and beyond current laws and regulations.

Design For All

Design for all is another accessibility strategy to promote inclusive innovation. Similarly to inclusive design, it is not anchored to any guide or principle in the same way as universal design is anchored to the 7 Principles of Universal Design. In recent international research it has been suggested that design for all and universal design can be used interchangeably (Persson et al, 2015, p. 508), but as we have discussed the adaption of "universell utforming" makes that difficult in a Norwegian context. Design for all is also present in a lot of different contexts meaning design for all can mean many different things to different people.

Simon Harper (2007) points to 3 main contexts design for all is usually discussed within:
1. The context of socioeconomics, ethics, and issues of general discrimination.
2. The context of encompassing everyone in society.
3. The context of designing products and services so that they are usable by the widest range of people (Harper, 2007).

Finding a common definition for design for all in all contexts can be difficult, but the definition used by The European Institute for Design and Disability (EIDD) is perhaps most common. It describes design for all as "'design for human diversity, social inclusion and equality" (EIDD, 2004, in Persson et al, 2015, p. 507). Additional clarification to this definition can be found in The Stockholm Declaration which reads "in short, everything that is designed and made by people to be used by people – must be accessible, convenient for everyone in society to use and responsive to evolving human diversity" (ibid.). Within Scandinavia the concept of design for all and accessibility has been tied to socio-political issues and it is argued that people's ability to participate in society is an important goal for a democratic system (Bendixen & Benktzon, 2015). Denmark, Finland and Sweden all primarily use the term design for all when discussing accessibility and the design legislations that have been put in place, while Norway is unique in its adaption of the term "universell utforming" (ibid.).

It has been argued that design for all is too wide in its hope to design for the widest possible range of people, as "there simply is too great a range of human abilities and too great a range of situations or limitations that an individual may find themselves" to be able to achieve or sustain such a goal (Harper, 2007). Harper (2007) argues that to create accessible and usable products within a design for all methodology, one needs to make generalizations about the users, and that these generalizations end up excluding the exact users the designer is trying to design for. Instead he suggests a "design-for-one" approach where the user interface is able to adapt to each individuals needs, limitations and desires at any given time. He suggests that a design team may stretch themselves too wide in their quest for design for all to the point where no user group gains true accessibility as it is impossible to keep all potential users and all potential situations in mind and create a product which is flexible enough to accommodate these different users and situations (ibid.). However, Jon Sandford and Elena Remillard on the other hand, argue that a utopian idea of accessibility (as design for all may be faulted for appearing) is in fact ideal, as " if we don't set our design goal unrealistically high, we are likely to fall far shorter from the ideal than we will if we set the ideal as the design goal" (Sandford & Remillard, 2021, p. 179).

Vulnerable Users

We anchor this master thesis in the theoretical framework of vulnerable users and inclusive design as the topic of vulnerable users is a continuation of the field of inclusive design which is concerned with those users that "pose additional challenges for designers" (Culén & van der Velden, 2013).

Vulnerable users can be defined as users that experience a "state of powerlessness" in interactions with, in our case, digital services (Røhnebæk & Bjerck, 2021, p. 742). This vulnerability is often associated with "age, frailty, diagnosis or limited capacities, both physically and cognitively" (Culén & van der Velden, 2013), but can also include temporary disability or the inability to interact with or learn new

technology. Vulnerable users can also be born out of differencitions in race, class, gender, sexual identity or other intersectional characteristics or circumstances between the designer and the user, as their needs may not be considered in the design of products and services because they are not fully understood (Mcdonald et. al., 2020). It can be easy to think of a vulnerable user group as one homogenous group with the same abilities and disabilities. However, a group like elders will due to a varied and gradual decline of cognitive and physical functions in fact be highly inhomogeneous which will affect their "motivation, ability and self-efficacy in using ICT" differently (Culén & van der Velden, 2013). These users may require designers to think of co-design differently as both their established work routines, and the previous experiences the designer may have had co-designing with a vulnerable user group can be unreliable; "various forms of vulnerability evoke different constraints and capabilities when it comes to co-production" (Røhnebæk & Bjerck, 2021, p. 744).

Designing for vulnerable users as a concept can be considered well-established in the design world. WCAG and universal design legislation works to ensure usable products for those with decreased eyesight, hearing or other disabilities (see among others uutilsynet, 2022). Media that contain flashing images or patterns often include a photosensitive seizure warning to warn those with a history of epileptic seizures (see among others Xbox, 2022). And accessibility options for a vast array of disabilities are now included in AAA gaming titles (see among others, The Last of Us Part 2 in Wilds, 2020). However, cognitive and emotional conditions such as for example anxiety, panic disorders, depression or bipolar disorder are not considered as often. Interestingly, there are some examples of phobias taken seriously. For example, the Obsidian Entertainment game Grounded has an arachnophobia safe mode which makes the spider-enemies in the game "look and sound less spiderlike" (Grounded, 2020 in Phillips, 2020). One could argue that the trend to consider the cognitive and emotional conditions of vulnerable users is on the rise, but not quite as mainstream yet as other physical conditions such as epilepsi.

The theoretical framework of vulnerable users is appropriate for this thesis as those papers concerned with vulnerable users often point out the lack of design methodology and aids spesifically curated for this user group (See Culén & van der Velden, 2013, Røhnebæk & Bjerck, 2021 and Vines, McNaney, Clarke, Lindsey & McCarthy et al., 2013) and we believe we can help to fill some of this gap for the elder user group.

Research Question

Our Motivation

In this thesis we wanted to expand and further develop our ability as designers to learn from and empathize with a new user group. We have seen that elders will become an increasingly important user group in society moving forward and as interaction designers specializing in user-centered design methods and co-creation, we are especially interested in learning about and interacting with these users since they will become a key part of our work moving forward.

Additionally, by working in the industry for a short while, we have both gained insight into how this is a relevant problem in need of a solution. We have experienced that the industry often emphasizes that older users need to be considered as important users to the services they are creating, but struggle to pinpoint exactly how they should be taken into account, pointing only to larger text size and more contrast when prompted to elaborate. The possibility to potentially further the fields of interaction design and inclusive design, and helping designers to more precisely design for this user group, is extremely motivational for us and forms the basis for why this particular direction was chosen.

Problem Statement and Research Question(s)

The main problem statement that began this thesis was:

How do we prepare for the tech-savvy generation, and ensure that the technology we design encompasses the needs of this new user group?

It was this question that prompted our research and followed us through the first two stages of our design process. However, as design is iterative, this question naturally changed and evolved throughout the process, especially in relation to our insights. Once we had gathered and analyzed our insights a new re-defined problem statement emerged:

How can we enable designers and innovators to create more accessible and usable digital services and products for digitally lacking, cognitively imparied elders?

This was the problem statement we ended up solving within this thesis. Our more detailed research questions can be found in the Results chapter under "How Might We Questions".

Primary User Groups and Stakeholders

As this problem statement and topic as a whole concerns a great many individuals, groups and organizations, we found it important to scope down and define which user groups and stakeholders our thesis involves.

Our primary user group are **designers and innovators** that have realized a large part of their own user group will be elders and are in need of guidance on how to design for them. These are our **project primary users** because they are the ones who will be interacting directly with the guide developed and putting it to use in their work.

Additionally, our thesis will hopefully benefit the **elders** who will come into contact with the products or services designed by our primary user group. These we can define as **indirect end-users**, who will be both indirectly and directly involved with and benefit from our thesis. Elders are defined as those 65+ in accordance with Statistics Norway (Gleditsch, 2020).

Project Primary Users

Designers   Innovators

Anyone creating digital services and products for elders

Indirect End-Users

Elders   Vulnerable Users

Who reaps the benefits?
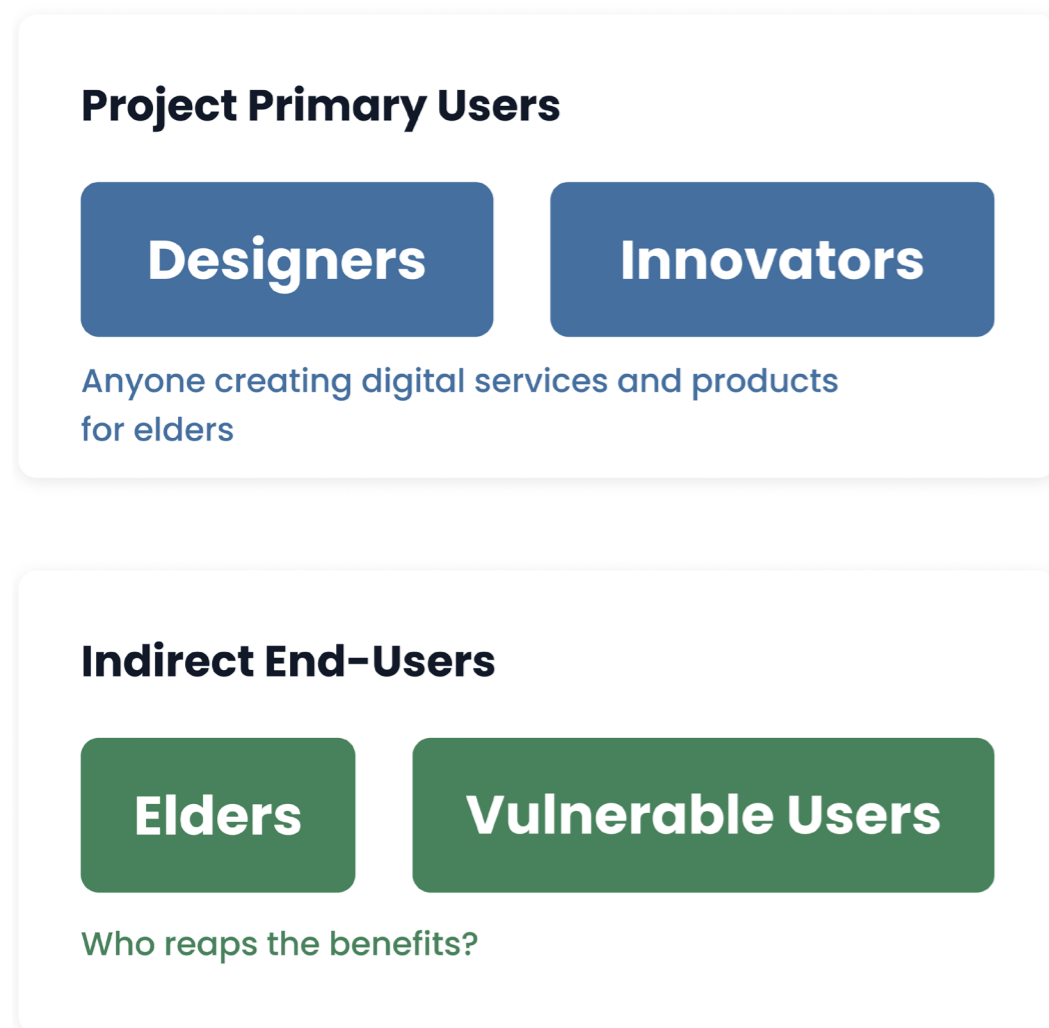
Figure 3: Overview of users. Project primary users are designers and innovators, essentially anyone creating digital services and products for elders. The indirect end-users are elders and other vulnerable users, who hopefully reaps the benefits by using the digital services and products created by the designers and innovators.

Our Aim for This Thesis

The aim of our thesis is to create a guide that will enable designers and innovators to create more accessible and usable digital services and products.

To achieve this our final delivery includes:
- 5 guidelines for inclusive design for elders.
- A website to present the guidelines in a accessible way: www.designforelders.com.
- The full master thesis report.

The aim was not to deliver a finalized, set-in-stone product, but rather a guide that can be further tested, iterated and expanded upon. In the same way as accessibility guidelines and similar need to be continually updated to not become outdated, so will our guide be required to change and adapt in line with the new creative processes and technologies the future will bring. We believe guidelines are at their best when they can be adapted and changed by the target user group to fit their goals, needs and situation, and this is our aim.

Additionally, our solution does not aim to replace any established accessibility guidelines, usability heuristics or other design principles, but rather aims to supplement the vast field of forever growing guidelines that hope to encourage inclusive design.

Structure of Thesis

In this Introduction chapter we have introduced the topic of this thesis and put it into a larger context. We then discussed how this topic is relevant to interaction design and why we believed a thesis within inclusive design is valuable in light of elders. Finally, we have discussed our motivation, problem statement and main user groups before concluding with our aim for this thesis.

In the Methods chapter we will describe the methodology we used to address our problem statement and research questions and describe the overall design methodology our process followed. In the Results chapter we will present all findings gathered in our Discover phase and discuss how we created our solution based on these findings. In our Solution chapter we will present the final solution and discuss whether this solution answers our problem statement and how might we questions. This solution will then be discussed up against our theoretical framework, context and background in our Discussion chapter before the project is concluded.
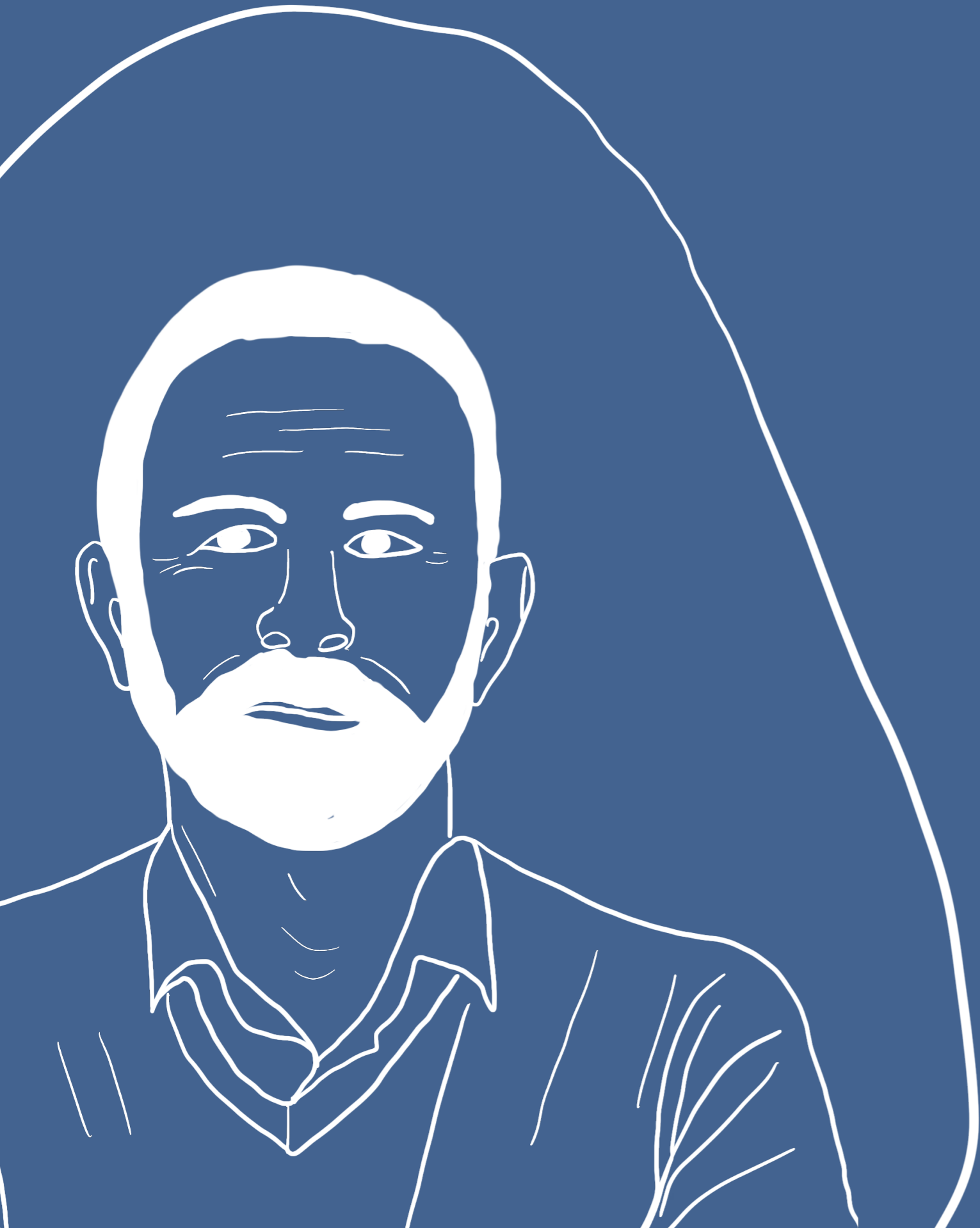
2

Methodology

Methodology

In this chapter we will describe the methodology we used to address our problem statement and research questions. First, we will describe the design methodology our process followed. Then we go into detail on each method and how they were utilized before finally discussing the research ethics we needed to consider.
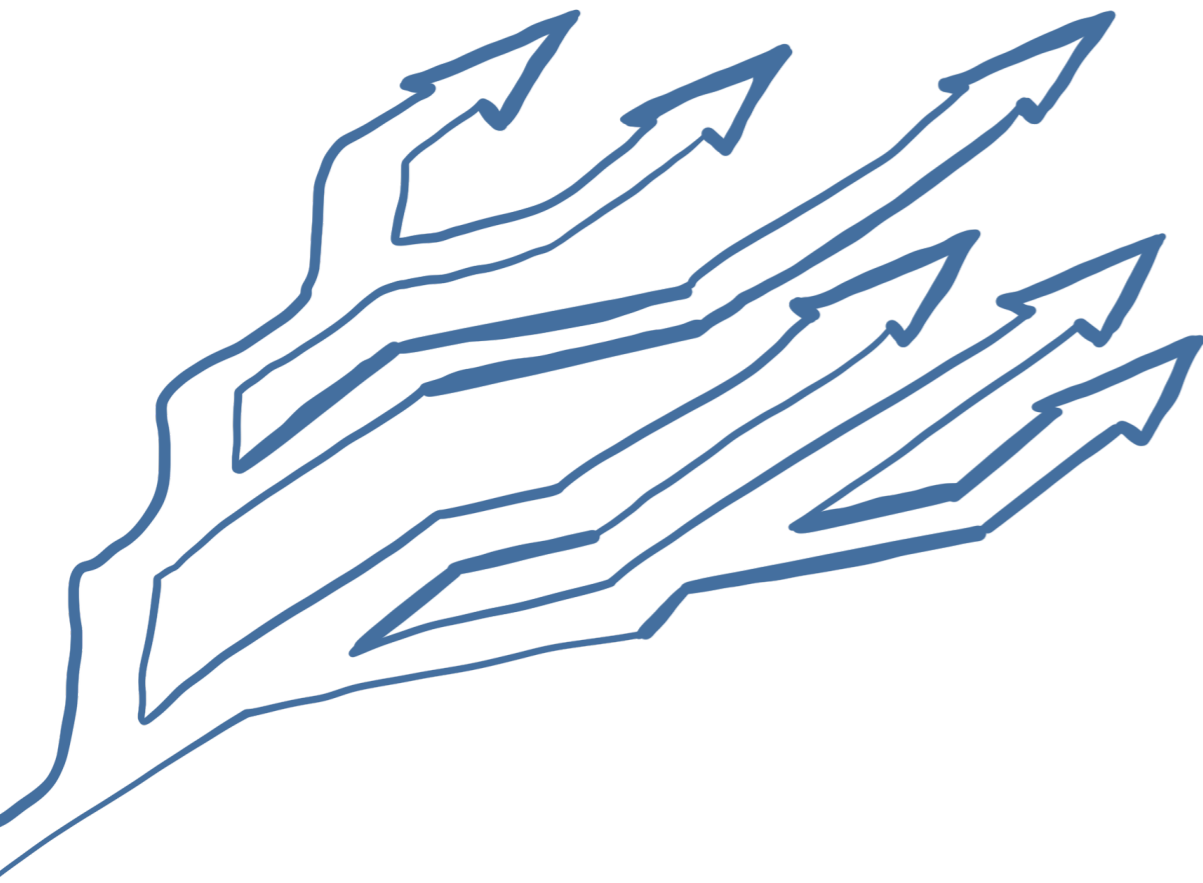
Design Methodology

The mindset of user-centered and co-design lays the basis for this thesis' methodological framework. Baxter, Courage and Caine (2015, p. 7) describes user-centered design simply as a "development approach that focuses on end users" with a particular emphasis on users and tasks, empirical measurements or product usage, and iterative design. The goal of user-centered design is to base the design process in an understanding of user needs and empathy of their issues. To gain this understanding we collected qualitative data as this provides "a rich description of participants' experiences" (ibid., p. 7) and allows for deeper empathy. However, our data was also quantified by using the content analysis software Nvivo to see how many times a certain word, phrase or theme was expressed.

In addition to our main methodological framework, this thesis utilized a co-design approach by giving stakeholders the opportunity to be "active participants in the design process" (Ku & Lupton, 2020, p. 24). Our stakeholders were (as described in the introduction chapter) highly involved collaborators throughout the project with the opportunity to be active participants through co-design based workshops and similar co-creative initiatives to ensure we solved the correct problems in ways our user groups would benefit from. To structure our process we took inspiration from the Double Diamond model and the evolved Framework for Innovation developed by the British Design Council (2015). Specifically, we followed the four Double Diamond phases and the now iconic diamond structure of divergent and convergent thinking. Divergent thinking is an extremely important step in creative processes as it allows one to "explore in multiple and diverse directions [...] from an initial problem or reference
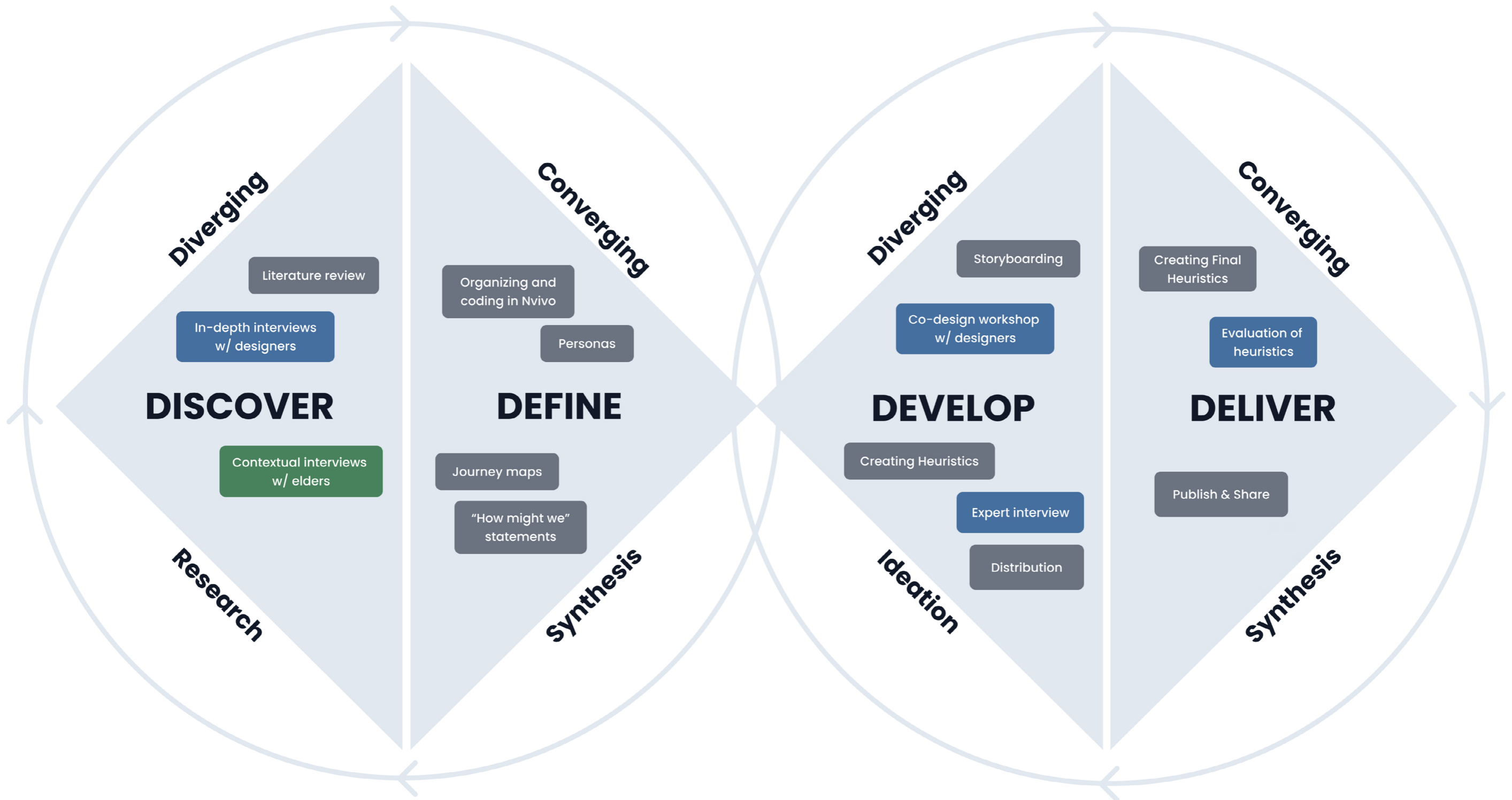
Figure 4: Design methodology visualization.

DISCOVER
- Diverging
- Research
- Literature review
- In-depth interviews w/ designers
- Contextual interviews w/ elders

DEFINE
- Converging
- Synthesis
- Organizing and coding in Nvivo
- Personas
- Journey maps
- "How might we" statements

DEVELOP
- Diverging
- Ideation
- Storyboarding
- Co-design workshop w/ designers
- Creating Heuristics
- Expert interview
- Distribution

DELIVER
- Converging
- Synthesis
- Creating Final Heuristics
- Evaluation of heuristics
- Publish & Share

Activities with primary user group, designers and innovators.

Activity with indirect end-users, elders and other vulnerable users.

Activites done internally, in light of user research.

point" (Lubart, 2016 in de Vries & Lubart, 2019, p. 147). It is an open, exploratory state where understanding and empathy is sought out. Convergent thinking is the contrasting process where one evaluates and hones in on which problem to solve and how to solve it (Vries & Lubart, 2019, p. 147). This phase is needed to arrive at a useful project scope and production. Together this cyclical pattern between divergent and convergent thinking forms creative processes (ibid.). As we were combining a variety of design methodology and involving different stakeholders at different times we found it important for both ourselves and the reader to visualize our process in an original illustration, as seen in figure 4.

As one is required to plan a master thesis thoroughly before starting the work, this project started out quite rigid, in the sense that each step and each activity was pre-planned and therefore not directly influenced by the knowledge gained in the previous step or activity. Despite this, it was important to us to work as flexibly and iteratively as possible, since this is key to truly working with a user-centered approach. To ensure this, we continuously asked ourselves critical questions on our goals for each activity, whether something was worth our time, and whether new activities needed to be added. For example, the plan to observe designer workshops with elders as participants was cut as this proved extremely time consuming to organize, and an expert interview was planned last minute as we saw we needed the insights that activity could give us. Due to the short timeframe we had for such a large project we had to make sure each activity we conducted had a relevant goal and would continue to pull the project in a relevant direction. By being open to change and constantly challenging ourselves and our assumptions we have been able to complete a more iterative project than this master thesis' structure might imply.

We will now be going into detail on each method we utilized to solve our problem statement and research questions. These will be presented within the phase they became relevant.

Discover

The discover-phase has an exploratory focus where gaining an understanding for one's user is key. This phase of divergent thinking is important to allow for deep understanding of a problem from many different angles. It was an extremely important phase to us as not only did these insights influence our continued internal process, they also ended up being directly available to our external primary user group as these insights formed the main body of information in our solution.
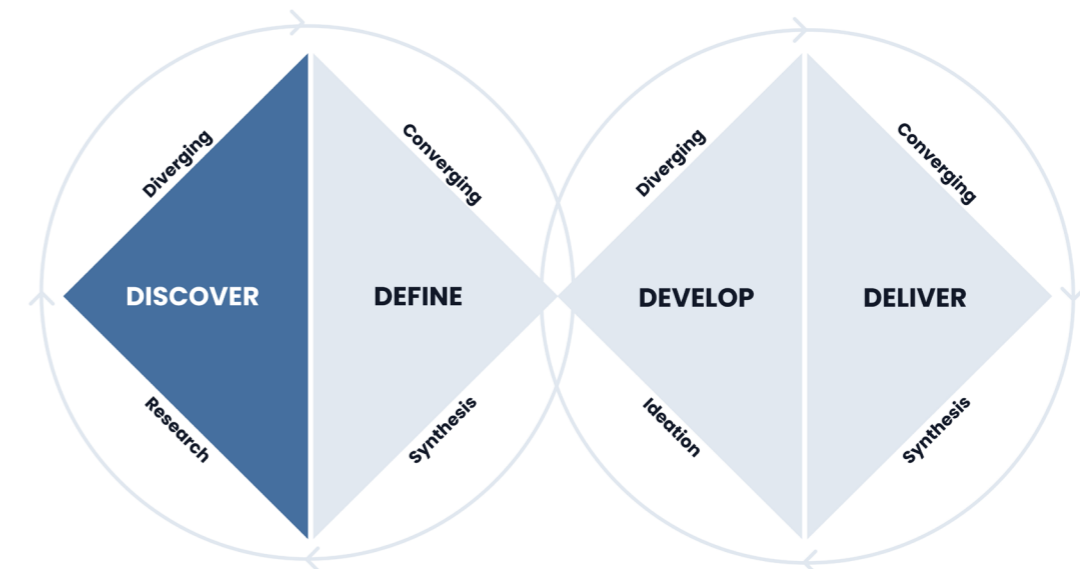
Literature Review
A literature review is in its widest definition a summarized collection of what research has been previously published within the field or topic of a chosen problem statement. To be able to successfully undergo any project, one needs to "understand the breadth and depth of the existing body of work and identify gaps to explore" (Xiao & Watson, 2017, p. 93), otherwise the project might turn out redundant in any number of ways.

There are a vast number of methodologies available when conducting a literature review (see Xiao & Watson, 2017 and Sovacool, Axsen & Sorrell, 2018). For this master thesis we conducted two descriptive, narrative literature reviews to "provide an account of the state of the

literature at the time of the review" (Xiao & Watson, 2017, p. 95). The first review aimed to explore previously developed design principles, guidelines and heuristics within the fields of User Interface Design, User Experience Design and Universal Design. It was conducted as a part of the course IMT4898 Specialisation in Interaction Design, Autumn 2021 and is a stand-alone piece from this thesis, but is summarized in our Introduction chapter under Context and Background. The second review was a more general overview of the interdisciplinary field this master thesis finds itself in and gave the authors a better understanding of the field they were entering. This review was not a separate piece and instead became the main body of our Introduction chapter.

Contextual Interviews and Participant Observation

Contextual interviews are conducted in a situational context, also known as in-situ interviews, where researchers can observe the participant and their surroundings. The participant can also point to elements of their environment (Stickdorn, Hormess, Lawrence & Schneider, 2018, p. 121). Participant observation allows for observation of situational contexts, including the interviewee's body language, mood and gestures. According to Stickdorn (et al, 2018, p. 120), participant observation should include asking participants to explain certain pains, gains, activities, behaviors and artifacts. However, participant observation does not only refer to what the participants are specifically doing, but also what they are not doing (Stickdorn et al, 2018, p. 120).

In total we observed and interviewed 7 elders. These elders were recruited largely by contacting and visiting senior centers in the Oslo region, in addition to snowball sampling (Stickdorn et al, 2018, p. 103), with the criteria being that they needed to be elders above retirement age with varying degrees of technical and digital understanding (for more on the participant criteria see appendix B, C and E). The interview was conducted as a contextual interview with observation of the participant's use of their own modern technology, if any, such as smartphones, tablets, laptops and smartwatches. During the observations we were particularly interested in their body language, in what

condition their devices were in, how easily they were able to navigate around their favorite digital services and products, how confident they seemed while using a device and if their interactions revealed any major challenges that they did not articulate. All these observations were collected by an observer while the interviewer completed and recorded the interview.

Once the data was collected we coded it in NVivo before taking it into further analysis. See more about the coding in the Define section.

In-depth Interviews

In-depth interviews are one of the most frequently used methods in user-centered design (Baxter, Caine & Courage, 2015, p. 220). Interviews are also a widely recognized qualitative research technique, and can be executed both as a solo-activity or in concurrence with other research activities. Such interviews help researchers learn more about particular experiences, processes, wants and needs (Stickdorn et al, 2018, p. 122) which are used for decision making further into the design process.

We conducted semi structured and in-depth individual interviews with a total of 13 designers and innovators who work with elders from both the public and private sectors. These were selected by contacting organizations in the public and private sector who openly work with design for elders and recruiting those who worked or have worked with developing digital services and products for elders (for more on the participant criteria see appendix A and F). The goal was to understand user needs, experiences, pain points and concerns, both for elders using technology and for designers working with elders. We used storytelling principles to allow interviewees to naturally discuss the relevant topics.

Once the data was collected we coded it in NVivo before taking it into further analysis. See more about the coding in the Define section.

Define

In the define-phase the insights gathered are analyzed and interpreted before the scope of the project gets narrowed down to the specific problems the project wishes to address. This first converging phase is key to be able to concretize and visualize the problem(s) you have discovered, establish the scope of the project by honing in on what you want/are able to solve and prepare for a new, narrower diverging phase. For us the project took a distinct turn within the Define phase as it became clear as we were analyzing our data and concretezing the problem that many of the presumptions and hypotheses we had begun this project with were false and that the project needed to mold to fit the new problems we had discovered.
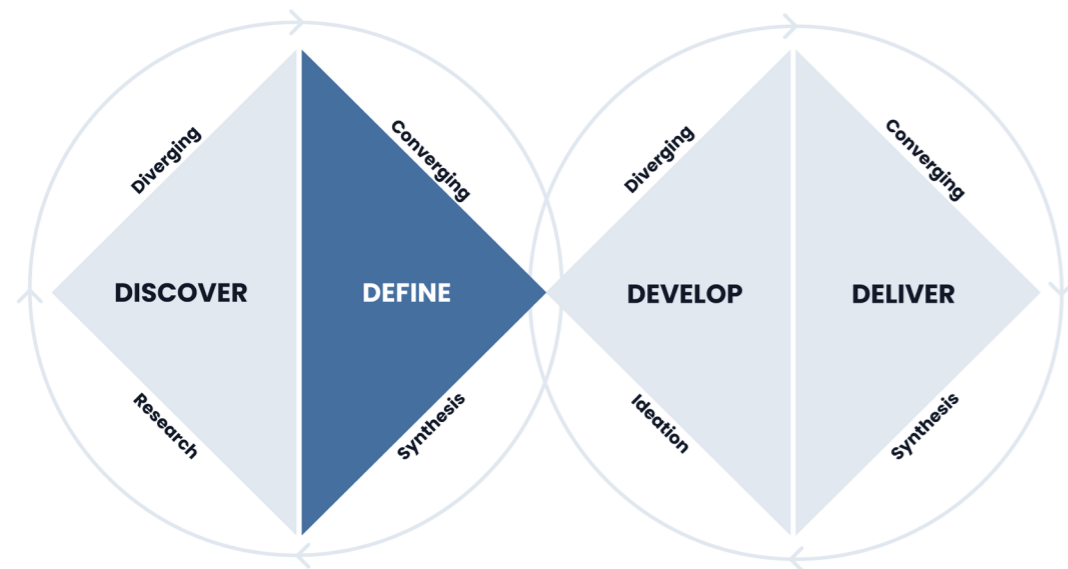
Nvivo

As mentioned above, we used the program Nvivo to organize the findings gained from our research. Nvivo is a software developed to aid researchers in organizing and coding their data into relevant categories. We imported all our interview files into Nvivo, read through each of them and coded relevant sentences and paragraphs into categories that explained the core theme that was being explored, for example "stress", "complicated content" and "independence". Once this was done for all interviews, we then created parent categories

that organized our codes, for example "elders needs", "design industry needs" and "elders challenges". This helped us gain a much better understanding of the common denominators in our research and what we had learned. Additionally, it allowed us to gain some quantitative data from our qualitative research, such as how many times the words "universal design" or similar had been mentioned.

Once our data was coded in Nvivo we further analyzed our data by summarizing them and pulling out key insights. Then we visualized these in personas, journey maps and more.

Personas

In order to focus on particular user motivations and behaviors, and to help achieve empathy with these users, we created 5 personas, 2 designer personas and 3 elderly personas. A persona is strictly a fictional individual created to describe a fictional user (Baxter et al, 2015, p. 41). Stickdorn (et al, 2018, p. 128) describes personas as " a rich description of a specific fictional person as an archetype exemplifying a group of people, such as a group of customers, users or employees". Creating personas is a way of attaining empathy with different user groups in order to create solutions that address real problems (Stickdorn et al, 2018, p. 128).

In addition to helping us focus on particular user motivations and behaviors for both our primary user group and our indirect end-users, these personas were able to help us establish common ground within the team and more easily communicate user needs to stakeholders in our co-design workshops, meetings and other interactions.

Journey Maps

"Journey maps help us understand a user's experience of a product, service or space over time" (Ku & Lupton, 2020, p. 92). They visualize specific experiences over time, often exemplified by a persona (Stickdorn et al, 2018, p. 129). According to Stickdorn (et al, 2018, p. 129), the basic structure of a journey map consists of steps and stages of the visualized experience, often defining the scale. Journey

mapping is a useful tool to find gaps in user experiences (Stickdorn et al, 2018, p. 144). We utilized journey mapping as a method for understanding the journey designers and innovators embark on when designing technology for elders. We also created a journey map of a typical elder, in order to map out pain points, needs, actions, emotions, and frustrations.

These journey maps helped us visualize more concretely the difference between the needs of the experienced and inexperienced designer and allowed us to begin exploring where in the user journey our solution would come into play. This also helped us begin discussing what format the guide should take and how we should distribute it.

"How Might We…?" Questions

How Might We questions "break down your challenges into a set of trigger questions" (Stickdorn et al, 2018, p. 333) that traditionally are used to twist those challenges into design opportunities. These questions are used to narrow down the project scope and come to agreement on what focus to take into the Develop phase. As our project had taken a sharp turn during the Define phase these questions were of special importance for us to be able to leave our old assumptions behind and begin with a fresh mindset. To create our HMW questions we did a brainstorming session in Miro were we first identified problems we had discovered, such as "designers have little knowledge of cognitive limitations in elders", and then reformulated them into design opportunities: "HMW help designers gain explicit knowledge on cognitive limitations and how to counteract these in their designs?". These questions became the base for the divergent ideation that took place in the Develop phase.

Develop

In the develop-phase a second ideation takes place where the goal is to explore potential solutions to the problem. This idea stage is for generating potential concepts to solve your defined problem and was a vital stage for us at it offered an opportunity to begin sketching out the ideas that had been floating in our heads throughout the define phase and gain new, valuable insights from designers and innovators through co-design based methods on the direction the project was headed.
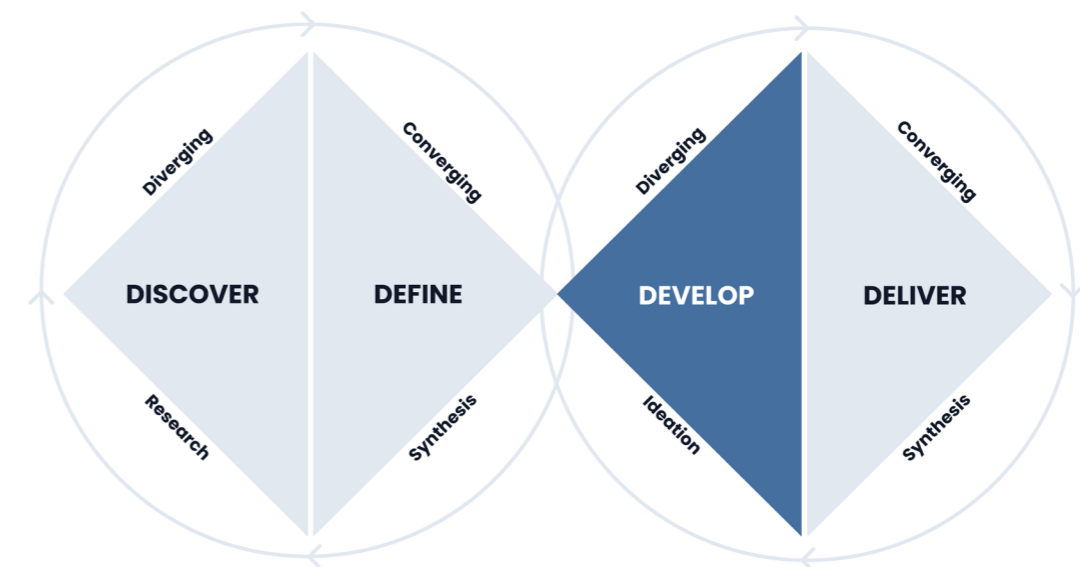
Storyboarding

A storyboard is a visual representation of an action told through "a series of images in chronological order" (Ku & Lupton, 2020, p. 80). "It is an extremely familiar piece of visual media that "people of all ages enjoy and understand" (ibid), and therefore it became a useful tool to show other people involved in the project how we imagined our solution would be utilized. At this stage we had begun imagining a guide that could give tips and tricks to both experienced and inexperienced designers, and these storyboards helped us explain the goals and current heading of the project to relevant stakeholders, for

example to participants of workshops. This mutual understanding was key during the Develop phase when co-design took center stage. Additionally, it was a good way for us to imagine the context in which our primary user group would be in when receiving and using the solution (an office or home-office), which helped us frame our ideation in the correct context.

First Iteration of Solution

Based on our insights we created at this stage a first draft of our heuristics. We had at this point settled that there was definitely a need for some sort of guide on designing for elders, and the main goal for this creation was primarily to reformat our insights from problems to a potential solution so that we were able to present something tangible in our co-design workshop and receive feedback. These heuristics were seen as a low-fi sketch to spark conversation and interest from our workshop participants, and not anything final.

Co-Design Workshop

To ensure that our stakeholders and users were active participants in the design process so that the solution came from the primary users and not the design team alone, we facilitated a co-design workshop. Co-design is a collaborative effort that actively seeks knowledge and ideas from users and stakeholders, as each participant has individual experiences and knowledge. This is ideal to utilize in a co-design workshop (Ku & Lupton, 2020, p. 34). According to Ku and Lupton (2020, p. 58) workshops provide a safe space for a wide range of stakeholders and users to become active participants in talking about a problem and innovate new solutions. We invited a few designers and innovators who had previously been involved with the project through interviews and the goal was to assess the first iteration of our guide by collectively sharing knowledge and experiences, in addition to discussing how best to distribute the finished product to the industry. The workshop was held remotely through Teams and Miro and included presentations and discussions of our key insights, the sketched heuristics and potential formatting and distribution. This helped us develop our solution by allowing us to discuss our ideas in a

larger context and gave us a very clear sense of where and how we should move forward.

Expert Interview

To gain a deeper understanding of the cognitive challenges elders may experience we at this stage conducted an expert interview with Oddbjørn Hove, a specialist and researcher in clinical psychology. The goal was to validate our insights, assess the first iteration of our heuristics and gain further information that we could utilize to create our guide. This helped us develop our solution as he was able to validate our own insights on cognitive limitations in elders and help us gain a better understanding of cognitive challenges in general.

Deliver

In the deliver-phase the explored solutions are narrowed down, prototyped and tested before either being implemented or rejected. This finalization stage implements the ideation and modeling done in the Develop phase and synthesizes into a final prototype and delivery (Zhang, Zhang, Zhang, Zhu, Hu, 2019, p. 4). Here it was important for us to gather all the threads of the previous phases and focus on creating a solution that answered both our problem statement and How Might We questions.
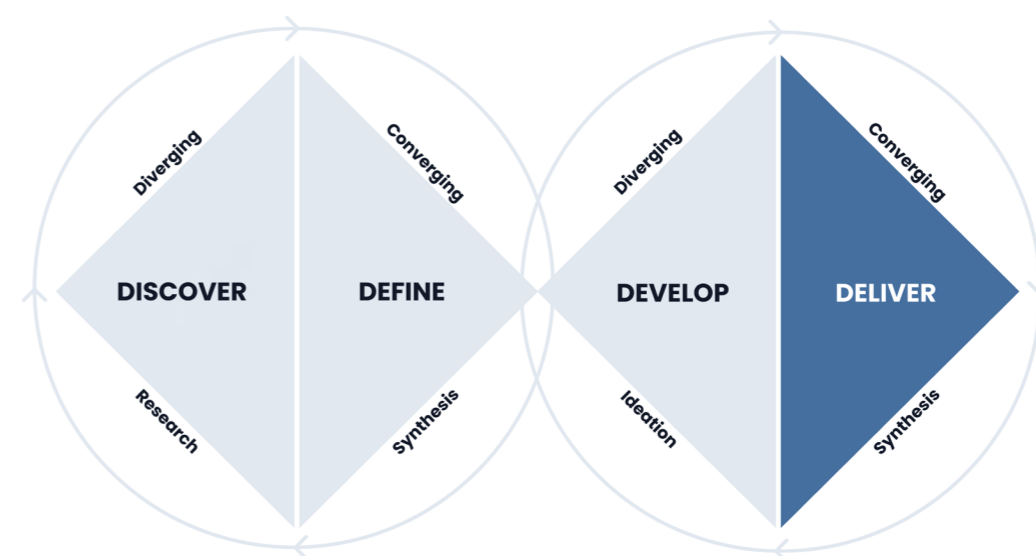
Second and Third Iteration of Solution

Iteration is hugely important in design and a good designer knows that a well-formed, meaningful product only arises after several iterations. To iterate is defined as "to say or do again or again and again" (Merriam Webster, 2022), and within design this often occurs when new knowledge or feedback has been received.

For us it was important to do an iteration of the solution that took into consideration the additional insights and feedback received after our workshop and expert interview. Here we realized the solution as a full website in Wix. A last iteration was done after we received feedback from a select few designers and innovators who had not previously been involved with the project to allow for fresh eyes. In this iteration the main focus was content and writing design, in addition to honing the message we wanted our users to be left with.

Final Evaluation of Solution by Users

In our last iteration we conducted a final evaluation of our guide. We published our guide as a functioning website in may 2022 and distributed it to the Norwegian design community through the slack channel UX Norge which at the time of writing has approximately 3000 members. They were asked to provide feedback on the usefulness of the guide and project as a whole by either direct messaging us on Slack or by using the built-in feedback questionnaire on Wix.

The site received 200 views and much useful feedback which helped us formulate future improvements and next steps. This feedback will be discussed in the Results chapter.

Progress Plan

To ensure we were able to complete our project on time we created a progress plan to follow throughout the semester. This timeline naturally changed and developed during the project, but was a useful baseline to keep on track.

Figure 5: Progress plan visualization.

Research Ethics

When doing research it is important to address the ethical concerns that may occur, especially when involving human participants. This was highly important for this project in particular, as it aims to include vulnerable users (elders).

All participation in this project was voluntary and not binding, meaning a participant could always withdraw an answer, or withdraw from the project completely without consequence. We always explained why we wanted to collect the data we were planning to collect and what the data would be used for. All participants also had to accept our terms and conditions as mentioned in our consent form either verbally or in writing. The data collected was anonymised before being presented to any outside stakeholders and was deleted completely when the thesis was delivered. Additionally, the project created a Data Management Plan (DMP) in line with the Norwegian Centre for Research Data that ensures "good and safe handling of data throughout the research process" (NSD, 2021). Together these steps protected our participants from ethical complications.

Conclusion of Methods Chapter

In this chapter we have described the methodology we used to address our problem statement and research questions. We have shown that we followed a user-centered and double-diamond based design methodology combined with a co-design approach. Additionally, we laid out which methods we used within each phase of the double diamond and addressed ethical concerns.

3
Results

Results

In this chapter the main body of work done for this master thesis will be presented. First we will present all the findings and key insights from our interviews and observations, then we will analyze our key insights and discuss how they re-defined our original problem statement, before finally detailing how we created a solution for this re-defined problem through continued research and iteration.

Part 1: Understanding the Problem

In this part we will present all findings gathered in our Discover phase. We have chosen to present these findings as detailed as possible, not only for the benefit of the thesis itself, but also for the benefit of those readers interested in gaining a deeper understanding of elders. An overview of all findings can be found in figure 6.

First, we will present all our findings in detail with visualizations. Each finding corresponds with the categories coded in Nvivo, with each heading representing a main category and each highlighted word within the text representing a subcategory. The visualizations also show this relationship. Those categories that are circled within the visualizations are enhanced as these were the categories mentioned most often. The categories were created by us when organizing our data in Nvivo. Quotes from elders and designers alike will be included to anchor all findings back to the source.

It is important to note here that we to an extent trusted our users to self-report their own behavior and struggles, which is not always the most accurate representation. Users will always to an extent be unreliable when reporting on their own behavior, and we needed to keep that in mind throughout the process. Designers may speak of their team as being highly efficient and well versed in universal design methods when that might not actually be the case. Elders may say they have little to no problems navigating online, but still need help from family and friends to complete daily tasks. We have tried to counteract

this bias through observation and analysis. Especially when interviewing elders we gained much insight through observation and analysis as we could see them struggle to complete tasks when they wanted to show us something, or spent a lot more time than expected to succeed.

Additionally, having interviewed designers who work with elders, we are able to use their own observations and experiences with elders to validate and expand our own understanding. Designers who work with elders have observed huge numbers of elders themselves and possess dense and deep insight on this user group. This is why the insights gained from elders and the insights gained from designers are presented together and not separated in this chapter; they compliment and inform each other.

Once all findings have been presented we will summarize our key insights, here defined as the findings that are of special note and importance to the continuation of the design process. Further discussion of these findings and key insights can be found in the discussion chapter.

About Elders

Elders Challenges	Elders Needs	Elders Feelings	Groups of Digital Elders	Elders Knowledge
Information Overload	Analog Alternatives	Downgraded	Digitally Competent	Unwillingness to learn
Complicated Content	Independence	Frustrates	Large User Group	Natural Interest
General Challenges	Reassurance	Dedicated	Digitally Lacking	Social Media
Navigating	Needs Help	Uncertain	Self-definition	Security
Limitations	Language	Sceptical	Young vs Old	Devices
Cognitive	Structure	Isolated	Non-digital	
Physical	Control	Stupid	Future	
Reading	Visuals	Stress		
Old Age	Time	Fear		
Teams	Safe			
Focus				

About Designers & Innovators

Design Industry Needs	Designers & Innovators	Insight
Make Adjustments	Empathy	Unrepresentative
Universal Design	Wants	User-testing
Inclusive Design	Pains	Interviews
Design For All	Does	
User Friendly	Says	
Awareness	Feel	

Figure 6: Overview of all findings from interviews and observations.

Presentation of Findings

Defining the Digital Elders

The "Defining the Digital Elders" category represents all interview conversations on how one might define elders within groups and how this group differs from other groups such as the youths or similar.

There is a large variety of **digital competency** between elderly users today. While many are completely **non-digital**, an equal number are also very **digitally competent**. The vast majority of elders are placed somewhere in the middle and can be defined as **digitally lacking** in competence in various ways.

Many designers **compared elders to young people** and discussed the contrast between how these two groups grew up with, and now use, technology, especially in relation to cognitive and physical limitations. However, whether future elders will be more digitally competent or equally digitally lacking as those today due to a rapid development of technology and continued physical and cognitive limitations is not clear.

However, it is difficult to speak of elders as one group, as the definition of elders as those over 65 creates a vast and **diverse group** that does not necessarily have commonality in anything but their age. Even physical and cognitive limitations emerge at different ages for different people and manifest in different ways. Additionally, elders do not **self-define** as elderly and feel young even after retirement. Some might even get offended when others define them within the "elder" category.
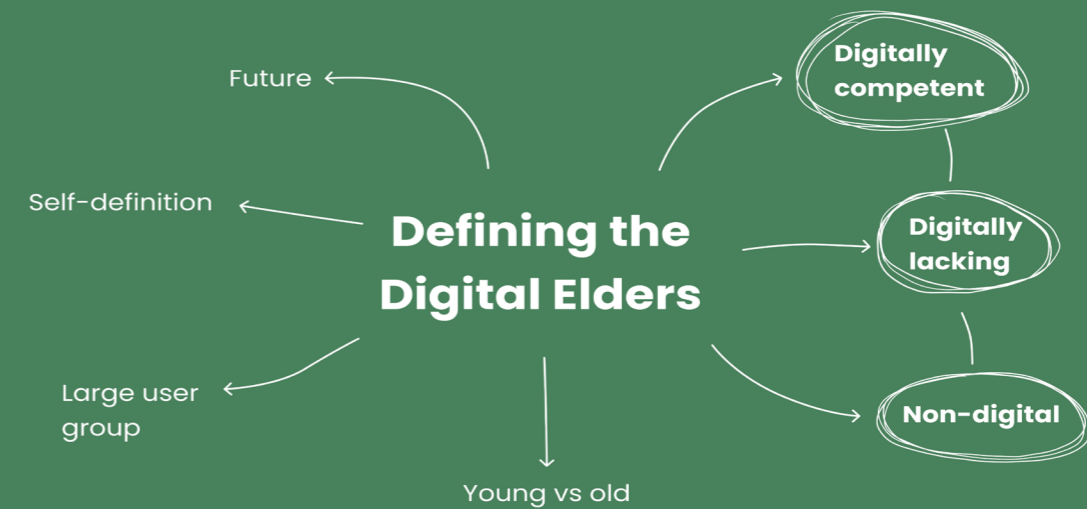
"There are elders who are digital outsiders, but the vast majority are digital in some way. It ranges from being able to use a mobile phone to being very digital. Being digital isn't a thing, it's a scale." — Designer

"I would say that around 60% of those who live around me are not that good with digital things." — Elder

"As a young person, you grew up with a computer, you're good at searching for answers yourself. While the elderly are mostly used to human contact, either physically or by phone. They have not had to search for everything themselves."
— Designer

"Elders are just as different as everyone else. Perhaps age is becoming a less important parameter. There are perhaps bigger differences between those who are 60 vs those who are 14. A 60 year old can have good physique or be wheelchair dependent." — Designer

"Those in their 60's do not necessarily define themselves as elders, as it can be a bit bitter. We sent a message to those over 60 and there were some who responded negatively. Felt age vs actual age is a bit touchy for some elders. Elders as a group are as complex as everyone else."
— Designer

Elders Feelings

The "Elders Feelings" category represents all interview conversations on how elders feel in the context of digital services and technology.

Most elders feel a lot of **frustration** when they meet challenges as they interact with digital services and technology. They often jump to the conclusion that they are **stupid** when they misinterpret or misunderstand things online. Very few criticize the design, and rather criticize themselves.

Some elders feel unjustifiably **frightened** when interacting with digital services, due to a lack of digital knowledge. They are especially afraid to make irreversible mistakes that can have huge consequences for themselves or other individuals and are unable to separate between plausible consequences, such as sending money to the wrong bank account, and implausible consequences, like giving away all their savings by clicking the wrong button. Some are also afraid to learn about technology in general because they feel like there is too much to learn and understand. They fear that their skill level is worse than others of similar age or experience. Additionally, most elders are aware of potentially dangerous interactions online, like scam or fishing, which results in an unwarranted **skepticism** for all interactions with digital services and products which is frequently present in the wrong contexts.

Due to a lack of digital knowledge and physical and cognitive limitations, many elders feel **stressed** when faced with tasks and/or information more complex than they are used to. Especially when navigating and making choices, elders often hesitate and feel **uncertain** in their choices both before and after making them.

In general, elders feel a pressure to use technology as the world becomes more and more digital to avoid becoming **isolated** from the rest of society. They express that they struggle to keep up with the technology they meet and worry they will become irrelevant if they do not learn how to use it. Despite this, elders are perceived as a **dedicated** user group who are very willing to participate and take part in design activities. They are a highly committed group who want to contribute and feel seen.

"When my friend had to complete a form, she misunderstood the questions and thought: Am I so stupid that I do not understand these questions or can I answer however I want?" — Elder

"I see how angry my friends get with certain apps. I understand that they have to update and change them, but every time there is an update, there is also a new challenge for elders. When we have learned the system, it changes again and we cannot keep up." — Elder

"Many are so afraid of making mistakes, that they simply have not even tried." — Designer

"Some have the fear of doing something irreparably wrong: "I'm too stupid, I can not do this, I'm forced to do something wrong. I also do not know how to fix it." They do not know what can go wrong and how and do not know how to fix it." — Designer

"There are many ways to be scammed. Text messages and everything all the time, even people who call. They quickly find out who is over 50 or 60. And it's so rude. Threats and stuff, they use intimidation techniques. But they have tried many times, so now they must soon understand that I cannot be tricked." — Elder

"They are uncertain in the digital world in the first place, so they get easily stressed when they have to fill something out." — Designerv

"Technology has come to stay, but you can become very isolated by technology." — Elder

"I will keep up to date, even when I retire. You have to keep up all the time or you will quickly fall behind." — Elder

Elders Knowledge

The "Elders Knowledge" category represents all interview conversations on how and why elders gain or do not gain digital competency.

When talking with elders we found that those elders who had gained a **natural interest** in technology through for example previous work experience or other exposure had a vaster knowledge of digital services and products than those without any natural interest. Other elders without this interest were more **unwilling to learn** and take on the task of becoming digitally competent as they felt they were too old for it and did not have the energy to embark on what they saw as a huge task.

In terms of where elders gain their digital competency and knowledge from, they primarily use **mobile** to complete tasks with desktop being used least and tablet used some. However, it is important to note that when elders say their most used technology is their mobile they do not necessarily mean a smartphone, so when specifically interacting with digital services and products many will likely be on a tablet. The motivation to use **social media** was mostly to keep in contact with friends and family. Primarily they used Facebook and Messenger.

Finally, it was found that elders' lack of digital knowledge can create **security issues** as they often need help to complete tasks such as paying invoices or similar that require them to give up personal information like social security numbers or Bank-ID to other individuals that should not be privy to this information. As these individuals are usually friends or family, not all elders express concerns about this when discussing it, but several of the designers we spoke to mentioned this as a big issue to be solved.
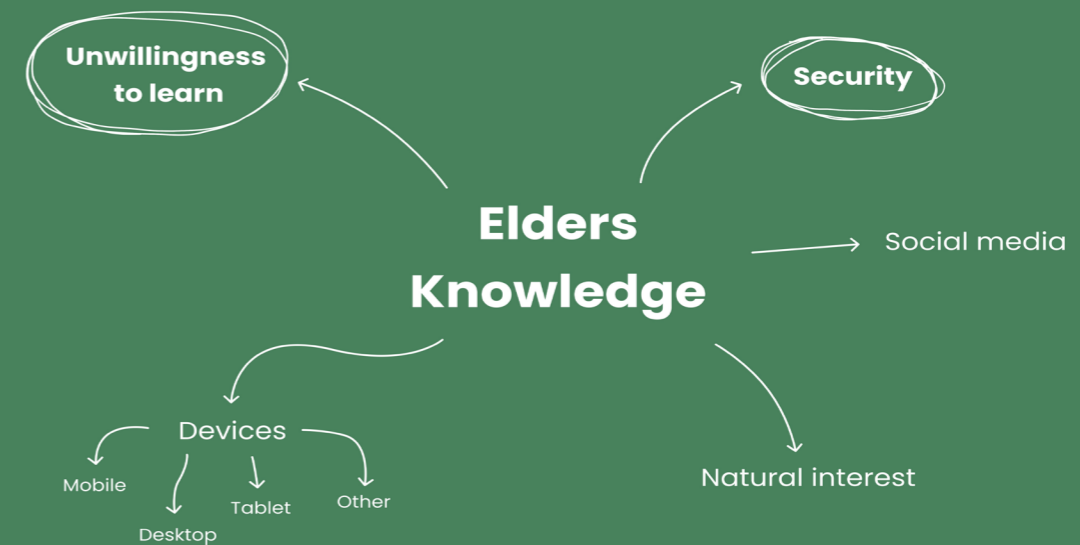
"I have talked to some elders who say the same thing, they are too old for it."
— Designer

"They have to see a value in staying up to date and see that the digital medium can be important in doing so. Generally have a curiosity and interest in finding information digitally." — Designer

"It's so easy to become an outsider. Elders may be used to going to the bank to pay bills and when all those things go digital, you'll shut these people out and raise the barrier for them to do the same as everyone else." — Designer

"The apps I use often, I find very easy to use. But I had learned how to use them. It's very nice to use both the iPad and the iPhone, but I do not sit with them all the time. On the subway and stuff like that, I usually have a magazine with me to read instead." — Elder

"There are many rules elders may not be aware of. It is not allowed to let other people use your password or Bank-ID. Many people do it anyway because they have no alternatives." — Designer

Elders Needs

The "Elders Needs" category represents all interview conversations on what needs elders have in the context of digital services and products and the digital age.

Elders, like many others, desire **independence** and do not want to feel like a nuisance to the people around them. Especially in relation to personal economics, elders struggle to complete the tasks required and are forced to include family or friends in their personal business. This, in addition to negative feelings such as fear, results in elders having a desire for **control** when using digital services and products, which several designers also mention by discussing how elders need clear actions with easily understandable consequences. Additionally, elders need to feel safe when interacting with digital services and products in order to confidently complete their desired task. When in doubt, some elders ask for **help** to purposefully push the potential mistake and blame onto someone else as a way of safeguarding themselves.

When interacting with digital services and products, elders are in need of a simplified **structure** of content and information. Almost all designers that were interviewed mentioned that how information is presented on the page and throughout a sequence is crucial to facilitating understanding. However, this is challenging as designers mention both that one needs to structure information on few pages, and that the pages cannot be overflowing with content. Finding the balance here is something several designers mention as a challenge.

The information must have clear, simple and understandable **language** in order to make complicated content comprehensible. Short sentences, informative headings, bulleted lists and an everyday vernacular are elements that often are repeated as a solution. They also need **clear visual language** that does not require any prior knowledge. Several designers noted here that what constituted as clear visual language to designers who have visual language literacy and elders who do not have this literacy is vastly different. The fact that three short lines above each other clearly indicates a hamburger menu
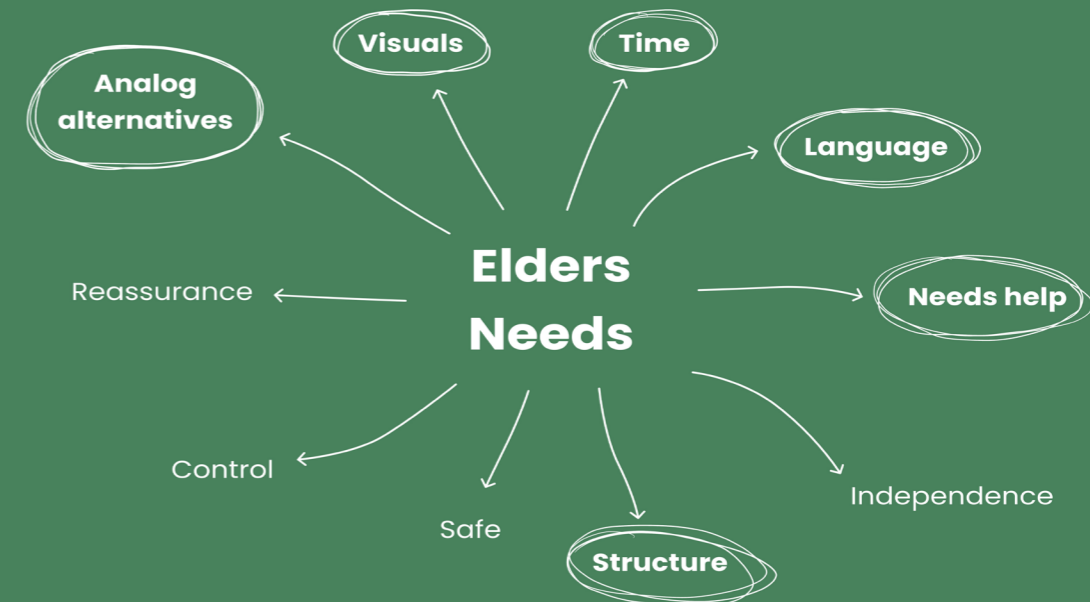
"This is about being independent when dealing with your own finances. Paying your own bills, knowing what you have in your account. That you do not have to depend on others. Many received help in more or less good ways." — Designer

"There is a lot to think about when it comes to cognitive load. You have to divide content into several sequences, but too many sequences are also tiring. It's hard to do very well, almost more difficult than contrast and stuff like that because those you can check. That is one of the most difficult things we do." — Designer

"You cannot build on previous patterns of how people have used the internet, because people who are digitally competent instinctively know what a hamburger menu is, what 'back' means, where we find links, but for people who have not been there it is not as intuitive. We designers have been very good at leaning on such tools." — Designer

"Despite universal design requirements, there is frequent use of icons which are very inexpressive. Googles' icon set for example has hundreds of icons that even I do not instinctively know what mean. When you have menus inside menus it gets painful." — Designer

"The cognitive challenges can arrive when you get older, even if you have been digitally competent your whole life, suddenly you are not. The idea that everyone will become digitally competent eventually is completely utopian." — Designer

"The problem is that human contact is gone, I think. The contact between those who sit in the district and us elders. Because the next time you call, a new voice answers. That gets so cumbersome." — Elder

"Time is a thing with the elderly, as they are stressed by the quick pace of digital services today." — Designer

to a designer does not mean it is clear for an elder. Due to physical limitations such as reduced sight and motor skills, the visual elements also need to be bigger, while cognitive challenges such as decreased processing speed and problem solving, mean that elders need more **time** to absorb, process and interact to avoid getting stressed. This is especially true with digitally lacking elders.

While certain elders are digitally competent, there are a large group of elders that are digitally lacking and non-digital who require human contact and **analog alternatives.** Most designers who work with elders discussed how we as designers need to be aware that digital interfaces aren't necessarily a solution for all elders, and some designers were adamant that this obstruction to digitalization would not go away as the older generations leave us. Rather, digitally lacking elders will be a continuous problem for designers in some capacity as each new generation will struggle to keep up with innovation and be affected by the physical and cognitive decline associated with healthy aging. Many elders also express sadness when discussing the digitalization our society is currently undergoing, especially with how human contact is becoming less and less normal in customer-service relations. When stuck doing a digital task, elders are in **need of help** and often rely on family and friends to get the help they require, but many would rather get help from the service they are interacting with through a chat, phone number or face-to-face interactions.

When involved in the design process, elders require extra effort as they need a lot of **reassurance** from the design team to feel comfortable and able to help. However, once this comfort is achieved, elders are very willing to help and grateful that service providers take them and their needs seriously.

Elders Challenges

The "Elders Challenges" category represents all interview conversations on challenges elders experience, both in general and in connection to digital services and products.

Due to old age, most elders struggle **cognitively** as well as **physically**. This means that they use more time, struggle to focus and have issues navigating. Designers discuss and describe these cognitive challenges often, but the vast majority do not identify them as cognitive. Due to these cognitive challenges, elders experience **information overload** more frequently than other user groups. They find it difficult to comprehend **complicated content** online and struggle with prolonged **focus**. Many designers are aware of this, but struggle to avoid information overload while still trying to keep the elders' focus and give enough information to make the content understandable. Some designers express uncertainty when it comes to how cognitive issues affect elders' use of their services and products. For example, designers are uncertain of elders' level of **reading** comprehension, as some elders diligently read all text without understanding, while others only read some text and appear to understand more.

Due to old age, most elders also struggle **physically**. This means that they struggle with sight, hearing, touch and fine motor skills. Designers discuss physical challenges with more knowledge and awareness than cognitive challenges, and seem more able to take these into consideration when designing, through for example increased contrast ratios and similar.

Navigation is a huge challenge for elders and designers alike, and is mentioned in almost all our interviews. Elders struggle to navigate back and forth between pages and tabs and in general understand established navigational language. Designers struggle to know what navigational language elders understand and what they cannot rely on. Some elders do not understand that they can **scroll** up, down or sideways when navigating digital services and products. Others prefer this method compared to navigating back and forth within a hierarchy of pages to receive information. Designers who work with elders have

"The elderly spent a lot of time evaluating the nuances of our answer options, something they did not need to do at all. So we have tried to remove things that can create confusion." — Designer

"The information out there is so general, so the more concrete the better. Reading speed, reading comprehension. What is the decline curve like? And what does that really mean for GUI and structuring of content?" — Designer

"The contrast ratios should be within the regulations, it should be good for the blind or elderly with poor eyesight, they should be able to use web reading and such." — Designer

"I have to keep a little to the left to press the right key. If I press straight on, I hit it on the right, so I always have to think ahead." — Elder

"Before the menu was on the left side, and you also had a main page with a summary. But then the users were most concerned with the main page and did not notice the menu. Now there is only a menu." — Designer

"Things that seem obvious are not. Even when just scrolling on a website, we have to guide a little more than we usually do. We need to create several alternative ways to do something on the same screen." — Designer

"The biggest consideration is that we can take very little for granted. In projects with other target groups, you lean on principles, UI design that has already been tested and verified, but when you design for elders, you cannot lean on it anymore." — Designer

"But there was someone who said to me: "I spend all my energy on living. I do not have the energy to learn this digital things. I live on an energy minimum and it's just a matter of surviving". He was a very old man". — Designer

found that large parts of the elderly user group today are not well versed digital users, which places **limitations** on what designers can do when innovating for elders. It is argued that because technology evolves so fast, elders struggle to keep up to date.

Some designers find designing for elders **more challenging** than designing for other user groups. The challenges designers experience are often similar to those they always experience, but in higher frequency and difficulty. For example, many designers experience issues when facilitating digital user tests with elders on **Teams**. Especially the need to use many different services in conjunction, like using Figma, Teams and email simultaneously, is extremely confusing and difficult for elders. The challenges elders experience are also vastly different to others within the same group, making it hard to pinpoint what to focus on.

In general, **old age** is a challenge in itself and daily tasks require more energy than before. Additionally, old age comes with certain stereo-types and judgements in our society which makes elders more or less willing to see themselves as elders.

Insight

The "Insight" category represents all discussion on how insight is gathered and used in the design process.

Naturally, the vast majority of designers mention insight gathering as a hugely important step to design well for elders. Many elders enjoy human contact and interaction, making **interviews** an ideal setting for gathering insights. However, digital and in-office interviews may be too intimidating for some. **User-testing** is paramount when designing for vulnerable user groups, however remote testing through applications like Teams and Figma is very challenging and stressful for elders. No matter the situation, elders require more guidance to understand the narrative they are presented with and associated tasks.

One of the biggest drawbacks to insight gathering with elders is that it is difficult, if not impossible, to reach the most vulnerable users in our society, including the least digital elders. Some designers and innovators therefore highlight the importance of recognising that their insight is **unrepresentative.**

Interviews ←

→ User-testing

Insight

↓

Unrepresentative
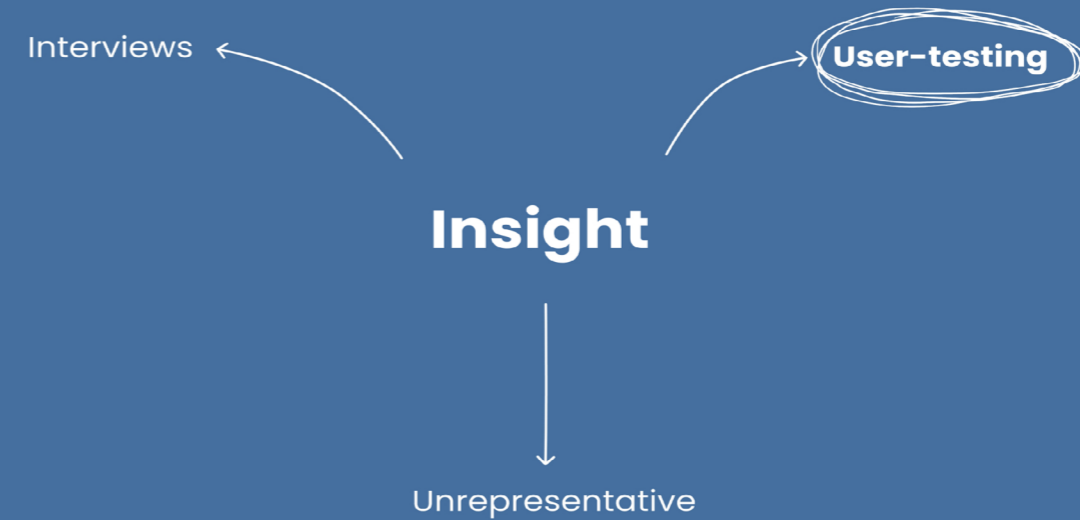
"User-testing the elders where they have to share their screen on teams and such is very difficult. With remote user testing people get stressed, and they feel stupid. It is difficult to be in a user test situation, so it is often enough for them to view our screen and comment." — Designer

"Those we have met and user-tested with are probably very committed, because we have been in contact with those who are in senior councils and such. Those who are perhaps more resourceful than the elders we actually wanted to test on. It is a challenge to get hold of users who struggle more than the resourceful ones we have tested on, but how do you get hold of the ones who struggle? But it is a challenge in general, but definitely something you feel. That we have not tested the entire range of the target group." — Designer

Design Industry Needs

The "Design Industry Needs" category represents all interview conversations on what the design industry is currently focusing on when it comes to elders, and what needs to change or improve.

Universal design is the most frequent topic of conversation in the designer interviews. After universal design became national regulations, this area has received increased focus in the industry. However, any inclusive adjustments beyond the scope of the national regulations is rarely mentioned. For example, **inclusive design** is referenced only once by one designer. In contrast, universal design and its national regulations is a topic of conversation in all designer interviews, and referenced exactly 50 times.

Additionally, the focus on usability and **user friendly** services and products is high in the designer interviews. Most designers believe that by designing with elders and their needs in mind, you will **design for all** and create digital services and products that ease all user experiences. Being more precise and clear in the design will benefit everyone. Some designers however, argue that making good digital products is about accommodating all user groups, and that the way forward is not to design specifically for the elderly, but rather to design with all potential user groups in mind.

Designers who work with elders desire a heightened **awareness** on design for elders and universal design within the industry and society in general, as they know that the design industry must **make adjustments** to accommodate elder needs and limitations in future.
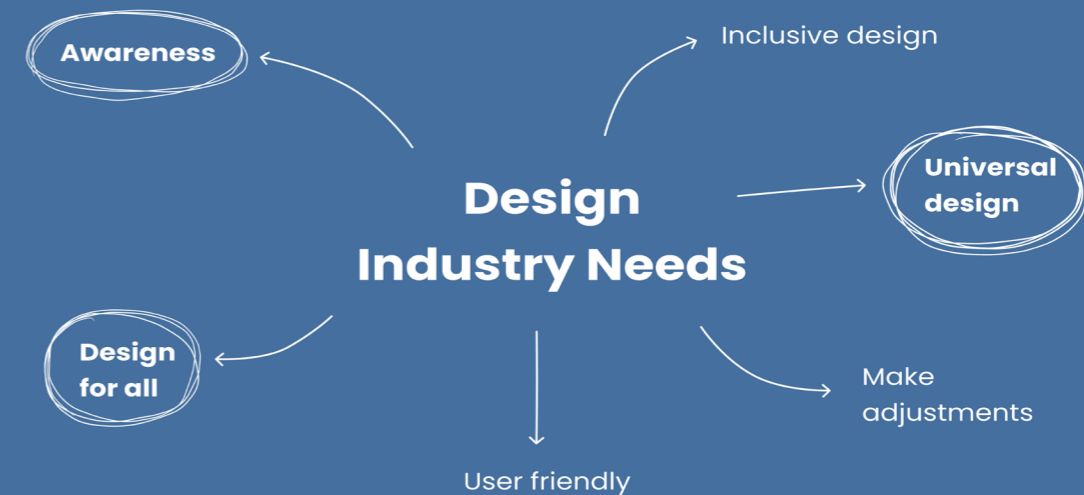
"We have probably not thought specifically about the elderly other than that which is embedded in universal design." — Designer

"We work a lot with universal design in our company, and I assume that there are principles and guidelines there [that will benefit elders]." — Designer

"Universal design is a legal requirement that I as a designer have to comply with regardless of the service I'm working on. No matter if I'm working with a larger company or a startup, universal design is something I have to keep in mind. But when we work with the elderly, it is even more important that you not only meet the requirements but that you go the extra mile." — Designer

If you design with universal design in mind, you hit many checkpoints [that will benefit elders]. — Designer

"I try hard to look at designing for elders as the same as designing for anyone. The way forward is not to design for elders, but rather to design for everyone." — Designer

"If it is elderly-friendly, it is friendly to many other user groups as well, which you may not be able to see as clearly." — Designer

"There is a high awareness in the team that this user group is in more need of help than a 'normal' user group." — Designer

Designers and Innovators

The "Designers and Innovators" category represents all interview conversations on what designers do, feel, say, and want, in addition to pain points they might have.

When discussing their work, designers describe themselves as such:

- **DOES:** Designers today have a high focus on investigation and insights, resulting in frequent user involvement. They are especially pleased when they get to involve users from the beginning of the project. However, different obstacles such as corona and/or time restrictions have made this difficult.
- **FEEL:** Designers feel a responsibility when designing for the elderly generation, as they have more limitations that challenge their ability to be independent and push them towards isolation.
- **SAYS:** Designers who work with elders say they have a high awareness in their teams that elders are in need of more accommodation than other user groups, however they are aware that both their own team and other design teams have a lot of potential for improvement.

Additionally, designers **want** extended knowledge on elders and explicit recommendations that are as specific as possible to their needs and requirements. A frustrating **pain** point that is often mentioned is that the motivation for universal design is often linked to laws and regulations rather than a genuine wish to improve a digital service or product for specific user groups. In addition, there are no general usability guidelines for cognitive limitations and it is difficult to user test with elders remotely, making it challenging to know how to make a difference and adhere to elders needs.

In general, designers who design for vulnerable users and elderly users are highly focused on **empathy** towards their user group. They are aware that the work they do can have a huge impact on the daily lives of the elderly generation, and that the challenges they discover stretch beyond the specific service or product they're working on. Rather, it is a larger societal problem that cannot be solved completely until society begins to value elders as much as any other age group.
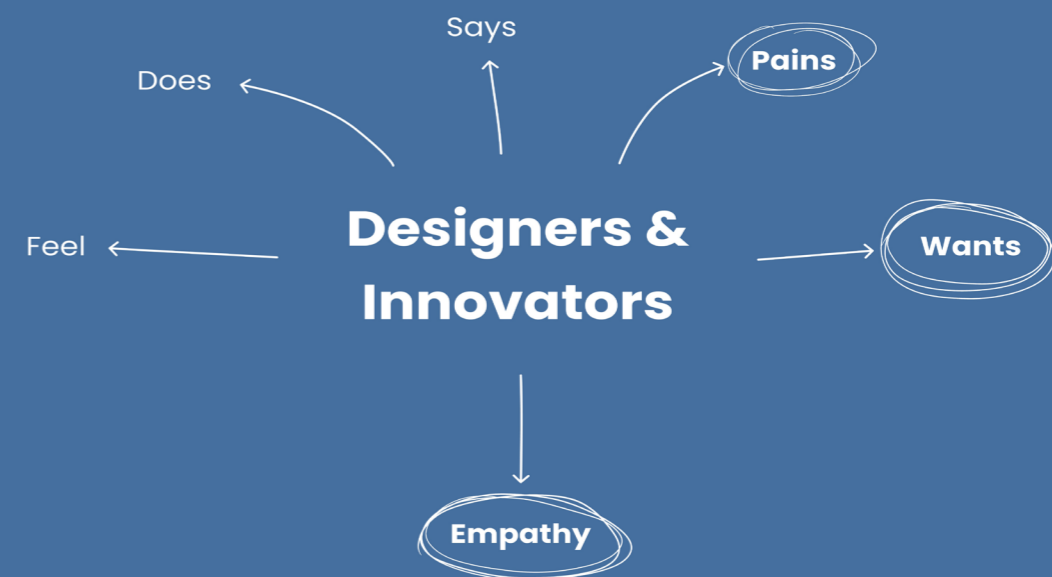
"More factual knowledge. Knowledge of cognition and the elderly, I think I would have benefited greatly from." — Designer

"Textbooks and such are too general, so the more concrete factual knowledge about elders and cognition is useful." — Designer

"We wish to work with UU [universell utforming] to benefit everyone, not to avoid fines." — Designer

"It's important to have an understanding that not everyone is equal. Different needs for different people. Both physically and mentally. Some may have difficulty touching a screen, while others have difficulty seeing, understanding or remembering." — Designer

"We say that everyone is equally worthy, but we as a society do not actually mean that. As long as our entire society thinks that getting old is tedious, no one wants to be." — Designer

"There is a lot of life wisdom in talking to the elders." — Designer

Summary of Findings and Key Insights

As with any project, even though all findings can be defined as interesting, they are not equally relevant to our problem statement and research questions. We therefore separate between our findings, all knowledge gained throughout the Discover phase, and our key insights, those insights which are relevant to our further work. These key insights are selected based on which topics were most frequently discussed, in addition to which topics we deemed most relevant to this thesis.

Elders

Digital Competency

There is a large variety of digital competency between elders. The vast majority can be defined as digitally lacking, while some are digitally competent and others completely non-digital. These differences are visualized in the personas seen in figure 7, 8 and 9.

Feelings and Frustrations

Most elders feel a lot of frustration when they meet challenges as they interact with digital services and products. They get stressed, uncertain and intimidated. These feelings and frustrations are exemplified in Sigrid's journey map seen in figure 10.

Digitally **Competent** Elder

Sverre is an independent guy, and has kept up with the digital wave over the last decades. He has had many smartphones, tablets and computers. He views himself as a digital person, and uses his devices multiple times a day to read the news, check social media, explore different apps, keep track of his economics, and control the household appliances. Sometimes he helps his friends with digital difficulties, and often gives the tips on websites to vitit or apps to download.

"I have worked with electronics my entire career, so I don't find technology hard to use at all"

Name	Age
Sverre	71

Status
Retired

Pre-Retirement Position
Engineer

Location
Nordre Follo, Norway

Goals
- Keep up with new technology and devices
- Find new and practical apps to download and explore
- Stay in contact with friends and family through social media
- Learn more interesting things about technology

Frustrations
- Does not like to admit that he is getting older
- Struggle more and more with problems related to sight, memory, speed and focus
- Sometimes encouter technical or digital issues even he can't solve
- Thinks some digital services are working poorly

Fears & Wants
- Fears he will become a liability
- Fears his beginning cogitive and physical problems will be noticed by others
- Wants his life to go on as normal without age implications
- Wants to be able to keep up with new and exciting technology

Figure 7: The digitally competent elder persona, Sverre.

Digitally **Lacking** Elder

Sigrid likes and uses technology to a degree. She is in contact with friend and family regularly over social media, SMS and Facetime. However, everything she does on digital devices requires a lot of time and effort and she gets annoyed that something as simple as sending a picture to a friend sometimes can feel impossible. She is mostly very independent, but needs help from her son occasionally, especially with scam emai.

"There are so many new things now, and when people try to explain to me how to use my PC for example, they use words from a language I don't know"

Name	Age
Sigrid	78

Status
Retired

Pre-Retirement Position
Receptionist

Location
Trondheim, Norway

Goals
- Stay in contact with friends and family through social media
- Not rely on help from friends or family to complete hard tasks
- Become independent and pay all her bills herself digitally
- Get better at using Facetime so she can call people more often

Frustrations
- Can't understand or navigate new written and visual language
- Tasks or information that are new or more complex are stressful
- Often feels stupid when she misinterprets or misunderstands
- As soon as she's learned to use an app the design changes

Fears & Wants
- Fears irreversable mistakes that can have huge consequences for herself or others
- Fears getting scammed online
- Wants tasks to be less frustrating and more intiutive so she can complete them herself
- Wants a clear written and visual language she understands

Figure 8: The digitally lacking elder persona, Sigrid.

Isolation and Independence

Elders feel a pressure to use technology to avoid becoming isolated and desire independence in their daily lives. They must often result in needing help from friends or relatives, which is visualized in Sigrid's journey map seen in figure 10.

Needs

Elders have a vast array of needs when interacting with digital services and products. They need simple language, visuals and structure to avoid getting overwhelmed. They also need more time to process and need help or analog alternatives available when they get stuck.

Cognitive Challenges

Most elders struggle cognitively as well as physically. The cognitive challenges include problems with focus and issues navigating. Due to these cognitive challenges, elders experience information overload more frequently than other user groups. They find it difficult to comprehend complicated content online and struggle with prolonged focus.

Non-Digital Elder

Sigbjørn thinks technology is difficult and gave up on trying to learn more about it a long time ago. He only needs his cell phone to make calls and write a few text messages, and does not like smartphones or tablets. He owned a computer a long time ago, but when it broke he did not find time to buy a new one.

He is heavily depended on his daughters to help him with various technical necessities, such as the online bank.

"Everything was better before"

Name	Age
Sigbjørn	86
Status	
Retired	
Pre-Retirement Position	
Geologist	
Location	
Nøtterøy, Norway	

Goals
- Be independent and not have to ask his family for a lot of help
- Live at home, the way he wants it, for as long as possible
- Keep updated on news and politics to that the perspectives of elders are heard and represented
- Keep using the things he is used to, they way he knows it

Frustrations
- Feels isolated from the rest of society
- Technology is too much to learn, and seems unfeasible
- Struggles focus, memory, poor sight and shaky hands
- Getting old is a challenge in itself and daily tasks require more energy than before

Fears & Wants
- Fears he will become completely cut off from the rest of the world
- Fears problems that can't be fixed without technology he don't understand
- Wants to feel included and valued in our society
- Wants more human contact, as technology can never replace a personal help

Figure 9: The non-digital elder persona, Sigbjørn.

Journey Map

	Sigrid
	Digitally Lacking Elder

Stages	Start	Realization	Pushes Forward	Frustration	Gives Up	Help
Steps	Opens her favorite app to complete a task	Realizes it has been redesigned	Tries to complete the task she wanted to do	Gets frustrated and wastes a lot of time trying	Gives up on completing the task herself	Gets help from family to complete the task
Thinking	I would like to congratulate my friend on her birthday. I know I can do it on Facebook on my iPad. Where is it again?	Hmm where is the birthday alert on this Facebook page? I found it a few days ago?	This was so much easier before when I knew where to go. Why is it changed?	I can't do anything with all these changes all the time? Can't they just keep it as it was?	I guess I'll have to get my son to help me find it tonight	Finally I can congratulate my friend on her birthday
Feeling	😌	🤔	🤨	😠	🙁	😊

Figure 10: Journey map for the digitally lacking elder persona, Sigrid.

Designers and Innovators

Physical vs Cognitive Limitations

Designers have a much better understanding of the physical limitations elders might have than they do of the cognitive limitations they might have.

Unrepresentative Insight

Some, but not all designers are aware that their insight on elders is unrepresentative, as it is impossible to reach the most vulnerable elders. This is exemplified in the designer's and innovator's personas', Jenny and Joakim, seen in figure 11 and 12.

Universal Design, Inclusive Design or Design for All?

Universal design has received increased focus in the industry. Focus on inclusive design beyond laws and regulations is more rare, however designers are aware that the design industry must make further adjustments to accommodate elder needs and limitations in future. Designers are not in agreement on whether the focus should be on designing for elders or designing for all.

Extended Knowledge

Designers want extended knowledge on elders and explicit recommendations that are as specific as possible to their needs and requirements. There are currently no general usability guidelines for cognitive limitations. This "want" is exemplified in the inexperienced designer persona (seen in figure 12), as well as the designer and innovator journey map (figure 13).

The **Experienced** Designer

Jenny is an experienced designer in the sense that she has worked on many projects where elders where the main user group. She believes that by designing with elders and their needs in mind, herself and other designers will create digital services and products that will ease all user experiences as being more precise and clear in your design will benefit everyone.

"It's so easy to become an outsider. Elders may be used to going to the bank to pay bills and when all those things go digital, you'll shut these people out and raise the barrier for them to do the same as everyone else."

Name Jenny **Age** 34

Position Interaction Designer

Industry Health Services

Location Bergen, Norway

Goals
- Continue to learn about elders' needs, espesially cognitive needs
- Stive for inclusive design beyond the national regulations of universal design
- Try to meet elders where they are most comfortable to increase the changes of representative insight
- Advocate for elders and their needs in all environments

Frustrations
- There are no usability guidelines for cognitive limitations
- Universal design is often linked to laws and regulations rather than a wish to improve a service
- It is almost impossible to gain insight on the most vulnerable and non-digital elders
- It is difficult to user test with elders remotely

Fears & Wants
- Fears they rely too much on UI language elders don't know
- Fears digitalization will isolate even more elders in the future
- Wants recommendations that are as specific as possible to elders needs and requirements
- Wants heightened awareness on design for elders and other vulnerable users

Figure 11: The experienced designer (and innovator) persona, Jenny.

The **Inexperienced** Designer

Joakim is an inexperienced designer in the sense that he has not worked on products spesifically designed for elders. However, he designs products that are supposed to be usable by all and finds it difficult to know how to accomdate vulnerable users like elders. He feels he does not have enough knowledge about them or their needs, but it is something he would like to change.

"The information out there is so general and that makes it hard for someone like me who doesn't know a lot about elders to put that into practice. Like, what does it all really mean for UI and structuring of content?"

Name Joakim **Age** 41

Position Interaction Designer

Industry Financial Sector

Location Oslo, Norway

Goals
- Learn more about elders challenges beyond contrast ratios and size
- Be as knowledable on cognitive limitations as he is on physical limitations
- Consistently incorporating universal design throughout the design process
- Design more inclusively for elders

Frustrations
- Finds designing for elders more challenging than designing for other user groups
- Struggles to communicate complicated content in a simple and understandable way
- Unsure how cognitive limitations effects elders use of their services
- Finds it diffcult to find time to read scientific papers on elders

Fears & Wants
- Fears he is not accomodating for elders/vulnerable users
- Fears it will be difficult to accomodate for elders
- Wants specific recommendations on how to accomodate for elders
- Wants easily digestable and available factual content on elders and their needs

Figure 12: The inexperienced designer (and innovator) persona, Joakim.

Journey Map

	Jenny — The Experienced Designer	Joakim — The Inexperienced Designer

Stages	Start	Awareness	Insight	Research	Realization	Frustration
Steps	Start working with elders as a user group	Becomes aware of lacking knowledge	Does insight gathering to gain more knowledge	Realizes more scientific research would be helpful	Realizes there is no easily digestable help available	Frustrated that this problem isn't solved
Thinking	I'm confident in my ability to design for elders	I need more knowledge on cognitive limitations	I'll try to get information by speaking to and observing elders and learning from their experiences	I still need more insight, elders are so complex and are not always able to reflect on the reality of their situation and needs	I hoped there was a guide for cognitive limitations	Why is there no guidance here? Surely others have struggled with this and found solutions. Why are they not available to me?
	The design needs to be usable to all users	How can I design for all, including elders?			I don't have time to read all the scientific papers	
Feeling	😌	🤔	😃	🤨	🙁	😐

Figure 13: The journey map for the experienced and inexperienced designers (and innovators), Jenny and Joakim. These are the personas' exemplifying the projects primary users.

Part 2: Reframing the Problem

As mentioned in our Introduction chapter, the authors of this thesis went into this process with certain assumptions and hypotheses on how future generations of elders would behave. They would be tech-savvy with high digital literacy, increased resourcefulness and a wide understanding and interest in technology. These were the elders we believed would be our indirect end users. However, at this stage we realized our insights did not match these hypotheses. So, in this part of the thesis we will analyze our insights in further detail and describe the way our insights informed and reframed our problem statement.

The Reality of Tech-Savvy Elders and Digital Competency

We started this thesis with the hypothesis that the majority of elders in 2030 would be classified as tech-savvy as that new generation of elders not only experienced, but also fueled and funded the huge technological boom of the last five decades. However, as we have seen in our insights, this is in fact not the case. Our insights show that although some elders can be defined as digitally competent, and that the tech-savvy elder does in fact exist on some level, the reality is that these tech-savvy individuals are and will continue to be a minority, not the majority we first believed.

Instead elders can be categorized as being digitally competent, digitally lacking or completely non-digital, with digitally lacking elders being the largest group. This digital competency is not something one gains and retains for the rest of one's life, but rather something constantly challenged by technological innovation, cognitive and physical decline and one's own natural interest.

Additionally, our insights show that digital competency is not a linear skill with natural continuity and progress. It can instead be understood as a competency ladder which some elders might scale one step at a time, gaining all relevant knowledge along the way (often the digitally competent elders). Some might skip a step every now and then, missing out on important knowledge and become unable to scale the stairs completely (often digitally lacking elders). While others again may feel too intimidated to even begin climbing (often non-digital elders). It is also important to note that every step will likely feel different for each elder. The challenges all these elders experience, are rarely due to incompetent use, but rather due to a lack of knowledge in combination with non-inclusive design that does not take that lack of digital competency or physical and cognitive limitations into consideration.

This was an important realization for us as we realized that by redefining our indirect end user to the digitally lacking elder instead of the tech-savvy elder we would be able to help solve a larger and more prevalent problem.

Non-Digital Elders and Digital Exclusion

When entering our insight gathering phase our focus was mainly on our hypothesis of the tech-savvy elders and their needs. Despite this, perhaps unsurprisingly, we gained a large amount of insight on non-digital elders and the extremely vulnerable users that are slowly being excluded from society.
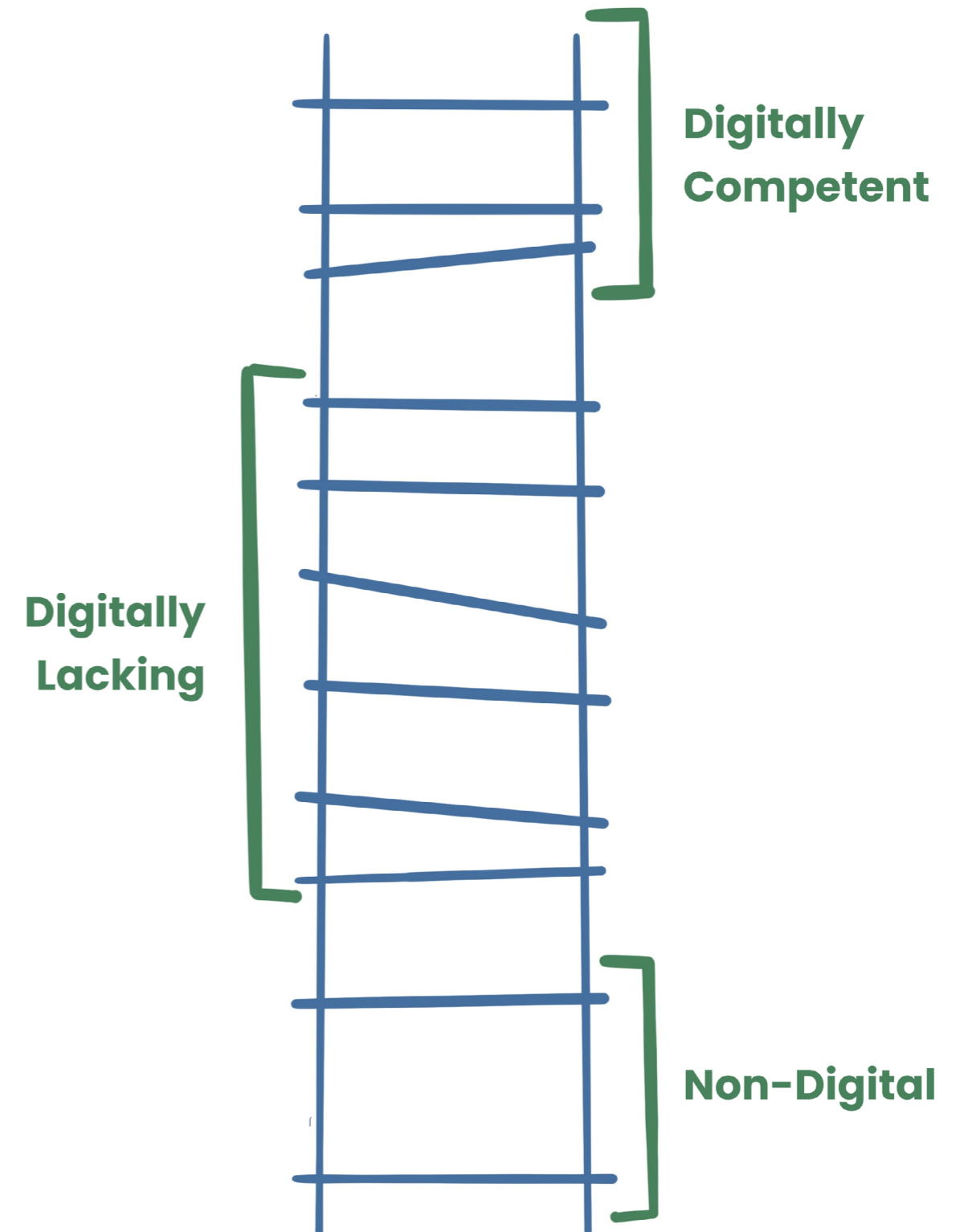
Figure 14: The competency ladder showing that digitally lacking elders might skip a step every now and then, missing out on important knowledge and become unable to scale the stairs completely. Some non-digital elders may feel too intimidated to even begin climbing beyond the bottom steps, while digitally competent elders might scale one step at a time, gaining all relevant knowledge along the way.

Digital exclusion, as these non-digital elders experience, is not an exclusive problem to elders. Any number of disabilities can make the digital society difficult to engage with (see Andersson, 2022) and many are concerned about how this will continue to affect us. As mentioned in our introduction chapter we saw that a digital class system is very much being established between those you have access to and knowledge about technology and those who do not (see Elkjøp Nordic, 2020). In our own insights we saw that a number of elders can be defined as non-digital and that these elders were unwilling to learn and take on the task of becoming digitally competent as they felt they were too old for it and did not have the energy to embark on what they saw as a huge task. Because of this they are afraid to become isolated from the rest of society and advocate for analog alternatives to digital services and products at every opportunity.

However, we set out in this master thesis to improve the user experience for elders who use digital services and products. So despite the prevalent problem the non-digital elders represent, we realized we were not making our final product to benefit them, and decided to stick to our original scope of digital elders. Non-digital elders are then not included in our indirect end user definition, as non-digital elders will not come into contact with the digital services or products designed by our primary user group (designers and innovators) and are not considered in the solution this master thesis presents. Having said that, this master thesis encourages further work on this problem, as its solution will be pivotal to the future and welfare for our elders.

Evaluating Our Problem Statement

After having taken stock of what we had learned in our insights and how these had shifted our perspective through the analysis described above, it was time to look at what this meant for the final product created in this thesis.

We got confirmation that the overall problem of how to design for elders was a relevant problem for designers as many mentioned that they find designing for elders more challenging than designing for other user groups. However, we felt a need to re-evaluate our original problem statement as it no longer fit the problem we desired to solve or represented the indirect end-user we wanted to help.

Our original problem statement was:
How do we prepare for the tech-savvy generation, and ensure that the technology we design encompasses the needs of this new user group?

We saw a need to remove ourselves from the tech-savvy description of elders, as we had found the digitally lacking to be in most need of help rather than those with a high digital competency. Additionally, we wanted our problem statement to encompass the cognitive challenges we had uncovered and showcase that these would be a focus point for our solution.

Our new problem statement became:
How can we enable designers and innovators to create more accessible and usable digital services for digitally lacking, cognitively imparied elders?

This was the problem statement we ended up solving within this thesis. Additionally, we created more detailed research questions that can be found under "How Might We Questions".

How Might We Questions

When creating our How Might We questions we narrowed down the challenges we had found to the key problems we could help solve. We created three main How Might We questions with some subquestions to ensure we kept certain perspectives front of mind. These questions were used throughout the rest of the process to guide the creation of the final product.

Having completed this re-evaluation of our problem statement and the overall direction of the master thesis we were able to enter our solution-development phase, confident we were continuing to listen to our insights and solving the correct problems for our original motivation of emphasizing with and assisting vulnerable users, while still remaining within the limited scope of a master thesis.

How Might We...
...give designers and innovators the knowledge they require to design for elders?

How Might We...
...make inexperienced designers feel more confident in their ability to design for elders?

How Might We...
...help experienced designers gain explicit knowledge on cognitive limitations and how to counteract these in their designs?

How Might We...
...help designers and innovators advocate for more inclusive design beyond the scope of laws and regulations?

How Might We...
...lessen the cognitive load digitally lacking elders feel when completing digital tasks?

Part 3: Creating the Solution

With these preliminary clarifications out of the way it was time to create our solution: a guide that can help designers and innovators design more accessible and usable digital services and products for digitally lacking, cognitively impaired elders.

Storyboards

To ensure mutual understanding between ourselves and our stakeholders we created two storyboards to show how we imagined our guide would be found and utilized in a work setting at this stage. These storyboards show a designer going from realizing they are in need of guidance when starting a project, through a process of using the guide and then to completing said project with the help of our guide. They can be considered a first iteration. More detailed storyboards can be found in the Solution chapter.

Storyboard

Jenny
The Experienced Designer

1	2	3	4	5	6

Sitting by her desk after one of the first team meetings with the new project team

Knows that elders will be a hard user group to accommodate for, as they face more challenges than other user groups

Check the Slack UX community for weekly updates and finds a link to **the guide.** She reads it and learn a few things she didn't know

Shares the guide with her team, and other colleagues

Adds the link to the guide to her bookmarks under "UX resources"

Use the guide consitently when making design decisions and in discussions

Figure 15: The experienced designer (and innovator) persona, Jenny's storyboard on how she finds and utilizes the guide in a work setting .

Storyboard

Joakim
The Inexperienced Designer

1	2	3	4	5	6

Is in a meeting with other designers and stakeholders at the beginning of a project, discussing primary users

Realize that he knows very little about elders's needs beside their physical challenges

Due to financial and time restrictions, the project can't gather a lot of first hand insight on elders

Gets a message from a colleague in the shared work chat with a recommendation to check out **the guide.** Reads the guide and learns a lot he didn't know

Adds the link to the guide to his bookmarks under "UX resources"

Use the guide consitently when making design decisions and in discussions

Figure 16: The inexperienced designer (and innovator) persona, Joakim's storyboard on how he finds and utilizes the guide in a work setting .

First Iteration of Solution

Based on our insights we created at this stage a first draft of our solution. The main goal for this creation was primarily to reformat our insights from problems to a potential solution so that we were able to present something tangible in our co-design workshop and receive feedback. This first iteration can be considered a first low-fi sketch of what became the final solution.

To create these heuristics we gathered all the main challenges found in our insights and brainstormed what design decisions could help improve these challenges. Several designers had suggested solutions

1 Tolerance for Variety
- Elders will have many different ways to approach doing a task, try and make as many of them available so they do not hit dead ends.

> Our insights show elders use the trial-and-error method to complete tasks

2 Low Effort Navigation
- Create navigational structures that allow the users to feel in control
- Nudge users to scroll when needed to communicate this option is available
- Divide content into several sequences to avoid information overload
  - Find a balance between this and keeping focus
- Ensure users understand how to go back to a previous page or action
  - Consider whether the word "back" and what that means is being understood by your users

3 Simple and Forgiving Design
- Be mindful that both small and large redesigns will likely confuse and stress your users
- Be forgiving of typos in places that require user input
  - Search fields, forms etc
- Make registration or sign-in optional when possible

4 Offer Help
- Consider providing easy-to-find customer support like an online chat or phone number users can get help from

> Our insights show elders are often forced to rely on family and friends for help

5 Safety and Control
- Create navigation that allows the user to feel in control
- Explain the consequences of all actions to allow users to feel safe
- Offer a button to increase text size
- Ensure error messages are direct, informative and does not blame the user
- Help the user understand what they can do to solve the error message presented

6 Unrepresentative Insight
- Recognice that your insights will likely remain unrepresentative
- Hard to reach the most vulnerable users

7 Clear Written Language
- Simplify complicated content to its most basic form
- Avoid complicated language and use short, simple sentences with concrete, everyday words.
- Avoid using technology terms that may be unfamiliar to the user
- Be aware some users might feel pressed to read all text presented on the page

8 Simple Visual Language
- Do not rely on navigational design conventions without explanation or verification
- Explain what they are, user test that they work

> Our insights show that designers often rely on UI-language that elders might not understand

Figure 17: 8 main problem areas with several underlying heuristics as presented during the workshop

to problems they saw in their interviews, so these quotes were also brought forward and taken into consideration. A large number of specific heuristics were created, some reframed or discarded, before we settled on 8 main problem areas with several underlying heuristics. Each heuristic was organized within problem areas to make them easier to discuss and evaluate during the workshop. These problem areas were selected as they were the most prevalent problem areas we found in our insights.

Co-Design Workshop

To ensure that our solution would meet user needs we facilitated a co-design workshop with designers and innovators we had previously interviewed. It was important to us to create a solution that primarily came from the user, instead of something created only by us, as this would help ensure a usable and useful solution.

Goals for the Workshop

The main goal for this co-design workshop was to ensure designers and innovators were active participants in our design process, as this is crucial to ensure a finished product that meets user needs.

The other goals for this co-design workshop was to:
- Validate our insights.
- Assess the first iteration of our design heuristics.
- Discuss how best to distribute the finished product to the industry.

It was important for us to present our insights as it gave our stakeholders an opportunity to challenge them. These findings were also important background for the other tasks in the workshop. Assessing the first iteration of our design heuristics was the most important session for us and took up the vast majority of the workshop, as this feedback would directly impact the final product more than any other task. Finally, discussing how best to distribute the finished product was an important step as it was crucial that the format of our guide suited the situational context designers find themselves in when needing these tips and guidelines.
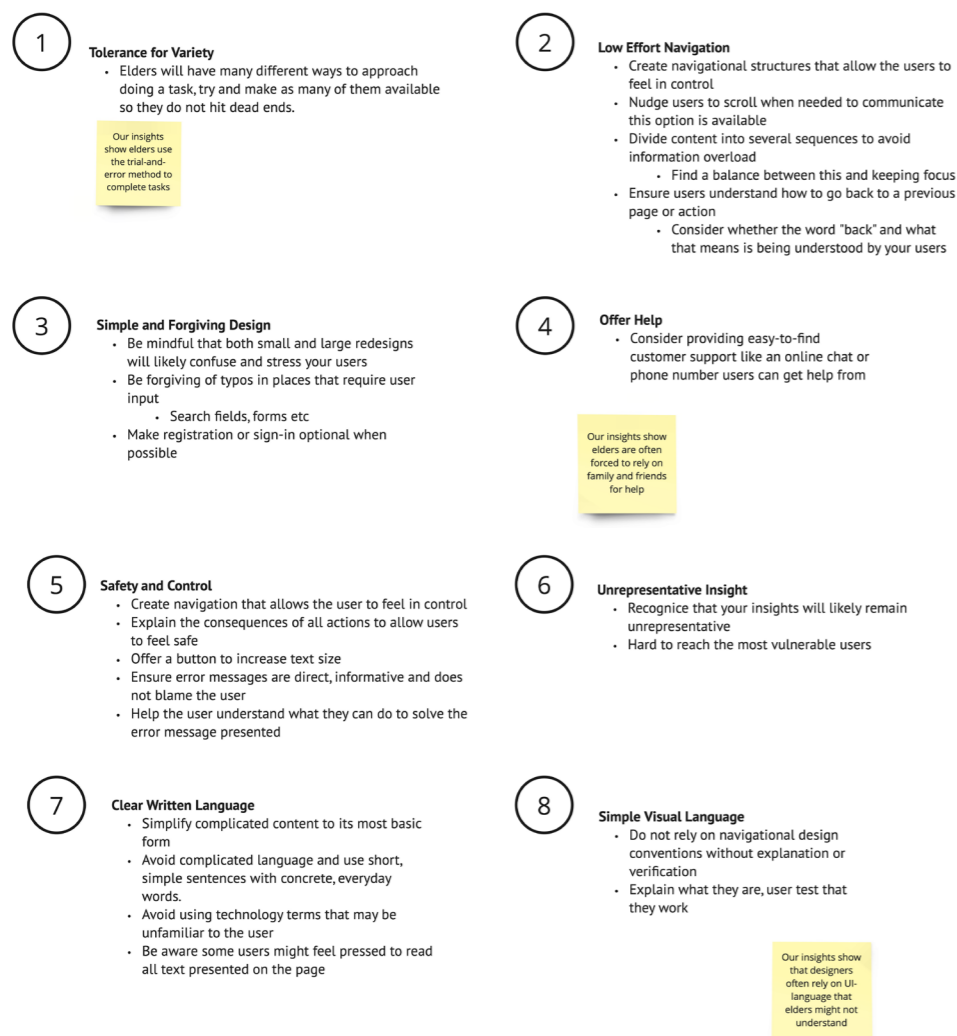
Structure and Approach

The workshop was held remotely through Teams and Miro. We began with a short introduction and icebreaker, allowing participants to get to know each other and become comfortable in the space (Figure 18). We clarified some expectations by discussing our goals for the workshop, why they in particular had been invited to this workshop and what roles the authors of this thesis would have throughout the workshop.

Once participants were warmed up and comfortable we presented our key insights and asked participants to validate whether these insights were in agreement with their own interpretation of the problem, or if there were any elements they were unsure of. The participants spent a long time here and these insights inspired them to add their own musings and questions (Figure 19).

We then moved on to presenting and receiving feedback on our heuristics (Figure 20). Here we looked at both content, wording, organization and general understanding or misinterpretation.

Finally we spent a few minutes discussing in what format the guide should be distributed to the design industry before concluding and summarizing final thoughts (Figure 21).
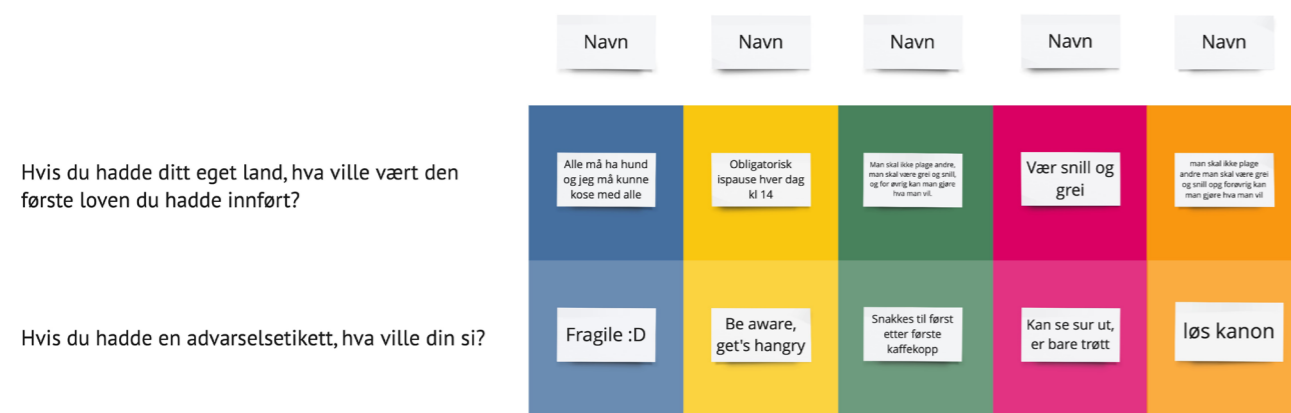
Figure 18: The workshops warm-up exercise, an icebreaker game. The workshops participants got to know eachother and get more comfortable by answering two questions: If your were your own country, what would be the first law? And, if you had a warning lable, what would it say?

Figure 19: The validation part of the workshop. The key insights from the interviews and observations were presented, and participants were asked to validate whether these insights were in agreement with their own interpretation of the problem, or if there were any elements they were unsure of.

Figure 20: Presenting the heuristics to the workshop participants, and receiving feedback on improvements.

Figure 21: Discussing distrubution. What format the guide should be distributed to the design industry.

Outcome of Workshop

The workshop was an important milestone in this project because we were able to discuss our findings and heuristics in a larger context and work through several questions and potential problems we were unsure how to move forward with. The feedback, reactions, discussions and ideas generated by the participants in this workshop gave us a very clear sense of where and how we should move forward.

Validating Our Insights

Participants were able to validate our insights and confirm that they matched their own understandings. Some insights were new and of special interest to designers which again created new insights for us through valuable discussion.

When discussing the insights on elders, feelings and frustrations were especially interesting to the participants. The feeling of not being seen or taken care of in a digital society was brought up repeatedly. Fear was also an important topic and all participants agreed that elders fear making mistakes online. That the interaction itself is perhaps not very difficult for elders, but that the fears created by not understanding what happens next, paralyzes them to some extent.

When talking about the insights on designers, much discussion was had on whether the focus should be on designing for elders or designing for all. These designers believed that the concept of design for all is too wide, that when one tries to design for all one ends up designing for no one. Some believed one should design for those with the heaviest limitations to make it as accessible as possible, while others brought up the point that you then run the risk of creating something that is inaccessible to "regular" users. In general though, all agreed that design for elders is an important topic that needs to receive heightened awareness within the industry.

By validating our insights in this way we received valuable feedback that our insights were indeed consistent with other designers' understanding of the elderly user group which allowed us to move forward with the project confident that these insights were reliable.

Additionally, through the discussions described above, we received new insights which were used throughout the rest of the project to iterate the final solution.

> "Very good that you have included the aspect of feelings. It's hard to learn something new when emotions get in the way" - Designer

> "Elders do not feel safe enough to experiment or explore in digital solutions" - Designer

> "Very interesting that some older people are "forced" to be more open about personal / private things like finances" - Designer

> "We have probably gotten to the point where we need Universal Design requirements 2.0" - Designer

Assessing the First Iteration of Our Design Heuristics
When assessing our design heuristics, a main takeaway was that the designers were more interested in reading our insights than they were in the heuristics themselves. Working designers are experts at solving problems and converting insights into innovative solutions. They did not necessarily need help with solving user problems, rather they needed help understanding them. This feedback was hugely important to us at this stage, as it made us realize our solution could include both insights in the form of factual knowledge, and heuristics in the form of tips and tricks to encourage inclusive design for elders. An additional important take away was that designers still felt it was somewhat unclear whether these heuristics took cognitive limitations into consideration or not, which meant we needed to clarify this in our next iteration. Participants also had many useful notes on the heuristics themselves.

The **Tolerance for Variety** heuristic was confusing to the participants. They did not understand what a dead end was or what we meant when we said elders might have many different ways of approaching a task. The aim of this insight was to encourage designers to offer more than one path for elders to reach their goal, so that they would be met with more successes than failures when using the trial-and-error method to complete tasks. However, this was not communicated effectively.

This feedback allowed us to rewrite the heuristic in a more understandable format in the next iteration.

The **Low Effort Navigation** heuristic was more understandable to participants, however the difference between this heuristic and the previous one was somewhat unclear. Additionally, designers wanted more context for why these tips were suggested. They wanted factual explanations, examples and quotes from our insights to support the tips presented. By giving readers the factual background they argued designers would be even better equipped to use these heuristics skillfully. This feedback inspired us to present more of our insights in the next iteration.

The **Simple and Forgiving Design** heuristic was met positively in concept, but in practice participants had many concerns. Most importantly they did not see a link between the tips that were included under this heuristic and felt that being mindful of redesigns should be its own point, while being forgiving of typos fit better under Offer Help. They were also unsure how making sign-in optional was relevant. This feedback helped us begin thinking about different ways we might categorize our heuristics in future iterations, and which heuristics we should cut.

The **Offer Help** heuristic was well-received by participants, however they found the imbalance between the relatively little content here vs the large amount of content under other heuristics confusing. They suggested that one-to-one contact is but one way of offering users help, and that helpful text boxes, tutorials and similar can aid users equally well if implemented correctly. Here they also mentioned again that they wished for more factual knowledge to understand the reasoning behind the heuristic. This feedback allowed us to expand this heuristic further in our next iteration by including helpful text boxes, tutorials and similar.

The **Safety and Control** heuristic was extremely interesting to participants. They agreed with the overall point that one needs to create solutions that allow users to feel in control, by for example clarifying

what actions do and their consequences. However, the structure and categorization of the heuristics were again questioned. Some offered that perhaps safety and control are two different things, or perhaps these tips fit better into other already existing categories. At the same time they agreed that it is important to reassure users. This feedback again showed us that our categorization was not usable in its current state and needed changing.

The **Unrepresentative Insight** heuristic was interesting to participants as the possibility of unrepresentative insight is a challenge designers face every day. At the same time they questioned why this heuristic did not suggest a potential solution to the problem. They recognized that we argued for a change in attitude among designers, but sought more detailed help on how to counteract this. This feedback made us realize we needed to add more context when discussing unrepresentative insight.

The **Clear Written Language** heuristic was supported by participants. The point that one needs to be aware that some users might feel pressured to read all text presented on the page was brought up as especially interesting, since several participants had not considered this previously. At the same time participants found this heuristic a bit overwhelming and implored us to reduce the amount of text. This feedback forced us to be critical to our own heuristics, cut those participants found uninteresting and shorten everywhere else.

The **Simple Visual Language** heuristic was also supported by designers, and they argued when designing for elders one should question all UI conventions one might take for granted as being understandable. They also brought up here whether our 8 heuristics were in any way linked or correlated to the 8 insights we had presented previously. At this stage the insights and heuristics were not linked in terms of categorization, only in terms of content. This feedback inspired us to categorize our heuristics more in line with the already existing categorization we had for our insights.

How this feedback was used is further discussed under "Second Iteration of Solution".

> "There are 3 principles we should always follow: Predictability, overview and control" – Designer
>
> "It is important to be mindful of redesign, but you have to change things that do not work. You have to be aware of the consequences, but you can't not do it. But why are you moving that button? You should have a really good reason for doing so. Remember that people have learned it all over again" – Designer
>
> "All large companies want to cut customer service, but I do not understand why. It's free user insight!" – Designer
>
> "Should these points be general principles to follow, or should they be tangible, specific things? What level do you want these points to be at? General or specific?" – Designer
>
> "I think it will be very useful with factual knowledge. One thing is all these principles, but why do we do it? Clarify the elderly perspective because then it will differ more from ordinary Universal Design principles" – Designer
>
> "I can't help being a bit confused by the structure, the categorization. There are sometimes too few and sometimes too many principles in each category" – Designer

Discussing Distribution
When discussing how these heuristics should be distributed to the design community in Norway, it was clear that participants wanted something easily accessible and easily retrievable to fit into the workflow of a design thinking-based project. They wanted it with open access and as easily shareable as possible. All participants agreed that a dedicated website would check all these boxes. Additionally they wanted something tangible they could use in a non-digital space, like a poster or similar they could print out and hang in their office as a constant reminder to design inclusively. This feedback was used to determine that the solution should be presented in the form of a website and that a poster or similar would be beneficial.

Summary of Workshop

To summarize, in this workshop we were able to validate our insights and confirm that they were reliable to move forward with. We also received new insights which were used throughout the rest of the project to iterate the final solution. We saw that the heuristics at this stage did not function as we hoped, some were unclear while others were too familiar and lacking context. We realized that our solution both could and should include both insights in the form of factual knowledge, and heuristics in the form of tips and tricks as designers do not necessarily need help with solving user problems, rather they need help understanding them.

We also saw that designers still felt it was somewhat unclear whether these heuristics took cognitive limitations into consideration or not, which inspired us to conduct an expert interview with specialists in clinical psychology to discuss cognitive challenges and solutions.

Expert Interview on Cognitive Challenges and Solutions

To gain a better understanding of the cognitive challenges facing elders so that we could incorporate this perspective into our final solution, we conducted an expert interview with a specialist and researcher in clinical psychology Oddbjørn Hove (PhD), who works within the field of design through the MindMe project. The MindMe project at the Department of Research & Innovation, Helse Fonna Health Trust is a health and well-being related innovation project which works to develop a "user-centered digital self-reporting tool for the diagnostic assessment of mental disorders in people with cognitive impairments" (Hove, O. personal communication, May 2022). The project aims to "empower people with mental disorders to participate in the examination and treatment of their mental health and improve the health service for an especially vulnerable and costly patient group" (Hove, 2022). His involvement in the MindMe project and his background in psychology and innovation research within cognitive design made Hove a highly relevant expert for us to consult for our project.

His interview and help was very valuable for us as we gained a better understanding of cognitive challenges in general and how it might affect user interaction which we could utilize to create our guide. He was also able to further validate our insights.

Our key insights from this interview were as follows:
- Our key insights on elders and their struggles with technology were consistent with his own findings and understandings.
- The heuristics created at this stage were in line with his own understanding of how to assist those with cognitive limitations.
- Discussions around universal design often lead to a discussion around physical limitations and Hove preferred to engage in conversation around inclusive design as these conversations often incorporated cognitive limitations more naturally.
- Cognitive limitations and vulnerable users' needs are slowly starting to get more focus in the design industry.
- Simplifying visual and written language is one of the most important tools we have to lessen cognitive load.
- If there is no connection between the written language and the illustrations or other visual language used, users might get confused, or conclude that they are missing something.
- Requiring the user to pay attention to many things simultaneously requires a level of focus users with cognitive limitations do not possess.
- Guiding and helping users is extra important if they have cognitive limitations.

> "The more impaired cognitive function you have, the harder choice becomes. To deal with choice, to go back, etc. In our app there is little to no navigation."
> – Obbjørn Hove, PhD

> "I believe that for this user group it is not an exercise in power to limit them, rather it opens up possibilities for use. When limited they can actually can use it. But then you have to decide very clearly what is the purpose of this digital service. There can't be too many purposes, you can't make something that will be used for a lot of different things." – Obbjørn Hove, PhD

Second Iteration of Solution

After receiving feedback on our proposed solution from designers and innovators in the form of a workshop and an expert interview it was time to reiterate our solution based on these insights. As designers wanted the guide to be accessible, retrievable and shareable, we realized the solution as a full website in Wix.

Content wise, the biggest change implemented at this stage was to lessen the focus on the design heuristics themselves and heighten the focus on our insights on elders and cognitive limitations. We learned from the workshop that designers were more interested in our insights than our heuristics as they wanted to learn the underlying reason for why problems occur, rather than receive help solving those problems. This is also in line with the design industry needs noted in our interviews where designers were interested in gaining factual knowledge about elders and their needs. During our review of previously developed heuristics for design work (see Berg & Haksø, 2021) we also concluded that all the current guides required the designer to possess intimate knowledge of elders and their needs to be able to utilize the heuristics in an effective manner. All this to say that by putting the focus of this iteration on insight and factual knowledge we answered designers' wishes more accurately and gave them the tools they need to use both our own and other heuristics in a more effective manner in future.

The heuristics were therefore removed from their previous categorizations and reorganized into guidelines with relevant insights and tips, which is exemplified in figure 23 and 24. This is also in line with findings from our workshop where designers found the previous categorisations confusing. Some heuristics were removed and others were added with many being rewritten and tweaked. For example, a tip suggesting to keep illustrations and pictures relevant to other content was added due to the insights gained in our expert interview, while the "offer a button to increase text size" was removed as the designers in our workshop found this heuristic to be uninteresting

and too specific. All other feedback discussed under "outcome of workshop" was also implemented.

The website also included a "learn more" page offering learning resources to encourage designers and innovators to continue their learning (Figure 25). Additionally an "about" page was created to give some more context on the project, the master thesis and ourselves (Figure 26).

Figure 22: First section of the front page of designforelders.com.

Figure 23: Example of an guideline; The Digital Lacking Elder. This guideline showcases how the previous heuristics were reorganized into guidelines with relevant insights to help the users understand the problem and several tips in the blue "how to help"-section. The guidelines are also supplemented with qoutes from our research.
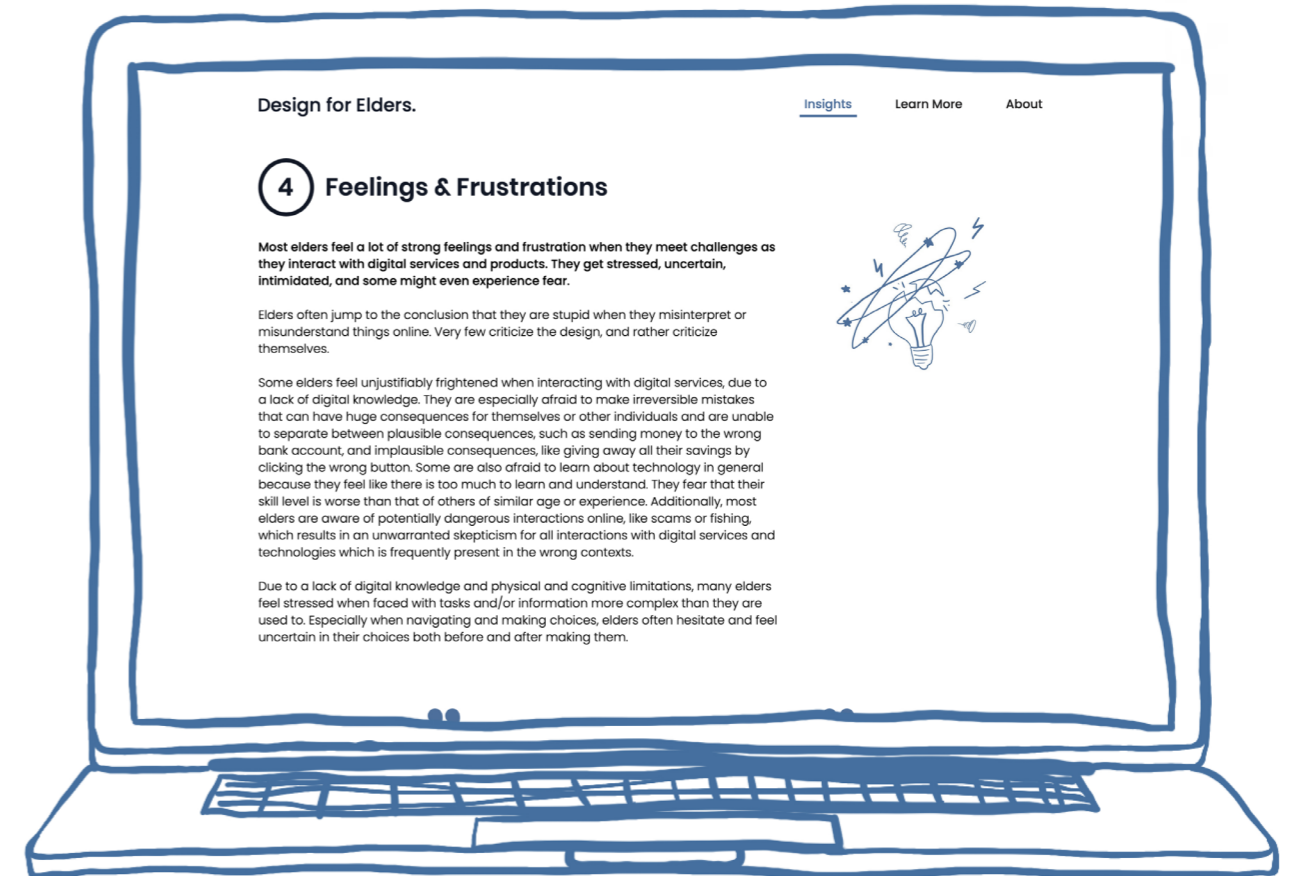

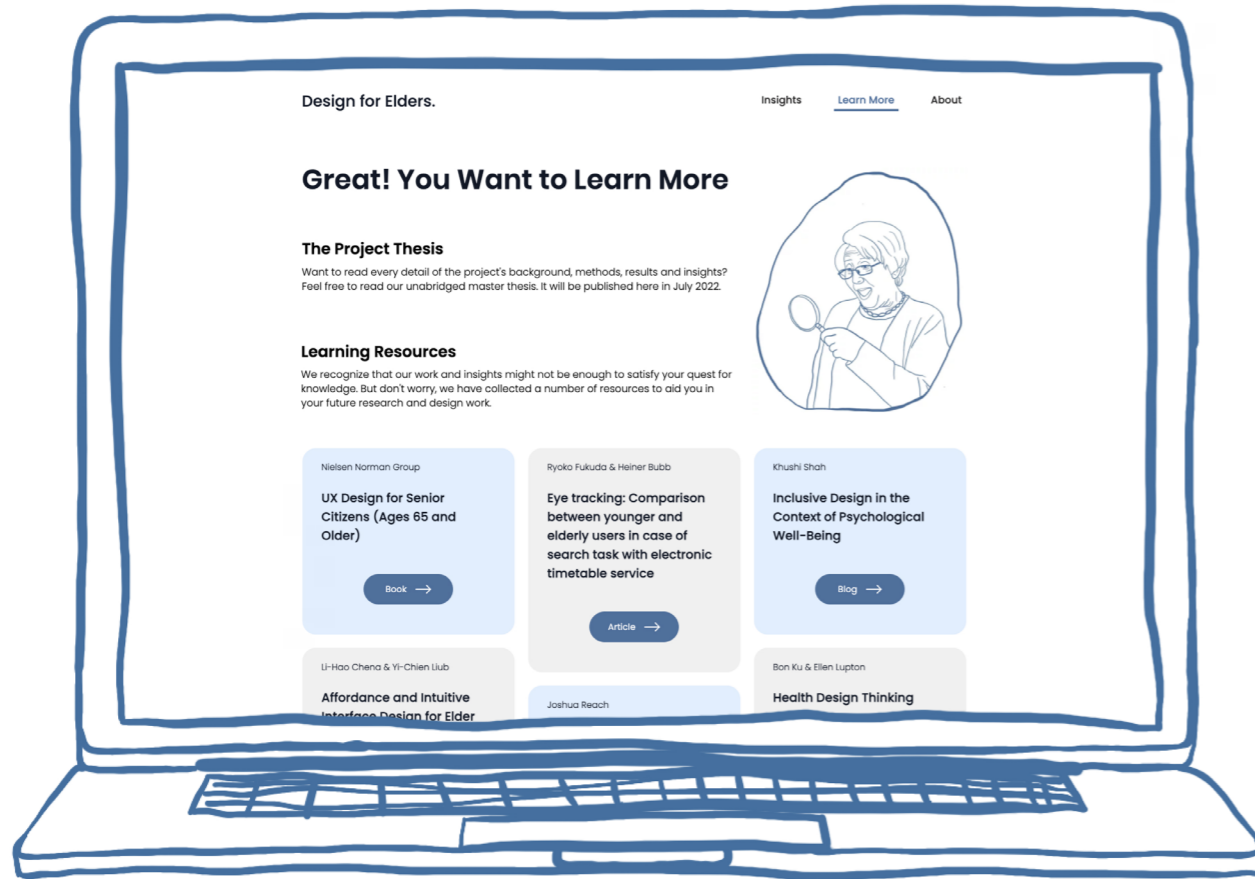Figure 24: Example of an guideline; Feelings & Frustrations.
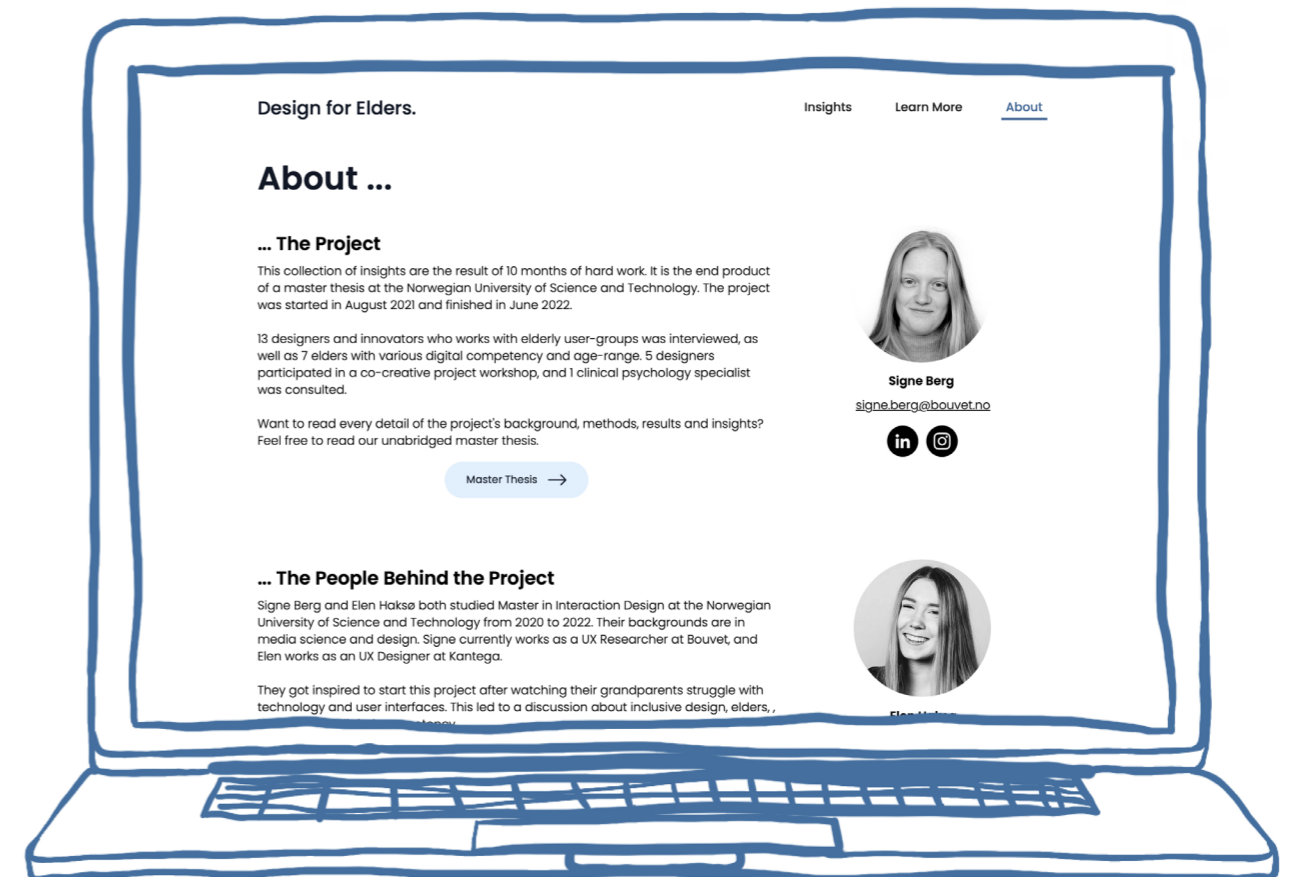
Figure 25: The Learn More page.

Figure 26: The About page.

Testing of Second Iteration

To test the second iteration of our solution we conducted 5 "First Look" tests with designers and innovators that had not yet been involved with the project. These first look tests were conducted as casual conversations where the tester received the link to design-forelders.com, shared their screen and was simply asked to talk us through their first impressions; what they wanted to read/click on, where they felt like pausing or skipping and why, what they felt like they were learning and similar. The website was also shared with psychology specialist Oddbjørn Hove and our supervisor Mari Bjerck for review. Additionally the project was shared in internal design forums at IT-consultant firms Kantega and Bouvet to allow for feedback from more fresh eyes. All the insights gained from these user tests are gathered here.

The most significant insight from these user tests was that we needed to improve the content and written formulations on the website. The text was too theoretical in nature having been written and structured very similar to the master thesis itself. This made the text difficult to scan and it was hard for people to find the critical information we wanted them to receive within the larger text. Some of the sections of text also felt too long for testers, and several mentioned that outside the context of the user test they would not continue reading as far as they had. Some also commented that it was confusing what elements (text, illustration, quotes) were connected, where one section began and where another started. It was also mentioned that the introduction, the first thing they met, was not interesting enough because it didn't argue why they should keep reading. Two designers mentioned that since they don't design specifically for elders, they were unsure whether these tips were relevant to them before they started reading.

Once they began reading and scrolling through the insights and tips presented in the solution, however, the designers quickly realized the point of the solution themselves without us giving them direction. They went on the journey we hoped they would go on right in front

of our eyes, from wondering if this was relevant for them, to starting to discuss how this could and should be applied to their own work. Especially the Feelings & Frustrations section built a huge amount of empathy for elders and motivated the designers to include this perspective in their work moving forward.

> "This [Unrepresentative Insight] is a very good point" — Designer
>
> "This [Feelings & Frustrations] is heartbreaking" — Designer
>
> "Now I realize we have to do better, we have to learn more about this" — Designer

In the internal forums at Kantega and Bouvet we did not receive a huge amount of feedback on the website itself, however people found the topic of design for elders very interesting and relatable to their own parents/grandparents. Sharing the website started many interesting conversations both in forums and verbally where the conversation continued in new directions, so it was clear this was a compelling topic for many. However, both these conversations and our first look tests revealed that the vast majority of designers believe that the problem of the digitally lacking elders will resolve itself in the not-to-distant future, once the digitally lacking elders leave us and the digital natives of current generations become elderly. As our interviews with designers who work with design for elders today have shown, this is in fact not the case as cognitive and physical limitations felt by elders will be a universal usability issue for generations to come. Additionally, technological innovation moves at such a pace that the idea that the digital natives of today will still be digitally competent with tomorrow's technology is not guaranteed (see among others Hanson, 2011). We will pick up this discussion in our Discussion chapter, but it is important to note here as it made us realize we needed to include this argumentation somewhere within our solution to contextualize why design for elders is and will continue to be relevant.

Third and Final Iteration of Solution

In the third and final iteration of our solution, the insights gained from previous testing were used to make changes that would allow for a better user experience. The main focus of this iteration was content and written formulations, in addition to honing the message we wanted our users to be left with.

In terms of content and written formulations, we restructured and rewrote large portions of text on our Insights page. Designers had felt this text was too theoretical, making it difficult to scan and understand. The text was altered to use more engaging and empathetic wording, and the most important and most interesting insights from the designer's perspective were moved forward. We also shortened the text and restructured the content on the website to allow the eye to scan from top to bottom in a more natural way. Some designers had also mentioned it was difficult to differentiate between when one section of content ended and another began. We therefore created a section divider, in the form of a squiggly line, to create an easily recognizable shift between sections. We also saw that the Feelings & Frustrations section built huge empathy towards elders and motivated the designers to include this perspective in their work. Therefore the Feelings & Frustrations section was moved further up on the website, from the fourth section to the second section. We felt it important that The Digitally Lacking Elder section still came first as it is important context to understand the rest of the insights shown on the page, but that Feelings & Frustrations should come as soon as possible after that.

Our user tests showed that designers were at first confused about why they should be interested in design for elders, and why it was relevant for them. Our user tests also revealed that many designers believe that the problem of the digitally lacking elders will resolve itself in the not-to-distant future, once the digitally lacking elders leave us and the digital natives of current generations become elderly. However, our interviews show that cognitive and physical limitations will create barriers for elders in the technological world for the foreseeable future, and that the digital languages we know and understand today may be completely useless to us when trying to decode technology in the future. We realized we needed to include this argumentation somewhere within our solution to contextualize why design for elders is and will continue to be relevant. To do this we reformatted our introduction into a series of questions and answers: "Why Should I Care?", "Won't This Problem Solve Itself?" and similar. This allowed us to directly answer the concerns many designers in our user tests had and argue our perspective efficiently without taking away from the core content of the website which are the guidelines we are sharing.

No changes were made to the about or learn more pages, apart from adding some additional learning resources that we had come across since creating the first version of the website.

Testing of Final Iteration

Once our third iteration was complete we conducted a final evaluation of the solution by users. It was clear at this stage that the third iteration would be our final iteration before the deadline, but we still wanted to evaluate the product in a larger context. Even if we would not be able to implement any changes based on these insights, they would help inform future improvements and next steps for our project, beyond the scope of the master thesis itself.

The test was conducted by distributing the finished website to the Norwegian design community through the Slack channel UX Norge which at the time of writing has approximately 3000 members. They were asked to provide feedback on the usefulness of the guide and project as a whole by either direct messaging us on Slack or by using the built-in feedback questionnaire on Wix. The site received around 200 views and approximately 10% of visitors left feedback either through the embedded feedback form or by directly reaching out to us.

The key insights gained here were:
- Designers and innovators who reached out to us were happy to see a product such as designforelders.com and were excited to utilize the guide in their future work.
- The guide clearly created interest in all visitors as the average viewing time on designforelders.com was 8 minutes and 18 seconds.
- The topic on how to design for elders is an engaging one. Several of the forums we shared the guide in merged from feedback-giving to a general discussion on elders and design.
- A few designers mentioned they desired something more tangible like a poster that they could download and use in their work.

Feedback received through impersonal and indirect forums such as these could be argued to be less effective, as only 10% of viewers gave feedback and the feedback received was largely positive, with little detailed feedback to be found. We argue this feedback is still valuable as it shows how compelling design for elders is within the design industry and seems to indicate that designforelders.com has

helped quell some of the need for information on how to design for elders. However, user testing is a never-ending process, and we believe extensive testing is a natural next step for the project if it is to be expanded upon after delivery.

Conclusion of Results Chapter

In this chapter the main body of work done for this master thesis has been presented. We have presented all our findings in detail through descriptions, visualizations and quotes and extracted key insights. These key insights were then analyzed and a new re-defined problem statement was developed to better represent the problems identified. Finally, a solution to these problems was created and tested through an iterative co-design process resulting in a guide that can help designers and innovators design more accessible and usable digital services and products for digitally lacking, cognitively impaired elders. This solution is presented in full in the Solution chapter.

4

Solution

Solution

In this chapter the final solution to our problem statement will be presented. We will explore whether this solution does in fact answer our problem statement and related How Might We questions and look at future improvements and next steps for the project.

What is The Final Product?

In this master thesis we have explored the problem of how we can enable designers and innovators to create more inclusive, accessible and usable digital services and products for digitally lacking, cognitively imparied elders. The result and solution is a set of five guidelines that each contain insights and tips that provide an understanding of elders as a user group and help on how to accommodate these individuals within the design process. The insights are a description of our research findings, while the tips (how to help) are suggestions on how to use the insights in practice. The guide's five guidelines are presented on a website, designforelders.com, to make them easily accessible for the primary user group, designers and innovators. We offer this guide as a supportive learning tool to inspire designers and innovators to include elders and cognitive design seriously in a more meaningful way than previous guides, by bringing the cognitive aspect to the forefront. This solution will hopefully help designers and innovators to navigate and aid the predicted increase in elderly individuals in the population, and the consequences this may bring to the design industry.

5 Guidelines for Inclusive Design for Elders

1. The Digitally Lacking Elder

The first guideline is "the digitally lacking elder". Here we show how elders vary in digital competency, and that cognitive functions can impact their use of digital services and products. As counteractive measures, we suggest simple visual language, using relevant illustrations and being aware of unrepresentative insights. Each of the five insights in the guide is accompanied by one or two quotes to anchor the textual content directly to the research we have done.

The variation in digital competency is a crucial context to understanding the rest of the insights presented. Some designers may believe that most elders are completely non-digital, while others might believe that most elders are extremely digitally competent. The context of the digitally lacking elder is key to:
1. Realizing that this topic is relevant.
2. Understanding what the other insights presented are based on.

The tips to use relevant illustrations and be aware of unrepresentative insights can be seen as especially valuable. These are tips that we have not found in other general design principles, guidelines and heuristics in use today. The tips presented throughout the guide have been organically created through a deep understanding of the elder user group specifically, and offer a new perspective on inclusive and cognitive design.

① The Digitally Lacking Elder

Elders today vary in digital competency. The majority can be defined as digitally lacking. As we age, cognitive functions decline at various degrees and at various speeds for different people which impacts the use of digital services and products.

Digital competency is not about being digital or non-digital, but rather a scale from non-digital, through digitally lacking, to digitally competent. The vast majority of elders are placed somewhere in the middle and can be defined as digitally lacking in competence in various ways. While some elders are completely non-digital, an equal number are also very digitally competent.

HOW TO HELP

Simplify Visual Language
Keep a simple visual language (icons, pictures, illustrations, etc). Do not rely on design conventions that elders may not understand without explanation or verification. Be sure to explain what they are, and user test that they work.

Use Relevant Illustrations
Make sure illustrations (media, pictures whatever) serve a relevant function, and are not just there as a decorative measure. Some elders will try to find the connection between the illustration and other content, and can get confused, or conclude that they are missing something if this connection does not exist. Others might mistake illustrations as an interactive part of the user interface, and feel stupid or frustrated when the interaction is unsuccessful.

Be Aware of Unrepresentative Insights
Recognize that the insight you gather on elders will likely be unrepresentative to some degree. It is difficult, if not impossible, to reach the most vulnerable users in our society, including the least digital elders. Be aware that your solution may need simplification beyond what your insights reveal.

"I would say that around 60% of those who live around me are not that good with digital things."

Elder

"There are elders who are digital outsiders, but the vast majority are digital in some way. It ranges from being able to use a mobile phone to being very digital. Being digital isn't a thing, it's a scale."

Designer

Figure 27: Guideline 1: The Digitally Lacking Elder.

2. Feelings & Frustrations

The second guideline is "feelings & frustrations". Here we establish a powerful sense of empathy towards elders, by showcasings their frustrating experiences and how it makes them feel. We advocate that when elders interact with digital services and products that are not inclusively designed, they can get stressed, fearful and often hesitate while making choices. As counteractive measures, we suggest being mindful of redesigns, clarifying expectations and actions, incorporating extra confirmations for actions and only asking for the information one requires.

According to our user tests, this guideline had the most valuable insights, as it includes the core of elders needs and pain points. The insights in this guideline creates value by allowing designers to understand clearly how their designs might affect the user group and also aids them in improving these effects. To be mindful of redesigns is an especially important tip to establish usability for elders, and designers and innovators saw this as an innovative suggestion during testing.

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(2) Feelings and Frustrations

When elders interact with digital services and products, they can get stressed, uncertain, intimidated, and some even experience fear.

When navigating and making choices, elders often hesitate and feel uncertain about their choices both before and after making them. Several are afraid to make irreversible mistakes that can have huge consequences for themselves or other individuals. Some are unable to separate between plausible consequences, such as sending money to the wrong bank account, and implausible consequences, like giving away all their savings by clicking the wrong button.

Elders are also afraid to learn about technology in general, as they feel like there is too much to learn and understand. They fear that their skill level is worse than that of others of similar age or experience. Additionally, most elders are aware of potentially dangerous interactions online, like scams or fishing, which results in an unwarranted skepticism for all interactions with digital services and technologies which are frequently present in the wrong contexts.

HOW TO HELP

Be Mindful of Redesigns
Both small and large redesigns and updates will likely confuse and stress your elderly users, as they struggle to relearn. Reflect on the motivations and reasonings behind redesigns and updates beforehand. Be helpful by providing guides, and consider offering extra help in the days and weeks after a redesign or major update.

Clarify Expectations and Actions
Our insights show that some elders might have unrealistic fears of the consequences of their actions. Allow elders to understand what happens when they perform an action before it is performed, in order to feel safe.

Incorporate Extra Confirmations for Actions
Help ensure that elderly users understand and can confirm that they wish to complete the action.

Only Ask for Required Information
Only ask for the information you require at any given time. Explain why you need that information to ensure that elderly users understand and feel in control.

> "I see how angry my friends get with certain apps. I understand well that they have to update and change them, but every time there is an update, there is also a new challenge for elders. When we have learned the system, it changes again and we cannot keep up."
>
> **Elder**

> "They are uncertain in the digital world in the first place, so they get easily stressed when they have to fill something out."
>
> **Designer**

Figure 28: Guideline 2: Feelings and Frustrations.

3. Cognitive Challenges

The third guideline is "cognitive challenges". Here we show designers and innovators how cognitive challenges like decreased problem-solving abilities and decreased processing speed can lead to information overload and other forms of stress. As counteractive measures, we suggest avoiding complicated language, keeping text relevant and concise, refraining from stressing a choice and making actions and buttons descriptive.

This guideline provides value by helping designers and innovators gain knowledge on cognitive challenges that they otherwise may not have realized had such a large impact on elderly users. Additionally, if implemented and used consistently by designers and innovators, these insights and tips will help lessen the cognitive load elders experience when completing digital tasks.

③ Cognitive Challenges

Old age impacts elders' cognitive functions in various ways. They might use more time, struggle with prolonged focus, and find it difficult to comprehend complicated content online. Some might struggle with problem-solving, and experience decreased processing speed and information overload more frequently than other user groups.

Decreased cognitive function, means that elders need more time to absorb, process, and interact to avoid getting stressed. This is especially true with digitally lacking elders. Many designers are aware of this, but struggle to avoid information overload while still trying to keep the elders' focus and give enough information to make the content understandable. Some designers express uncertainty when it comes to how cognitive issues affect elders' use of their services. Our insights show that designers discuss and describe these cognitive challenges often, but the vast majority do not identify them as cognitive challenges.

HOW TO HELP

Avoid Complicated Language
Technology terms that may be unfamiliar to elders. Instead, use short, simple sentences with concrete, everyday words. Avoid abbreviations and complicated punctuation.

Keep Text Relevant and Concise
Some elders might feel pressed to read all text presented on the page, but struggle to keep focus long enough to complete.

Refrain from Stressing a Choice
Avoid stressing users by forcing them to make a choice before they are ready, such as time limited offers. Give them time and space to process and move forward at their own pace.

Make Actions and Buttons Descriptive
Actions and buttons should be more descriptive than simply "Read more". Be sure to rather add context by writing "Read the article" or similar.

"The elderly spent a lot of time evaluating the nuances of the answer options [in our survey], something they did not need to do at all. So we have tried to remove things that can create confusion."

Designer

"Time is a thing with the elderly, as they are stressed by the quick pace of digital services today. Therefore, digital services aimed at elders must have a different time span, as they become more stressed."

Designer

Figure 29: Guideline 3: Cognitive Challenges.

4. Navigational Challenges

The fourth guideline is "navigational challenges". With this guideline, we show that navigation is a major challenge for elders who often struggle to navigate within a digital hierarchy and understand digital navigational language. As counteractive measures, we suggest sequencing content into smaller sections, making backtracking as understandable as possible, allowing for multiple ways of navigation, giving feedback during navigation, nudging users to scroll when needed and keeping choices to a minimum.

This guideline creates value by providing designers and innovators with something more tangible, like navigation, to focus on and improve while designing for elders. Designing digital services and products can be overwhelming, but by lending a helping hand in crucial steps of the process, like while the information architecture and navigational prompts are created, we help designers make informed choices that can lead to more inclusive designs for elders.

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④ Navigational Challenges

Navigation is a huge challenge for elders and might struggle with otherwise simple navigational cues and navigational language.

Some elders struggle to navigate back and forth between pages and tabs and in general understand established navigational language, like for example the hamburger menu. Designers struggle to know what navigational language elders understand and what they cannot rely on. Some elders do not understand scrolling conventions, like scrolling up, down, or sideways when navigating digital services and products. Others prefer this method compared to navigating back and forth within a hierarchy of pages to receive information.
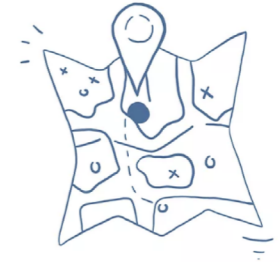
HOW TO HELP

Sequence Content
Divide content into several sequences to avoid information overload. It is important to find a balance between avoiding information overload and keeping focus.

Make Backtracking Understandable
Be sure that elderly users understand how to go back to a previous page or action. Consider carefully whether the word "back" and it's convention is understood clearly.

Allow Multiple Ways of Navigation
Have tolerance for variety in navigation, as elders will have different ways to navigate. Some elders struggle to learn new ways of navigating and might feel frustrated if they can't navigate the way that they already know.

Give Feedback During Navigation
Create navigational structures that allow elderly users to feel in control. Be sure to give them clear feedback on where they are, where they are navigating next and other possibilities for navigation.

Nudge Users to Scroll When Needed
Be sure to clearly communicate when scrolling is an available option.

Keep Choices to a Minimum
Be aware that some elders struggle to process and navigate too many choices, due to a decline in cognitive function. Many prefer making one choice at a time rather than several choices at once.

"Before the menu was on the left side, and you also had a main page with a summary. But then the users were most concerned with the main page and did not notice the menu. Now there is only a menu."

Designer

"Things that seem obvious are not. Even when just scrolling on a website, we have to guide a little more than we usually do. We need to create several alternative ways to do something on the same screen."

Designer

Figure 30: Guideline 4: Navigational Challenges.

5. Isolation & Independence

The fifth and final guideline is "isolation and independence". In this guideline, we show that elders feel pressured to use technology to avoid becoming isolated from an increasingly digital society, and that many lack independence as they are forced to seek out help to overcome digital challenges. As counteractive measures, we suggest helping users through helpful text, information-text-buttons, FAQ's, tips, and explanations, supplying human contact options and being forgiving with typos and mistakes in places that require user input.

This guideline creates value for designers and innovators as the introductory insights show how much independence an elderly user might lose if inclusive design is not considered. The guidelines insights promotes empathy and provides important reasoning to why inclusive design and the tips suggested in the guideline should be considered. It can be helpful both for the design itself, but also when in discussion with stakeholders or other business partners to help argue for a more inclusive approach. For elders it creates value by counteracting the isolation and independence issues they are currently experiencing. Additionally, it argues for the importance of real, human contact, something they miss in today's digital age.

⑤ Isolation & Independence

Elders struggle to keep up with the fast-moving and innovative pace of technology but feel pressured to use it to avoid becoming isolated from society.

They desire independence in their daily lives as they are often forced to seek out help from spouses, family, and friends to overcome digital challenges, for example paying bills online. Some elders are forced to share personal data to overcome these digital challenges. While some are aware that they should not share certain personal data, they don't feel like they have any other alternatives.

HOW TO HELP

Offer a Helping Hand
Help your elderly users through helpful text, information-text-buttons, FAQ's, tips, and explanations.

Supply Human Contact
Consider providing easy-to-find customer support like an online chat or phone number users can get help from.

Be Forgiving
Digital services and products should be forgiving of typos and mistakes in places that require user input, such as search fields, forms, etc.

"I will keep up to date, even when I retire. You have to keep up all the time or you will quickly fall behind."

Elder

Figure 31: Guideline 5: Isolation and Independence

Designforelders.com

Although our main delivery and solution is the five guidelines, each containing insights and tips, it was important to find an appropriate way to present these to make them as accessible as possible to designers and innovators, the primary user group. Discussions with a selection of designers and innovators through workshops, showed that designers and innovators wanted a solution that was easily accessible, retrievable and shareable, resulting in designforelders.com. This website presents the guidelines containing insights and tips, as well as some context on the overall master thesis project. The website is available both in desktop and mobile versions.

Front Page

At first arrival at the website, users are met with an introduction to the project. Why is this an important topic of conversation, and what is the aim of the website? Through the introduction we answer the questions we found most pressing to address, as our workshop and user tests revealed concerns and questions designers and innovators often had. Additionally, this first impression backs up the importance of design for elders with some statistics from Statistics Norway to contextualize and anchor the project in the upcoming substantial increase of elders in the population. As all content is not shown in full, the user is encouraged to scroll down to receive more information. They are served with an overview of the five guidelines we present on the page with the option to either click on them individually to navigate to them instantly, or continue scrolling.

The introduction and project context section on the front page are more suited to the inexperienced designers and innovators (in the sense of having little experience with designing for elders) we met while conducting our user tests. It allows them to gain vital insight into why this problem and user group is something they should take seriously. An experienced designer will be more interested in immediately getting the insights and tips in each guideline. This is why we have ensured that the journey from the introduction to the overview of the five guidelines, and from there the insights themselves, is short.

The five guidelines with insights and tips are then presented with accompanying quotes and illustrations. At the bottom of the page the user is prompted to provide feedback through a feedback form so that we can improve and adapt to user needs and wants.

Figure 32: First section of the front page of designforelders.com in the final solution.
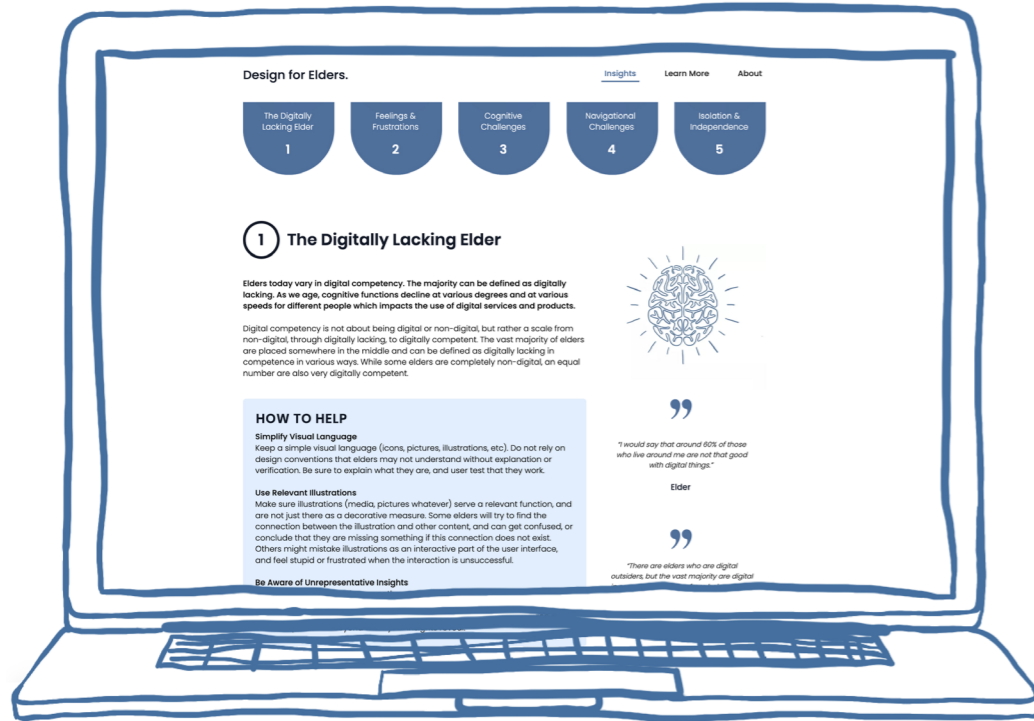
Visit the website

Figure 33: The Digitally Lacking Elder (inside laptop screen):

Design for Elders. Insights Learn More About

1 The Digitally Lacking Elder

Elders today vary in digital competency. The majority can be defined as digitally lacking. As we age, cognitive functions decline at various degrees and at various speeds for different people which impacts the use of digital services and products.

Digital competency is not about being digital or non-digital, but rather a scale from non-digital, through digitally lacking, to digitally competent. The vast majority of elders are placed somewhere in the middle and can be defined as digitally lacking in competence in various ways. While some elders are completely non-digital, an equal number are also very digitally competent.

HOW TO HELP

Simplify Visual Language
Keep a simple visual language (icons, pictures, illustrations, etc). Do not rely on design conventions that elders may not understand without explanation or verification. Be sure to explain what they are, and user test that they work.

Use Relevant Illustrations
Make sure illustrations (media, pictures whatever) serve a relevant function, and are not just there as a decorative measure. Some elders will try to find the connection between the illustration and other content, and can get confused, or conclude that they are missing something if this connection does not exist. Others might mistake illustrations as an interactive part of the user interface, and feel stupid or frustrated when the interaction is unsuccessful.

Be Aware of Unrepresentative Insights

"I would say that around 80% of those who live around me are not that good with digital things."
Elder

"There are elders who are digital outsiders, but the vast majority are digital"

Figure 33: Second section on designforelders.com in the final solution, showcasing the first guideline: The Digitally Lacking Elder.

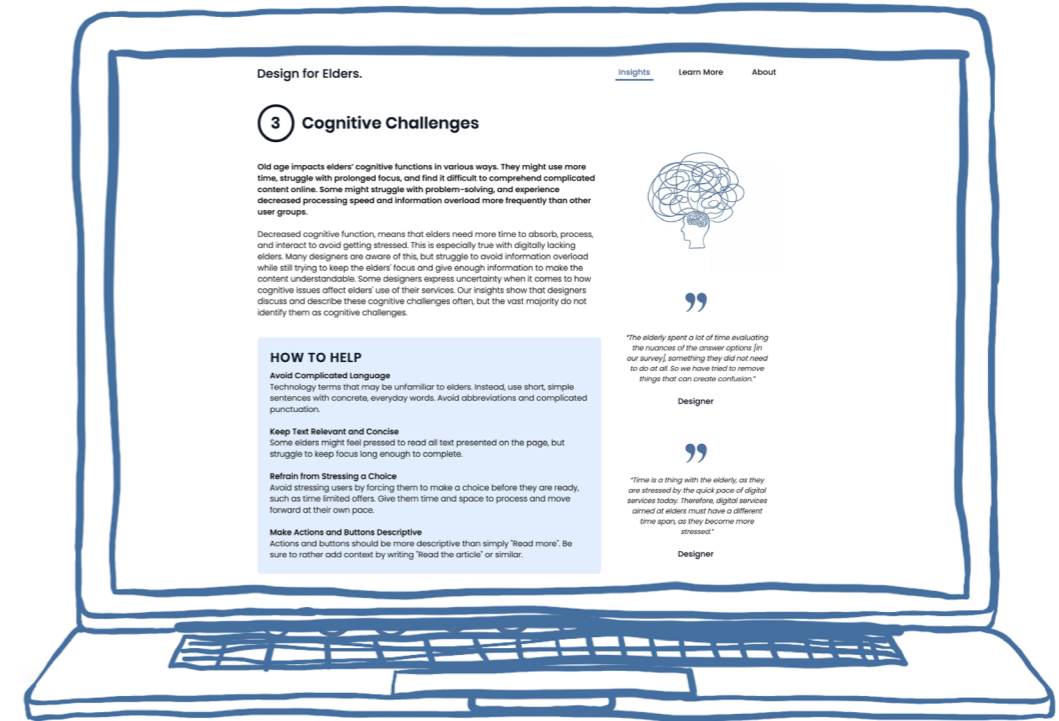Figure 35 (inside laptop screen):

Design for Elders. Insights Learn More About

3 Cognitive Challenges

Old age impacts elders' cognitive functions in various ways. They might use more time, struggle with prolonged focus, and find it difficult to comprehend complicated content online. Some might struggle with problem-solving, and experience decreased processing speed and information overload more frequently than other user groups.

Decreased cognitive function, means that elders need more time to absorb, process, and interact to avoid getting stressed. This is especially true with digitally lacking elders. Many designers are aware of this, but struggle to avoid information overload while still trying to keep the elders' focus and give enough information to make the content understandable. Some designers express uncertainty when it comes to how cognitive issues affect elders' use of their services. Our insights show that designers discuss and describe these cognitive challenges often, but the vast majority do not identify them as cognitive challenges.

HOW TO HELP

Avoid Complicated Language
Technology terms that may be unfamiliar to elders. Instead, use short, simple sentences with concrete, everyday words. Avoid abbreviations and complicated punctuation.

Keep Text Relevant and Concise
Some elders might feel pressed to read all text presented on the page, but struggle to keep focus long enough to complete.

Refrain from Stressing a Choice
Avoid stressing users by forcing them to make a choice before they are ready, such as time limited offers. Give them time and space to process and move forward at their own pace.

Make Actions and Buttons Descriptive
Actions and buttons should be more descriptive than simply "Read more". Be sure to rather add context by writing "Read the article" or similar.

"The elderly spent a lot of time evaluating the nuances of the answer options [in our survey], something they did not need to do at all. So we have tried to remove things that can create confusion."
Designer

"Time is a thing with the elderly, as they are stressed by the quick pace of digital services today. Therefore, digital services aimed at elders must have a different time span as they become more stressed."
Designer

Figure 35: The third guideline, Cognitive Challenges, on designforelders.com in the final solution.

Figure 34 (inside laptop screen):

Design for Elders. Insights Learn More About

2 Feelings and Frustrations

When elders interact with digital services and products, they can get stressed, uncertain, intimidated, and some even experience fear.

When navigating and making choices, elders often hesitate and feel uncertain about their choices both before and after making them. Several are afraid to make irreversible mistakes that can have consequences for themselves or other individuals. Some are unable to separate between plausible consequences, such as sending money to the wrong bank account, and implausible consequences, like giving away all their savings by clicking the wrong button.

Elders are also afraid to learn about technology in general, as they feel there is too much to learn and understand. They fear that their skill level is worse than that of others of similar age or experience. Additionally, most elders are aware of potentially dangerous interactions online, like scams or fishing, which results in an unwarranted skepticism for all interactions with digital services and technologies which are frequently present in the wrong contexts.

HOW TO HELP

Be Mindful of Redesigns
Both small and large redesigns and updates will likely confuse and stress your elderly users, as they struggle to relearn. Reflect on the motivations and reasonings behind redesigns and updates beforehand. Be helpful by providing guides, and consider offering extra help in the days and weeks after a redesign or major update.

Clarify Expectations and Actions
Our insights show that some elders might have unrealistic fears of the consequences of their actions. Allow elders to understand what happens when they perform an action before it is performed, in order to feel safe.

"I see how angry my friends get with certain apps. I understand well that they have to update and change them, but every time there is an update, there is also a new challenge for elders. When we have learned the system, it changes again and we cannot keep up."
Elder

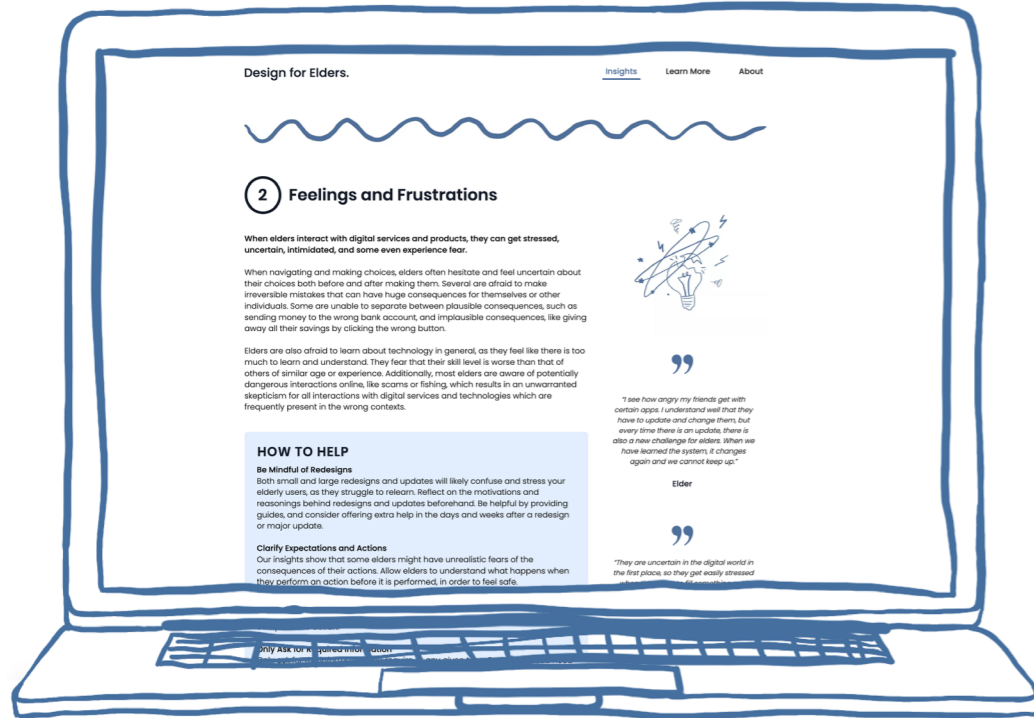"They are uncertain in the digital world in the first place, so they get easily stressed"

Figure 34: The second guideline, Feelings and Frustrations, on designforelders.com in the final solution.

Figure 36 (inside laptop screen):

Design for Elders. Insights Learn More About

5 Isolation & Independence

Elders struggle to keep up with the fast-moving and innovative pace of technology but feel pressured to use it to avoid becoming isolated from society.

They desire independence in their daily lives as they are often forced to seek out help from spouses, family, and friends to overcome digital challenges, for example paying bills online. Some elders are forced to share personal data to overcome these digital challenges. While some are aware that they should not share certain personal data, they don't feel like they have any other alternatives.

HOW TO HELP

Offer a Helping Hand
Help your elderly users through helpful text, information-text-buttons, FAQ's, tips, and explanations.

Supply Human Contact
Consider providing easy-to-find customer support like an online chat or phone number users can get help from.

Be Forgiving
Digital services and products should be forgiving of typos and mistakes in places that require user input, such as search fields, forms, etc.

"I will keep up to date, even when I retire. You have to keep up all the time or you will quickly fall behind."
Elder

Give us Feedback!   Learn More →

Figure 36: The fifth guideline, Isolation and Independence, on designforelders.com in the final solution.

Learn More

In the navigation menu of designforelders.com the user will find the "Learn More" page. This page provides a bit of context for the project thesis, but is mostly focused on providing a number of resources related to inclusive design, design for elders, cognitive design and similar.

The "Learn More" page creates value by offering extended learning opportunities for the primary users: Designers and innovators. We recognize that our insights and tips presented through the five guidelines are not, and cannot be, all-encompassing. The knowledge of elders we present in our solution is but a fraction of everything we learned and researched throughout this project. The designers and innovators who come across this guide will undoubtedly have questions and many will want to research further. The "Learn More" page is offered as a helping hand by encouraging further reading and research outside the scope of this solution. Additionally, it lifts up important academic and design thinking based works that may not be as commonly known.

About

To ensure the credibility of designforelders.com, it was important to put the website into a context and offer information on the project as a whole. The "About" page describes how the website and project came to be, how our data was retrieved and who was behind it. This provides value to the project by providing credibility and reliability to our guide.
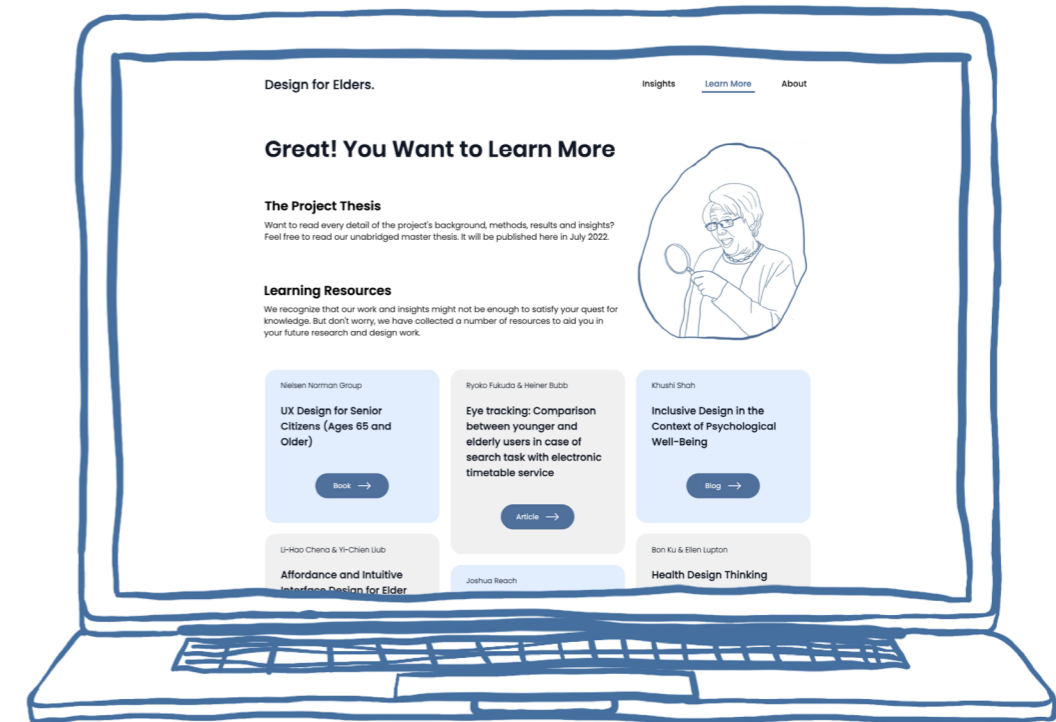
Figure 37: The Learn More page on designforelders.com in the final solution.
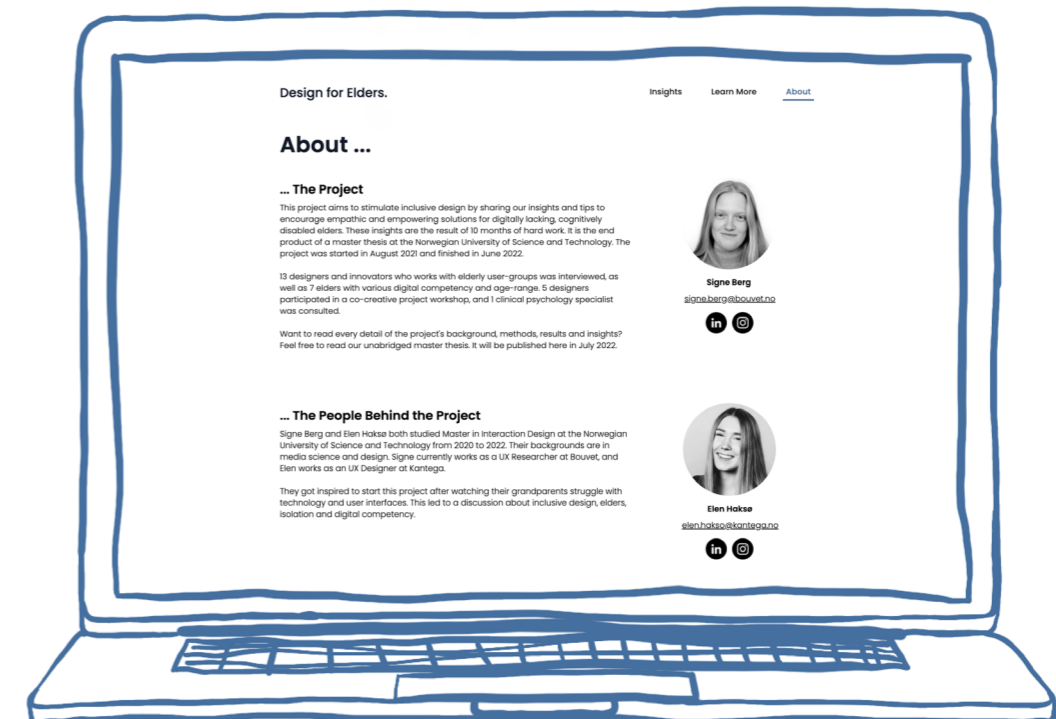
Figure 38: The About page in the on designforelders.com in the final solution.

How Will This Guide Be Used?

While it is difficult to predict future behavior, it is necessary to explain the intended use of the guidelines for the primary user groups. We have done this through the creation of storyboards. These storyboards can be seen as an end goal or dream scenario for our solution and showcases our belief that our solution can inform and enlighten, and be used consistently by designers when making design decisions and in discussions with designers or other stakeholders.

The insights included in each guideline will probably be equally important to inexperienced designers as experienced designers, as the insights from the co-design workshop revealed that designers in general were very interested in reading our insights about elders. However, the tips included in the "how to help" section of the guidelines are especially applicable for the inexperienced designers, providing them with tangible suggestions to follow and offering a helping hand by guiding them through the design process. The "how to help"-tips will likely have extra value for inexperienced designers, as they do not have as much experience with elders. This is exemplified in Joakim's storyboard 2.0 seen in figure 39, in order to visualize how the inexperienced designer might utilize the guide.

One might think that the guide will benefit the inexperienced designer the most, as they do not have the same knowledge about elders as the experienced designer. One major takeaway from the co-design workshop was that experienced designers working with elders are experts at solving problems and converting insights into innovative solutions. They did not necessarily need help with solving user problems, however they needed help understanding them. Additionally, the guide might be utilized by experienced designers as a way to substantiate their argument, and help shed light on the importance of inclusive design for elders. As exemplified in Jenny's storyboard 2.0 seen in figure 40, the insights and tips presented through the guidelines, can be used as argumentation in for example team discussions with stakeholders, project leaders, developers, product owners, financers and similar to advocate for inclusive design. This was seen as a huge asset in our user testing.
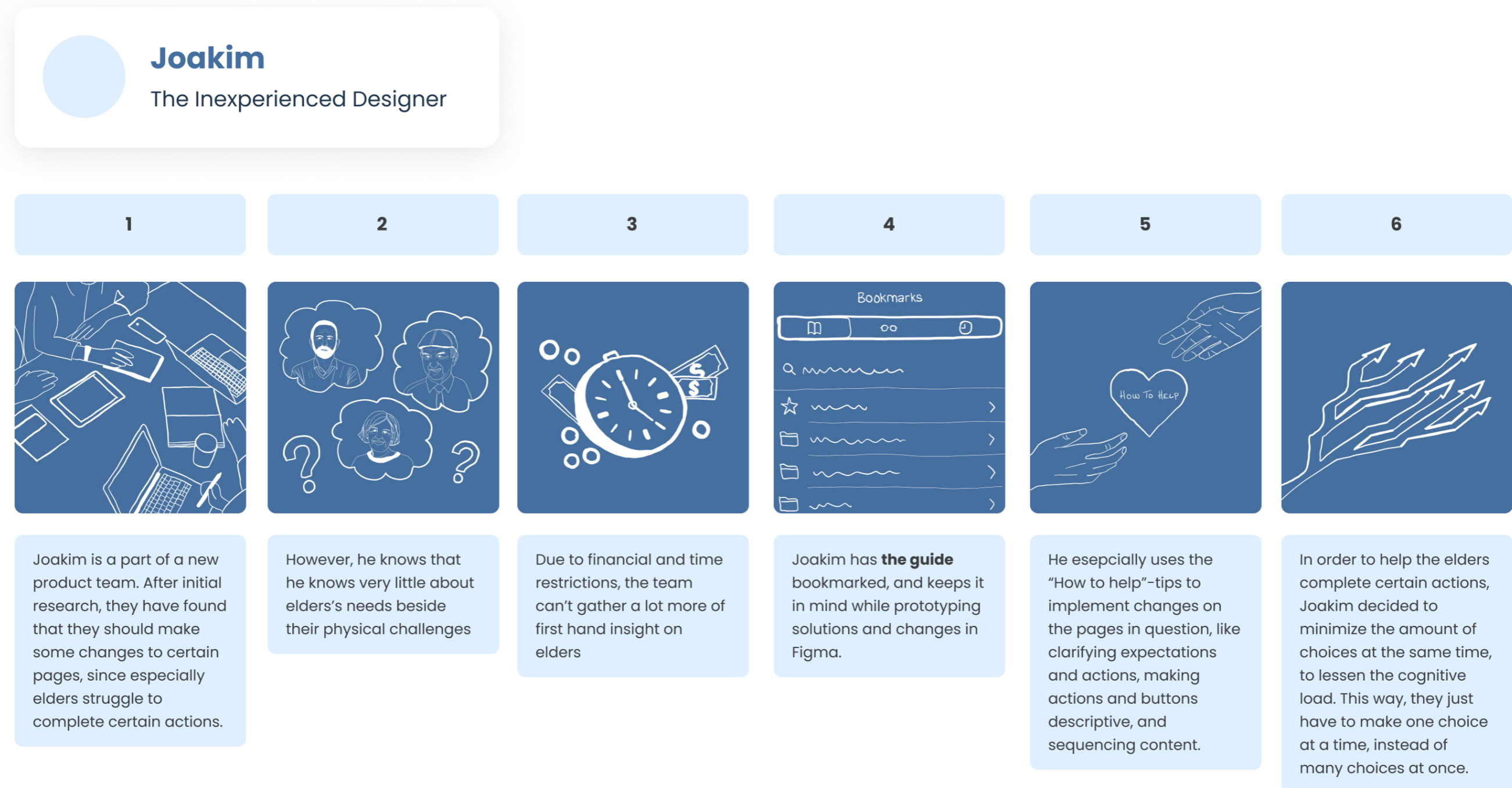
Storyboard 2.0 – Use of Guidelines

Joakim
The Inexperienced Designer

1	2	3	4	5	6

1 — Joakim is a part of a new product team. After initial research, they have found that they should make some changes to certain pages, since especially elders struggle to complete certain actions.

2 — However, he knows that he knows very little about elders's needs beside their physical challenges

3 — Due to financial and time restrictions, the team can't gather a lot more of first hand insight on elders

4 — Joakim has **the guide** bookmarked, and keeps it in mind while prototyping solutions and changes in Figma.

5 — He esepcially uses the "How to help"-tips to implement changes on the pages in question, like clarifying expectations and actions, making actions and buttons descriptive, and sequencing content.

6 — In order to help the elders complete certain actions, Joakim decided to minimize the amount of choices at the same time, to lessen the cognitive load. This way, they just have to make one choice at a time, instead of many choices at once.

Figure 39: Joakim's storyboard 2.0. How the inexperienced designer might utilize the guide as a helping hand by guiding them through the design process, and the challenges of designing for elders.

Storyboard 2.0 – Use of Guidelines

Jenny
The Experienced Designer

1	2	3	4	5	6

Participating in a digital team-meeting, Jenny finds herself discussing the new updates that will go into production shortly.

Other members of the team presses the time restrictions, and would like the new design updates published as soon as possible.
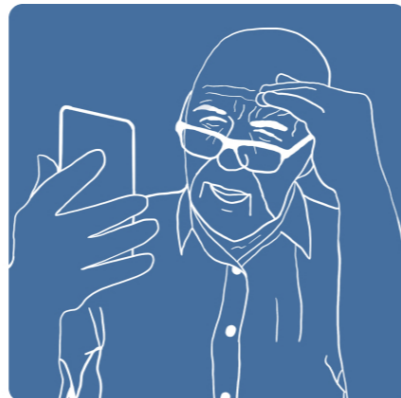
Jenny knows that a fair amount of the users that will be affected by the new design updates are elderly users, and that they will likey stress while trying to relearn.

She expresses her concerns, but are met with dismay: "I'm sure they will learn it eventually", and "Should we really use time on stressing about that?". However, Jenny knows it's her role to advocate for these users.

She decides to use **the guide** as a way to substantiate her argument. She shares her screen in the meeting, and presents the guideline about feelings and frustrations. The guide suggest to be mindful of redesigns, as both small and large redesigns and updates will likely confuse and stress elderly users.

The team discussed how it will affect the elderly users, but also which other users that will face the same frustrations. After discussing, the team concludes that they should spend a bit of time brainstoming how they can help these users relearn, and what kind of help and support would be best.

Figure 40: Jenny's storyboard 2.0. How the experienced designer might utilize the guide as a way to understanding elders better, and use it as a way to substantiate arguments in for example team discussions.

How This Solution Answers Our Problem Statement and How Might We Questions

Now, let us return to the problem statement and how might we questions that began this design process and evaluate whether this solution answers them all and how effectively.

How Might We give designers and innovators the knowledge they require to design for elders?

In our solution we argue that by presenting designers and innovators for both insights and tips on how to design for elders, we allow them both to receive information by itself to inspire choices, and additional tips that can help inexperienced designers make informed choices. Even the experienced designer requires an intimate understanding of elders to make accurate and helpful design choices, while the inexperienced designer may need more guidance through the tips in the how to help section.

In terms of content, the insights and tips presented in "The Digitally Lacking Elder" guideline specifically provide important context to understanding design for elders. By pushing away the notion that most elders today are either completely non-digital or completely digitally competent, but rather are somewhere in the middle, we argue the importance of designing for the digitally lacking. By showing designers that the information they gather themselves throughout the design process may be unrepresentative in one way or another, we contribute to ensuring that this information is used consciously, while still keeping the even more vulnerable users in mind. The insights and tips introduced in the "Feelings & Frustrations" guideline, includes core needs and pain points that elders may experience, which is hugely important information for designers to make informed choices. However, the insights and tips presented in the "Cognitive Challenges' ' guideline gives extended knowledge in an area where designers knew very little, experienced designers included, and therefore provides knowledge designers otherwise may not have realized had such a large impact on elderly users.

One can always argue that more knowledge than what is presented in our solution is required for designers to design adequately for elders. However, in this solution and in this context we opted to scope down the amount of content to the core elements to regain the attention of our users and rather encourage those willing to further investigate to learn more from the resources provided on designforelders.com. To conclude, we argue that we through these steps have given designers and innovators the knowledge they require to design for elders.

How Might We make inexperienced designers feel more confident in their ability to design for elders?

As briefly mentioned above, the tips included under how to help for each guideline allows inexperienced designers to feel more confident by offering a helping hand and guiding them through the design process with tangible suggestions to follow (see storyboard in figure X and X). The insights themselves are equally important to inexperienced designers as experienced designers, but the "how to help" tips will likely have extra value for inexperienced designers. The "Cognitive Challenges" guideline is especially interesting as the insights and tips provide new and valuable information to inexperienced designers, and help them on their way to become more experienced with the elderly user group.

Additionally, Designforelders.com is an easily accessible tool that can be kept open on a laptop during a project, bookmarked for later, and shared with colleagues to further spread knowledge on design for elders between inexperienced designers. There is of course an argument to whether inexperienced designers will find this page, as they may not be as active in the goings-on of the community as others, however by giving the website an easily recognisable and searchable name, we believe our solution will present itself to the inexperienced designer when it is searched for. We argue therefore that our solution is capable of making inexperienced designers feel more confident in their ability to design for elders, if (as with anything else) they gain access to it.

How Might We help experienced designers gain explicit knowledge on cognitive limitations and how to counteract these in their designs?

Throughout this process we have gained much knowledge on cognitive limitations in elders and how these affect their use of digital services and products. This understanding is baked into all insights and tips presented in our guidelines. However, to ensure that designers and innovators understood that they were gaining knowledge on cognitive limitations explicitly, we also created a separate guideline for cognitive challenges specifically, so that we could speak about these limitations directly. This was important as one might argue that it is inevitable that elders will feel stressed or uncertain in the face of technology, as this is what we are used to seeing. However, as we have shown, this stress and uncertainty is connected to a loss of cognitive function and lack of facilitation for these losses. Here the tips again become hugely important, as even experienced designers feel inexperienced when it comes to cognitive design, and therefore will require more of a helping hand on how to counteract them. Several of the tips mentioned in the "Cognitive Challenges" guideline are commonly known. Avoiding complicated language and making actions and buttons descriptive are not groundbreaking tips, however, by focusing on the cognitive aspect of design and providing the reasoning behind these tips, we believe we argue for additional simplification; for example, even simpler language than many may first consider.

Our "Learn More" page also has a large focus on cognitive design and psychologies' influence on inclusive design, offering further reading that can help designers and innovators to gain explicit knowledge on cognitive limitations. Additionally, the solution encourages those interested to read the full master thesis report for deeper understanding and knowledge. Together we argue these points allow us to say that our solution helps experienced designers gain explicit knowledge on cognitive limitations and how to counteract these in their designs.

How Might We help designers and innovators advocate for more inclusive design beyond the scope of laws and regulations?

All our insights and tips within the five guidelines help designers and innovators advocate for more inclusive design beyond the scope of laws and regulations, by providing real, tangible evidence for why certain decisions should be made above others. This evidence comes from reliable qualitative data from a recognized institution, and can be used as argumentation in discussions with stakeholders, project leaders, financers and similar to advocate for inclusive design in for example team discussions, similarly to how The 7 Principles of Universal Design and the 10 Usability Heuristics for User Interface Design are used today. The resources found under the "Learn More" page can be used for a similar purpose. Therefore, we believe our solution helps designers and innovators advocate for more inclusive design beyond the scope of current laws and regulations.

How Might We lessen the cognitive load digitally lacking elders feel when completing digital tasks?

Throughout this thesis we have argued that by giving designers and innovators more knowledge, understanding of and empathy with elders, we will help lessen the cognitive load digitally lacking elders feel when completing digital tasks, as the solutions and products those designers create will in return be more accessible. This argument is based on the idea that an informed designer is a conscious designer who makes choices based on what is best for their users. All this is of course dependent on the fact that our primary user group, designers and innovators, actually read, consider and hopefully implement the insights and tips presented under each guideline. However, some designers may not be able to do that, be it for financial, political or other reasons. It will also take time to see the effects these guidelines may have on the design industry and such an effect is therefore difficult to measure.

We argue that for the scope of this thesis and project as a whole, we are able to help lessen the cognitive load digitally lacking elders feel, however there is certainly a need for continued work in this area to heighten the awareness of design for elders within the design industry.

By addressing these core How Might We Questions we argue that we have answered our problem statement: **How can we enable designers and innovators to create more accessible and usable digital services and products for digitally lacking, cognitively imparied elders?**

We believe that more accessible and usable digital services and products will emerge when designers are given the opportunity to learn about and develop empathy for elders. They are able to make more informed choices which will lead to fewer pain points and higher usability for elders. As elders can be defined as a vulnerable user group, it is more important than ever to share knowledge within the design industry to better everyone's experience. Our five guidelines, in line with Berg & Haksø's (2021) concluding argument, provide insights and tips that do not rely on designers' knowledge of or ability to remember elders' needs, but explicitly states how one can improve one's design to benefit elders and why it is important. Thus, designers and innovators can enable their insight-gathering to go further and deeper than it otherwise would have. For projects that are unable to conduct user research on elders specifically for whatever reason, this guide will be vital to ensure proper measures are taken to include elders in design decisions. We argue that despite the plethora of previously developed guidelines, heuristics and principles, there is still a place for a tool that does not rely on designers' knowledge or understanding of elders' needs to be useful, and that makes design for elders more accessible by gathering and simplifying previous and new knowledge.

We saw in our insights that designers wanted extended knowledge on elders and explicit recommendations for how to design for them. We also saw that experienced designers desired a heightened awareness on design for elders within the industry. Through the five guidelines

with insights and tips created in this project, and designforelders. com, we believe we have answered the designer's wishes and given them the tools they need to use both our own and other resources in a more effective manner in the future by extending their knowledge and understanding of elders. Additionally, the existence of the website, and the attention it might receive will in itself heighten awareness on design for elders by making it a talking point for further reflection and potential action.

Together, all this enables designers and innovators to create more accessible and usable digital services and products for digitally lacking, cognitively imparied elders.

Future Improvements and Next Steps

Digital products and services live in an ever-changing digital universe and fast innovation will always be accompanied by new needs, pain points and a demand for research. This project therefore will never be completely finished, in the sense that it must follow and adapt to the changes of the world and society. The aim for this project was not to deliver a finalized, set-in-stone product, but rather a guide that can be further tested, iterated and expanded upon in the future. In the same way as accessibility guidelines and similar need to be continually updated to not become outdated, so will our guide be required to change and adapt in line with the new creative processes and technologies the future will bring. Therefore, this project will not be considered completed once the master thesis has been delivered, but will be continuously worked on to adapt to these changes.

As mentioned in our introduction, we believe guidelines are at their best when they can be adapted and changed by the primary user group to fit their goals, needs and situation, and this was our goal. By including a feedback form within the solution we are able to receive feedback directly from the primary user group and conduct continuous updating to satisfy user needs. These future improvements will be crucial to the project's longevity and ability to remain relevant in a world of constant innovation and change.

As mentioned in our Results chapter, we believe extensive testing is a natural next step for the project if it is to be expanded upon after delivery, as we plan. Additionally, we believe that to remain relevant and accessible to the design industry, we need to meet them where they are. Therefore we plan to pitch this project as a presentation that can be held at relevant design conferences. We also believe these presentations can be beneficial for designers in both the private and public sector, and plan to offer this as a service in future. This way the project and website will live on. At the time of writing we already have four interested parties for such presentations with further talks planned for august 2022.

Throughout this project we have worked to help designers gain knowledge on cognitive limitations elders may experience and how they may counteract these in their designs. Despite this we are still left with a desire to include more cognitive knowledge in our solution in future. We received a lot of information from specialist and researcher in clinical psychology Oddbjørn Hove (PhD), and were able to confirm that our guidelines can help lessen the cognitive load elders feel when completing digital tasks. However, we would have liked to have time to delve deeper into the field of psychology ourselves and learn even more about cognitive impairments that we could communicate to other designers and innovators. This would have given the project more academic depth and likely allowed for even more unique and interesting perspectives. Additionally we believe it would have been beneficial for designers who desire an even deeper understanding of cognitive design to create a summary or similar of various research articles in more understandable, less academic language, to make cognitive research more accessible to those interested.

Finally, designers and innovators wanted a solution that was easily accessible, retrievable and shareable, resulting in designforelders. com. Creating the website was prioritized as this was the most substantial demand, and would allow quick access to the entire design industry. However, designers also mentioned that they desired something tangible they could use in a non-digital space, like a poster or similar they could print out and hang in their office. Due to time constraints this wish was not possible to fulfill, but we plan to create both a poster and a PDF version of the website that can be downloaded from the website in future. Designforelders.com should not, and will not, only exist in the digital cloud of the internet. We believe that creating something tangible to accompany the website will work as a constant reminder for designers and innovators to design both inclusively and for elders.

Together, these form the future improvements and next steps for this project after delivery.

Conclusion of Solution Chapter

In this chapter we have presented the final solution to our problem statement. We have created a set of five guidelines that each contain insights and tips that provide an understanding of elders as a user group and help on how accomodate these individuals within the design process. The guide's five guidelines are presented on a website, designforelders.com, to make them easily accessible for the primary user group, designers and innovators. We have explored whether this solution has answered our problem statement and How Might We questions and argue that more accessible and usable digital services and products will emerge when designers are given the opportunity to learn about and develop empathy for elders through our guide. Finally we have looked at future improvements and next steps for the project to ensure the project lives on and is able to remain relevant in an ever-changing digital landscape. In the next chapter we will discuss our results and solution in a larger academic context.

5
Discussion

Discussion

In this chapter we will discuss our results and solution in a larger academic context. We will discuss more in depth why we believe the context of inclusive design was more beneficial to this thesis than that of universal design. We will then look at whether one should focus on designing for all to increase accessibility for elders or whether one should focus on designing accessibly for elders to ensure usable design for all. Finally, we will discuss whether the digitally lacking elders will become extinct as today's elderly leave us and the digital young become the future elderly generation.

Universal Design and Inclusive Design

As mentioned in our Introduction chapter, this thesis establishes itself as a continuation of the work done within inclusive design. Here we would like to discuss more in depth why we believe the context of inclusive design was more beneficial to this thesis than that of universal design.

The concepts of universal design and inclusive design in an international setting are in many ways very similar. Although universal design is often linked to a fixed set of regulations, requirements or success criteria, and inclusive design is considered more of a mindset for inclusion, they are both similar approaches that work to increase accessibility of interactive systems. In the Norwegian context, as we have seen, universal design is often linked to 'universell utforming', a set of legal requirements for both the public and private sector set in place by Norwegian law, which aim for a society where everyone can participate (see Bendixen, K. & Benktzon, M., 2015). This means that to Norwegian designers, the idea of universal design is firmly planted in the laws and regulations of 'universell utforming' (see Bendixen, K. & Benktzon, M., 2015). Therefore, discussing any inclusivity beyond these laws and regulations is very challenging within a universal design

context as any mention of universal design starts a discussion on 'universell utforming'. We saw this in our interviews where the question "How do you work with universal design and inclusive design today?" was initially answered by discussing 'universell utforming' and the laws and regulations designers are placed under. Inclusive design was referenced only once in our interviews by one designer. In contrast, universal design and its national regulations was a topic of conversation in all designer interviews, and referenced exactly 50 times.

We realized that opening up the thesis to be concerned with inclusive design instead of universal design allowed for a much deeper, more meaningful exploration to take place in future insight-gathering activities such as our workshop. It allowed the conversation to go beyond the current laws and regulations in Norway and rather discuss things such as internal awareness of inclusivity and what help is lacking in current 'universell utforming' regulations. We believe that by stimulating inclusive design as opposed to universal design in our solution we will encourage empathic and empowering solutions for a digitally lacking, cognitively imparied generation of elders in a Norwegian setting more successfully than if we had continued on the path of universal design, as inclusive design opens up to go above and beyond current laws and regulations.

We found it important to explore inclusive design beyond the laws and regulations of 'universell utforming' and create our tool within the mindset of inclusive design. These 'universell utforming' regulations are quite rigid and difficult to understand. There is much to get acquainted with from the designer's perspective and the regulations are mostly seen as a checklist that you check off right before release. A frustrating pain point that designers mention is that the motivation for universal design is often linked to laws and regulations rather than a genuine wish to improve a digital service or product for specific user groups. One hits many checkpoints when designing using the 'universell utforming' regulations, but one is not encouraged to go the extra mile. In other words: Our insights show that this kind of

checklist system is useful, but it does not encourage designers to make conscious and informed choices throughout the whole design process.

We argue it is more beneficial to inclusivity to keep accessibility in mind throughout the process. This is more time efficient, more economical and removes the need to accommodate inclusivity only after the service or product has been created. This of course does not mean that 'universell utforming' is without value, as it is hugely beneficial to have inclusivity enforced through laws and regulations, however we argue one also needs tools that encourage designers to make conscious and informed choices throughout the whole design process.

Designing for Elders or Designing for All?

Throughout this process there has been disagreement among the designers and innovators on whether one should focus on designing for all to increase accessibility for elders or whether one should focus on designing accessibly for elders to ensure usable design for all. We saw this in our interview insights and we discussed it during our workshop. The question "isn't that just design for all?" has also been one of the first questions the authors of this thesis have been asked when discussing the project with colleagues or other designers. These arguments are of course two sides of the same coin, however they are interesting to consider. Especially since we say the goal of this thesis is to stimulate inclusive design for all by focusing on design for elders.

First, let's look at how the different design norms differ in this consideration. Within the realms of universal design and inclusive design one could say there is no clear preference for either argument. Universal design does perhaps lean more to the side of design for all, as its definition is literally to design products that are "usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Persson et al, 2015). In the Norwegian context the idea of universal design is firmly planted in the laws and regulations of 'universell utforming' (see Bendixen, K. & Benktzon, M., 2015), which aim for a society where everyone can participate. This too leans towards the argument of design for all.

Inclusive design however, has a more open definition as its focus is to include a wide range of diverse users by constantly expanding the design process to accommodate a diverse range of users, as we develop a greater understanding of their requirements, desires and expectations (Persson et al, 2015). Here Perssons focuses on the fact that we designers need to develop an understanding of our user needs to be able to design inclusively towards them. Design for all itself is defined as "'design for human diversity, social inclusion and equality" (EIDD, 2004, in Persson et al, 2015, p. 507), with the added definition that "everything that is designed and made by people to be used by people – must be accessible, convenient for everyone in society to use and responsive to evolving human diversity" (ibid.). Once again the idea of everyone is mentioned in this definition. The designs must be usable by everyone in society and able to encompass all. We see then that perhaps with the exception of inclusive design, the norm within these accessibility strategies is to design for all to increase accessibility, including accessibility for elders. However, how would this work in practice?

Design for all has a very noble aim, but it is not necessarily the most inclusive in the end. It can become very overwhelming, as "there simply is too great a range of human abilities and too great a range of situations or limitations that an individual may find themselves" to be able to achieve or sustain such a goal of design for all (Harper, 2007). Harper (2007) argues that to create accessible and usable products within a design for all methodology, one needs to make generalizations about the users, and that these generalizations end up excluding the exact users the designer is trying to design for. He suggests that a design team may stretch themselves too wide in their quest for design for all to the point where no user group gains true accessibility as it is impossible to keep all potential users and all potential situations in mind and create a product which is flexible enough to accommodate these different users and situations (ibid.). This argument can also be found in our insights. Despite some disagreement, many designers we interviewed believed that if your design is elderly-friendly, it is friendly to many other user groups as well, which you may not be able to see as clearly. The participants in our workshop believed that the concept of design for all is too wide and that when one tries to design for all

one ends up designing for no one. Design for all sounds very inclusive, however we argue based on our insights that in practice design for all will indeed become too general, that if you try to embrace everyone, you end up embracing no one.

The authors of this thesis argue that to design inclusively and create accessible solutions that go above and beyond the laws and regulations universal design can offer, we ought to remove ourselves from the vague and generalized ideas of "all". Rather, we should designate certain user groups, such as elders with cognitive and physical limitations, as our focus points and design for the more precise challenges we know they encounter. As our insights show, this will allow designers a more detailed understanding of the users they are designing for, motivating better solutions that in the end will benefit a much larger audience than the user groups the designers focused on, simply because many challenges are shared between groups. Designing for elders allows designers to focus on more concrete challenges, resulting in more precise and accessible solutions that will benefit all users in the end.

One cannot be expected to know every single need, every single pain point of all potential user groups and all potential disabilities. That is near impossible, one has to pick and choose some things to focus on, and that is also what we see being practiced in the design industry today. Decreased eyesight, hearing or other physical disabilities have a high awareness, and we are slowly seeing some cognitive and emotional disabilities such as phobias taken more seriously in the gaming world (see Phillips, 2020).

Case studies and tips on how to design for users with depression or anxiety are slowly also appearing in general discourse (see Alr, 2020 and Vallerjo, 2019). So we see that the design industry is slowly increasing the number of disabilities it takes into account on a regular basis, however this is happening at a slow rate, with one new disability being focused on and included at a time. We argue that instead of focusing on one individual disability at a time, the design industry should instead focus on one larger user group and their common disabilities. By doing this we argue the design industry would be able to learn to design for a vast array of disabilities simultaneously, stimulating faster innovation in the domain of inclusive design.

Take the elder user group for example; by designing for elderly users and their physical and cognitive limitations, one would cover big sub-groups of disabilities. Our insights show that elders struggle with issues such as decreased eyesight, hearing loss, reduced processing speed, memory loss, rapid information overload, issues with problem solving and prolonged focus.

They also struggle with feelings such as stress, fear, uncertainty, frustration and similar that can be symptoms of not only old age, but also anxiety, or other cognitively challenging disabilities. By facilitating for the challenges elders have, by for example simplifying visual and written language, you will also facilitate for everyone else in society who also struggle with these challenges, no matter the underlying disability. Some may not even have a disability, but have decreased cognitive function when going through a particularly emotional or turbulent time in their life, or a time where sleep is hard to come by, like when having small children.

By designing for vulnerable user groups such as elders first, we are able to create more inclusive solutions for those who are weakest in our society, in addition to creating better and more intuitive solutions also for those who are strongest. To Jon Sandford and Elena Remillard's argument that "if we don't set our design goal unrealistically high, we are likely to fall far shorter from the ideal than we will if we set the ideal as the design goal" (Sandford & Remillard, 2021, p. 179), we say; **our ideal should indeed be design for all, but the realistic road to get there can be found in design for elders.**

How we suggest one should design for the digitally lacking, cognitively impaired elder has been presented in this master thesis. It is important to note however, that designing for elders does not allow for quick, simple adjustments at the end of a design process, but rather, just like universal design, inclusive design and design for all, it is a perspective that needs to be considered throughout the design process. This means elders need to be identified as important potential users at the beginning of the project, they must be included in initial research like user interviews and be continuously tested on, as the experienced designers we interviewed suggest.

Exactly how this is best done in practice is not within this master thesis' scope. But, we suspect that co-design based methods, such as those used within this thesis, can be extremely useful as they allow elders to be active participants in the design process and help create the ideal solution for themselves. Our insights show that elders are a dedicated user group who are very willing to participate and take part in design activities. They are seen by designers as a highly committed group who want to contribute and feel seen.

However, the challenges here are plentiful. As seen in our insights, when involved in the design process, elders require extra effort as they need a lot of reassurance from the design team to feel comfortable and able to help. Additionally, many designers experience issues when facilitating digital user tests with elders on Teams. Especially the need to use many different services in conjunction, like using Figma, Teams and email simultaneously , is extremely confusing and difficult for elders. Further work will be needed in this area to test and review how effective co-design based methods can be when dealing with a user group that can find design processes such as user-testing and interviews challenging and stressful.

To summarize, we have seen disagreement during this process among the designers and innovators on whether one should focus on designing for all to increase accessibility for elders or whether one should focus on designing accessibly for elders to ensure usable design for all. We believe the best designs come from those designers who truly understand their users, and their pain points, and who are able to convert these into innovative solutions. Therefore, we argue the way forward is not to design for all, neither is it to design for individual, specific disabilities, but rather to instead design for one larger user group, such as elders, and their common disabilities. By designing for vulnerable user groups such as elders first, we are able to create more inclusive solutions for those who are weakest in our society, included but not limited to the vulnerable user group we selected as our main focus. We believe this would stimulate faster innovation in the domain of inclusive design and overall generate a larger number of accessible and usable digital products and services.

Won't This Problem Solve Itself?

Throughout this process, the question "won't this problem solve itself?" has followed us. Won't digitally lacking elders become extinct as today's elderly leave us and the digital young become the future elderly generation? Here we would like to address this question.

As previously discussed, we hypothesized at the beginning of this project that the majority of the 2030 elders would be classified as a tech-savvy generation. We believed that the large number of media and technology languages future elders will have been exposed to and learned in their earlier years, would create a base of education which could aid them when they meet the technologies and languages of the future. Statistics Norway argues that we can expect a more resourceful older population in the future, as the future generation of elders are more highly educated (Stabell, 2017) and according to AARP research, older adults dramatically increased their use of technology during the covid-19 pandemic (AARP, 2021). Despite this, our findings told a different story. The reality that our insights showed us is that digital competency is not something one gains and retains for the rest of one's life, but rather something constantly challenged by technological innovation, cognitive and physical decline and one's own natural interest.

Today's technological innovation is moving fast. And many argue that it is not guaranteed that the young today will have the ability to use future technology. Hanson writes that "20 years from now it is possible

that computers as we know them may have evolved to the state where today's experience with the Web and other computing applications no longer well serves the older users" (Hanson, 2011).

Additionally, our insights show that many elders can't keep up with innovation, they become uninterested and stop learning. We saw this in our interviews, that those elders who didn't have any special interest in technology were way more likely to be completely non-digital than those who had a natural interest for technology and wanted to keep up to date. Several designers also believed that the idea that everyone will become digitally competent eventually is completely utopian. Technological innovation moves at such a pace that the idea that the digital natives of today will still be digitally competent with tomorrow's technology is not guaranteed. We argue that digitally lacking elders will not become extinct as today's elderly leave us and the digital young become the future generation, as, similarly to today's elders, not everyone in the future generation of elders will have kept up to date with technology and found this innovation interesting enough to learn how to use new technology.

In addition to fast innovation, we also need to address the increased cognitive and physical limitations elders experience. Aging tends to bring about many gradual changes in a person's perceptual, physical and cognitive ability. These can come in the form of physical limitations such as vision impairments, deafness, hearing loss, limited movement and dexterity or cognitive limitations such as short-term memory loss, lower speed of processing, and issues with problem solving in new circumstances. For those who have existing disabilities, these disabilities may worsen with age (Hanson, 2011). Our own results also show that elders experience additional stress when interacting with digital services and technology, and may have trouble navigating, experience information overload or a number of other issues.

Cognitive and physical limitations will continue to create huge accessibility and usability issues for future generations despite the digital competency they may have possessed as youths because these are age related changes that will challenge us all in the end. The idea that once

the elders of today leave us we will enter a new digital age where all individuals will be digital natives (see Prensky, 2001) and all elders will become tech-savvy, where we can remove all analog alternatives and enter a completely digitized world, is simply unrealistic.

To conclude, the problem of digitally lacking elders will not be solved with time and it is society's job to continue to accommodate not only digitally competent elders, but also digitally lacking and non-digital individuals.

Conclusion of Discussion Chapter

In this chapter we have discussed our results and solution in a larger academic context. We have seen that by opening up the thesis to be concerned with inclusive design instead of universal design we allowed for a much deeper, more meaningful exploration to take place, than if we had continued on the path of universal design, as inclusive design opens up to go above and beyond current laws and regulations. We have argued that designing for elders instead of designing for the vague idea of "all" allows designers to focus on more concrete challenges, hopefully resulting in more preise and accessible solutions that will benefit all users in the end. Finally, we have discussed whether the problem of digitally lacking elders won't just solve itself, and have argued that this is not the case as digital competency is not something one gains and retains for the rest of one's life, but rather something constantly challenged by technological innovation, cognitive and physical decline and one's own natural interest.

6
Conclusion

Conclusion

In this thesis we have aimed to answer the problem statement "How can we enable designers and innovators to create more accessible and usable digital services and products for digitally lacking, cognitively imparied elders?" by creating 5 Guidelines for Inclusive Design for Elders that will enable designers and innovators to create more accessible and usable digital services and products for elders.

By allowing them to gain key insights and knowledge on this user group we argue this solution will help designers and innovators to navigate and aid the predicted increase in elderly individuals in the population, and the consequences this may bring to the design industry. We have argued that designing for elders instead of designing for the vague idea of "all" allows designers to focus on more concrete challenges, hopefully resulting in more preise and accessible solutions that will benefit all users in the end. We recognize that following these guidelines in reality can be difficult. Time, economy, other user demands and similar can and will challenge designers ability to follow these guidelines within their projects. Therefore, as we have argued, it is pivotal that insights plays such a large role in these guidelines, so that designers can use that knowledge to argue why the steps are necessary toward stakeholders.

Throughout this process we have seen that knowledge and information on the subject of design for elders is in great demand. Both designers and innovators and academic individuals we have spoken to have been very interested in the topic and wanted us to expand our research in a plethora of ways. We therefore recognize that further work is needed within this subject and would like to suggest some possible roads for future research to explore. Firstly, this master thesis encourages further work on the problem of non-digital elders and digital exclusion, as the welfare of these individuals will be pivotal to ensure a more inclusive world in future.

We also encourage further work in the field of interaction design on how information should be structured to avoid information overload in elderly individuals. We found there was uncertainty among designers on whether one should create many sequences with little information or few sequences with much information, and further research on this will be required to continue improving design for elders.

Further work on making cognitive and psychological research more easily available and accessible to designers (by for example creating a summary or similar of various research articles in more understandable, less academic language) is also an important road to consider, as we believe this would be beneficial for designers who desire an even deeper understanding of cognitive design.

Finally, this master thesis encourages further work and testing on whether co-design based methods can be efficient and useful in a practical setting when dealing with a user group such as elders that can find design processes such as user-testing and interviews challenging and stressful.

In the meantime, we offer this guide as a supportive learning tool to inspire designers and innovators to include elders and cognitive design into their next design process.

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Appendix

Appendix A: Interview Guide For Designers and Innovators

Intro:
- Introdusere oss selv
- Introdusere prosjektet
- **Mål:** Få innsikt i hvordan designere jobber med eldre i dag, og undersøke hvilke utfordringer designere og innovatører møter ved utvikling av digitale tjenester for eldre.
- Har du noen spørsmål?

(start opptak på telefon)

Oppvarming:
- Kan du starte med å fortelle litt om deg og ditt arbeid her i *X*?

Del 1: Prosess:
- Hvordan vil du beskrive din prosess i utviklingen av design og tjenester?
  - Hvilke utfordringer opplever du?
  - I hvilket stadie av designprosessen opplever du å møte utfordringer?
  - Hvordan er din prosess sammenlignet med hvordan andre jobber i organisasjonen/bedriften?
- Hvordan vil du beskrive en typisk hovedsluttbrukeren på de tjenestene dere tilbyr og jobber med i dag?
  - Hvilken demografiske aspekter anser du som er viktig? Kjønn, alder, interesser osv.
- Hva anser du som viktig når en skal designe for ulike brukergrupper?
  - Hvilke grupper synes du det er spesielt vanskelig å designe for? Hvorfor det?
- Hvordan jobber dere med universell utforming og inkluderende design i dag?
  - Har dere noen diskusjoner med kollegaer internt eller eksternt, eller ledelse som dreier seg om dette?

(pause?)

Del 2: Eldre:
- Hvordan er din fremgangsmåte ved design og utvikling av digitale tjenester for eldre i dag?
  - Hva innebærer det for deg å skape for eldre som sluttbrukere?
- Hvilke hensyn tar dere når eldre skal være sluttbrukere av digitale tjenester dere lager?
  - Hvordan skiller det å designe for eldre vs andre brukergrupper?
- Hvilke utfordringer møter du som designer av digitale tjenester for eldre?
  - Er det et spesielt sted i prosessen at det er spesielt krevende? Er det gjennomgående i hele?
  - Er det noen verktøy som er mer/mindre verdifulle?
- Kan du fortelle litt om et tidligere prosjekt hvor eldre var regnet som en brukergruppe?
  - Hvem jobbet dere sammen med, hvem/hva var helt avgjørende for prosjektet?
  - Hva gjorde dere bra og hva kunne blitt gjort bedre?
  - Hvilke designmetoder brukte dere i tidligere prosjekter hvor eldre var regnet som en brukergruppe?
- Hvilke utfordringer opplever du at eldre har i bruken av digitale tjenester?
  - Hvordan tar du hensyn til disse?
- *(presentere guide ideen)* Hva ville du sett på som helt nødvendig å inngå i en guide for hvordan designe for eldre?

Avslutning:
- Er det noe mer du ønsker å fortelle oss?

Appendix B: Interview Guide for Elders

Intro:
- Introdusere oss selv
- Introdusere prosjektet
- **Mål:** Få innsikt i hva slags teknologi og digitale tjenester eldre bruker regelmessig, og forstå hvilke utfordringer de møter ved bruken av disse.

Oppvarming:
- Fortell litt om deg selv: Hvem er du?
- Før du ble pensjonist, hva jobbet du med?
  - Hva jobbet du med tidligere i arbeidskarrieren?
  - Hva slags skolegang hadde du?
- Hvor bor du i dag?
  - Hvem bor du med i dag?
  - Hvordan er familiesituasjonen din i dag?
  - Hvordan kommuniserer du med familien din?
- Hva liker du å bruke tiden din på nå som du er blitt pensjonist?
  - Hvorfor *X*?
- Velferdsteknologi, bruker du det? (hjelpe dem med å definere)

Del 1: Teknologi:
- Hvilke tekniske ting, som for eksempel telefon, nettbrett eller laptop, bruker du daglig?
  - Hva slags typer er dette? (Er telefonen en smarttelefon eller en fasttelefon?)
- Du nevnte at du har *X*, hva bruker du denne til?
  - Hvor ofte ville du anta at du bruker *X*? (robotstøvsuger, tv, smartapplikasjoner, playstation osv).
- Hva bruker du mest? Hva bruker du hver dag, hva bruker du innimellom?
- Hvor brukes enhetene? Kun hjemme eller tar de med ut av hjemmet? (Møter, ferier, avtaler, etc.)
- Kan du vise meg en av de digitale tjenestene du bruker mest og fortelle litt om den?
- Du nevnte at du bruker *X* hver dag/en gang i uka, hva bruker du det til?

  - Hva er det du pleier å gjøre når du er på X?
  - Hvilke nettsider pleier du å være på?

(pause?)

Del 2: Utfordringer
- Hvordan opplever du nettsider på PCen og apper på telefonen i dag?
  - Hvilke liker du spesielt godt? — Hvorfor det?
- I løpet av den siste uken er det noe teknologi som har ikke har fungert?
  - Hvordan løser du det om det ikke fungerer? (ringe noen osv.)
- Hvilke utfordringer møter du ved bruk av disse nettsidene og appene?
  - Opplever du noen aldersbegrensninger?
  - Opplever du at dette hindrer bruk?
- Du sa at du likte *X*, kan du vise meg den?
  - Kan du vise meg en app/teknologi/nettside du ikke er så glad i?
  - Er det noe teknologi du har prøvd å bruke men valgt bort fordi det ikke funket eller var for vanskelig?
- I Norge så må en benytte seg av enkelte digitale nettsider som for eksempel nettbanken, helsenorge, skattekort osv.. Hvordan forholder du deg til dette?
- Hvilke hensyn kunne du ønske at nettsider og apper tok for å forbedre din bruk?

Avslutning
- Er det noe mer du ønsker å fortelle oss?

Appendix C: Observation Guide For Elders

Oppvarming:

- Hvordan er kroppsspråket til den eldre?
- Hvordan forteller de om seg selv?

Del 1: Teknologi:

- Viser de frem teknologien mens de snakker?
- Hvordan bruker de teknologien? (Trykker flere ganger, trykker hardt, etc).
- Viser de / går inn på apper/nettsider mens de snakker?
- Sliter de med å finne rette formuleringer /navn på hva de prater om?
- Hvor ofte stiller de spørsmål med teknologien?
- Hva slags holdning har de til teknologi generelt?
- Hvordan ser enhetene ut? Godt brukt? Støvet ned? Skinnende nye?

Del 2: Utfordringer

- Har de noen bruksanvisninger? (Teip på fjernkontroll, jukselapp, etc)
- Viser de tegn til usikkerhet eller frustrasjon i bruk av eller diskusjon rundt teknologien?
- Hvor selvsikre virker de i bruken av teknologien / enhetene?
- Prater de i vei, eller svarer de kort på spørsmålene?
- Sliter de med å se skjerm, og må justere avstand til skjermen ofte?
- Holde de enhetene en bestemt måte? Hvorfor?
- Hvordan er kroppsspråket til den eldre ved prat om utfordringer?

Avslutning

- Stille den eldre spørsmål, eller ønsker de å avslutte?

Appendix D: Interview Guide For Expert Interview

Intro:

- Introdusere oss selv
- Introdusere prosjektet
- **Mål:** Målet for dette intervjuet er å få mer innsikt i hvilke utfordringer eldre møter med digitale tjenester og produkter, og få tilbakemeldinger på et utkast med heuristikker.
- Har du noen spørsmål?

Intervju del (15-20 min):

- Du har jo allerede fortalt oss litt om iSpe, men kan du fortelle litt mer om design- og utviklingsprosessen?
  - *(Stille oppfølging der det er naturlig)*
- Hvilke utfordringer opplever du at eldre har i bruken av digitale tjenester?
  - Hvordan kan designere ta hensyn til disse utfordringene under designprosessen?
  - **Hvilke kognitive hensyn bør designere ta når eldre skal være sluttbrukere av digitale tjenester de lager?**

- *(presentere guide ideen)* Hva ville du sett på som helt nødvendig å inngå i en guide for hvordan designe for eldre?

- Er det noe mer du ønsker å fortelle oss?

Validere/feedback del (25-30 min):

Vi har basert på vår innsikt, satt sammen et utkast på heuristikker, altså typ generelle guidelines som skal hjelpe designere å være mer inkluderende overfor eldre i designprosessen.

Det vi ønsker i dag, er å få tilbakemelding på heuristikkene, basert på din kunnskap som psykologspesialist, ettersom også har erfaring med tjenesteutvikling.

(Spørre om han har erfaring med Miro)

- Hva mangler? *(Hvorfor?)*

Avslutning:

- Er det noe mer du ønsker å fortelle oss?

Vil du delta i forskningsprosjektet…

"Forberedelse for eldrebølgen med høy teknisk forståelse: Hvordan designe digitale tjenester for fremtidens eldre"

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å forberede designere på den teknologikyndige generasjonen, og sikre at teknologien vi designer dekker behovene til denne nye brukergruppen. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Sammenlignet med eldrebølgen vi nå gjennomgår, har ikke bare dagens middelaldrende opplevd, men også fremmet og finansiert den enorme teknologiske eksplosjonen vi har sett de siste fem tiårene. Fremtidens eldre vil dermed uten tvil bli klassifisert som teknologikyndige og vår problemstilling i denne masteroppgaven blir: *Hvordan kan vi forbereder oss på den teknologikyndige generasjonen, og sikrer at teknologien som designes dekker behovene til denne nye brukergruppen?*

Dette brukersentrerte og co-design-baserte prosjektet ønsker å svare på dette ved å lage en kort, oppsummert guide for designere og organisasjoner som skal hjelpe designere til å forstå og ta hensyn til denne brukergruppen sine behov.

Vårt forskningsarbeid vil inkludere intervjuer, observasjoner og workshops.

Hvem er ansvarlig for forskningsprosjektet?
Institutt for Design, Fakultet for Arkitektur og Design ved NTNU er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?
Du får spørsmål om å delta fordi du passer definisjonen av vår brukergruppe. Utvalgskriteriene er at du er en person over pensjonsalder med særlig teknisk og digital forståelse. Du har svært god kjennskap til og bruk av teknologi som tablet,

smarttelefon, laptop o.l. og du bruker også flere digitale tjenester som f.eks. nettbank, sosiale medier, e-post og digitale helsetjenester.

Hva innebærer det for deg å delta?

Om du ønsker å delta vil vi gjennomføre et kontekstuelt intervju og en deltager-observasjon hvor vi ønsker å snakke om og diskutere din bruk av teknologi på ca 1 time.

Kontekstuelle intervjuer gjennomføres i en situasjonsbestemt kontekst, hvor forskere kan observere deltakeren og deres omgivelser og deltakeren også kan peke på elementer av miljøet sitt.

Deltaker-observasjoner gir mulighet for observasjon av av deltakerens bruk av egen moderne teknologi og eventuelle digitale tjenester som smarttelefoner, nettbrett, bærbare datamaskiner og smartklokker i et miljø du er komfortabel, eksempelvis i eget hjem.

Dataene som samles inn vil være dine svar på våre spørsmål som registreres gjennom notater og lydopptak.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger
Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

Kun prosjektgruppen vil ha tilgang til dine personopplysninger og navnet og kontaktopplysningene dine vil erstattes med en kode som lagres på egen navneliste adskilt fra øvrige data. Datamaterialet vil lagres på vår personlige Sharepoint side hos NTNU (OneDrive) som er beskyttet med tofaktorautentisering gjennom Feide.

Deltagerne vil ikke kunne gjenkjennes i den ferdige, utgitte publikasjonen.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?
Opplysningene anonymiseres når prosjektet avsluttes/oppgaven er godkjent, noe som etter planen er 31. August 2022. Personopplysninger og lydopptak vil slettes ved prosjektslutt.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra NTNU har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til:
- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
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- Vårt personvernombud: Thomas Helgesen (thomas.helgesen@ntnu.no)

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- NSD – Norsk senter for forskningsdata AS på epost (personverntjenester@nsd.no) eller på telefon: 53 21 15 00.

Med vennlig hilsen

Mari Bjerck	Signe Berg	Elen Haksø
(Forsker/veileder)	(Student)	(Student)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i intervju
- ☐ å delta på observasjon
- ☐ at Signe Berg og Elen Haksø kan bruke opplysninger om meg til prosjektet
- ☐ at mine personopplysninger lagres frem til prosjektslutt.

(Signert av prosjektdeltaker, dato)

Vil du delta i forskningsprosjektet…

"Forberedelse for eldrebølgen med høy teknisk forståelse: Hvordan fremme inkluderende design for fremtidens eldre"

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å forberede designere på den teknologikyndige generasjonen, og sikre at teknologien vi designer dekker behovene til denne nye brukergruppen. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

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Dette brukersentrerte og co-design-baserte prosjektet ønsker å svare på dette ved å lage en kort, oppsummert guide for designere og organisasjoner som skal hjelpe designere til å forstå og ta hensyn til denne brukergruppen sine behov.

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Du får spørsmål om å delta fordi du passer definisjonen av vår brukergruppe. Utvalgskriteriene er at du er en designer som har erfaring med å designe for eller mer eldre. Du har kunnskap om den eldre målgruppen og er opptatt av inkluderende design.

Hva innebærer det for deg å delta?

Om du ønsker å delta vil vi gjennomføre et dybdeintervju om din erfaring med å designe med og/eller for eldre på ca 1 time. Målet er å forstå brukerbehov, opplevelser, smertepunkter og bekymringer, både for eldre som bruker teknologi og for designere som jobber med eldre.

I tillegg skal vi arrangere en design workshop for våre partnere og brukergrupper som vi håper du ønsker å delta på, hvor målet er å dele kunnskap og erfaringer i fellesskap og utvikle en designguide med tema "hvordan designe for eldre".

Dataene som samles inn vil være dine svar på våre intervjuspørsmål som registreres gjennom notater og lydopptak, samt dine svar på våre workshopaktiviteter.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

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- ☐ at mine personopplysninger lagres frem til prosjektslutt.

(Signert av prosjektdeltaker, dato)

Appendix G: Workshop Plan

Introduksjon

- Ønske velkommen, si hei!
- Introduksjonsrunde (10 min): Navn, hvor man jobber, fun fact!
- Over til Miro: Icebreakers (15 min)
- Forventningsavklaring: Mål, hvorfor er de her (Vi har invitert de hit i dag i dag for å dele kunnskap og erfaringer. Slik at vi kan presentere dere for vår innsikt og arbeid så langt, men også slik at vi kan dra enda mer nytte av deres kunnskap og erfaringer). Hvilke roller har vi/dem, hvordan kan de hjelpe oss. Nevne parking: De kan alltids skrive inn ting der om de kommer på noe som ikke er relevant for (10 min)
- Har dere spørsmål før vi går videre?

Innsikt (40 min)

- Presenterer målet: Hovedmålet er å presentere dere for innsikten, da det er viktig bakgrunn for de videre oppgavene. Delmålet er å få validert om den stemmer overens med deres tolkning av problemstillingen, eller om det er noe dere stusser på.
- Fremgangsmåte: Vi presentere innsikt (Hva har vi lært? Hvordan har vi samlet innsikten? Med hvem? Hvorfor?), mens dere eventuelt legger inn tilbakemelding eller spørsmål i Miro. Vi går igjennom tilbakemeldingene etterpå.
- Spørsmål til det?

- Gå gjennom som presentasjon. 5 min stillhet til å legge inn flere kommentarer.

(*10 min pause*)

Feedback (30 minutter)
- Mål: Hva mangler, hva er uklart, hva er nyttig?
- Timer: 2.5 minutter

(*vurdere 5 pause om god tid*)

Distribusjon (30 min)

- Hvordan skal denne guiden distribueres til designmiljøet i Norge?
- Vi har noen tanker og ideer selv, men ønsker å høre deres upartiske meninger.
- Ingenting i vår masteroppgave som sier at vi må ha en distribusjonsplan, men vi føler vi har lært noe, det har vært stor interesse fra samarbeidspartnere så vi tenker det kan være nyttig for flere.
- Hvordan bør det distribueres på en måte som gjør det enkelt for dere å ta det i bruk?

Oppsummering (15 min)

- Parkingsplassen
- Avsluttende tanker og kommentarer?

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