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MASTER THESIS

eGovernment in Norway: Are Older Users Included?

Author:
Kine Lohne de Nijs

Supervisor:
Barbara Wasson

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Abstract

There is a trend in the "western" world towards digitalization of governmental services. This process has as a goal to reduce costs in the public sector by providing more of the services digitally. Older adults are a population group that are increasing in Norway. In this study, different questions regarding their inclusion in the introduction of eGovernment have been explored.

The methods used was a literature survey, interviews, and a heuristic evaluation of Norwegian eGovernment websites.

The study showed that while the regulations and guidelines are adapted to make the websites accessible for older adults, they need to be used by developers that understand the needs behind the guidelines. For older adults to use the websites they require understanding of why and knowledge of how to do so.

The study also showed that there is ethical consideration here. How much do we force the older adults to adapt to the technology, or do we adapt the technology to them?

Keywords: Older adults, eGovernment, accessibility, guidelines., ethics, e-Inclusion

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Chapter 1

Introduction

In 2014 11% of the population in Norway was over 70 years old. Statistisk sentralbyrå (2014) estimates that by 2060 19% of the population in Norway will be over 70 years old. This increase shows that this group of older adults is growing more and more important as users of online resources. Two out of three Norwegian between 65 and 74 use the Internet. Norway have started on a quest to be one of the leading countries internationally when it comes to development of a digital public sector (Ministry of Government Administration, Reform and Church Affairs, 2012).

1.1   Personal Inspiration

I have had an interest in universal usability since my bachelor degree where I worked together with a fellow student that had visual impairments. I then learned how important it is for programs and websites to be usable also for those that have extra challenges. Watching my grandparents struggle with the changing society and with the changes towards more technology, I came to see that older adults is one of those groups that have extra challenges.

1.2   Digitalization in Media

In April 2011 an article was published in the online newspaper VG by Murtnes (2011). This article says that the new digital mailbox "Digipost" that was launched that day would take over and become more effective than the ordinary mailbox. The intent was that all letters from public institutions, banks, and insurance companies would de delivered electronically. Hilde Ebeltoft-Skaugrud from Posten Norge (the company behind Digipost), said in an

interview with Murtnes (2011): *"It will be a lot easier and not at least safer for the users to relate to"*[1].

Bergen Municipality became one of the first municipalities that transferred to digital mail. In December 2015 they started sending out letters from the municipality to the residents through digital channels (Tjeldeflåt, 2015). City councillor Ulstein said in a newspaper article:

> "As a private person we expect dynamic and seamless Internet services. Within trade, bank, and insurance services it have been a very large development the last few years. There is no reason that the municipalities should not be similar[2]. (Tjeldeflåt, 2015)".

In November 2016 NAV[3] stopped sending out payment slips to pensioners in Norway. From then the only place to find them was by logging on to nav.no and retrieving them (Bugge, 2016b). It was first publicized that it was not possible to opt out of getting them digital, and within the next week, after pressure from senior citizens organizations and media and intervention by the Minister of Labour and Social Affairs Anniken Hauglie, this was reversed so that by calling in and making a request pensioners could still recieve their payment slips in the regular mail (Bugge, 2016a).

1.3   Research Questions

Today, the ability to use computers and websites becomes more and more a necessity, also for those who did not grow up with computers. As designers and programmers it is important to take the needs of "non-traditional"[4] users into consideration and make our products and services accessible for a wide audience with differing needs.

There are regulations, standards, and guidelines to help us adress the needs of these users. In this project one of the goals is to examine these regulations, standards, and guidelines and see if they take the needs of older adults into consideration. In addition as Norway is moving towards digitalization of government access and services, another field of interest is how this process includes or excludes older adults, and how these older adults deal with the digitalization.

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[1]Translated from Norwegian.
[2]Translated from Norwegian.
[3]Norwegian Labour and Welfare Administration
[4]A term used by Patsoule and Koutsabasis (2014) to describe e.g older users

Based on these areas of interest, 4 research questions have been defined:

1. How do the different universal access regulations and guidelines cover the needs of older adults?

2. How does the digitalization of government take the needs of older adults into consideration?

3. Is digitalization of government something older adults understand and how do they relate to it?

4. Which ethical issues ought to be taken into consideration when it comes to digitalization of public services and older adults?

1.4   Thesis organization

This thesis comprize 8 chapters. Chapter 2 outlines the methodology used. Chapter 3 presents a literature survey covering the research of relevance to this study. In chapter 4 the different digital mailboxes are introduced and a heuristic evaluation is presented. Chapters 5 and 6 report on individual interviews and a group interview. In chapter 7 the information gathered is discussed, organized around the research questions. The final chapter, chapter 8, summarizes the findings.

In this thesis elderly, older adults, seniors and similar terms all refer to people between 65 and 80 years, unless otherwise specified.

Universal access, universal usability, and universal design are all terms that refer to the design of ICT that will be available for a multitude of users. The terms cover design towards blind, hearing impaired, people with handicaps, and people with varying degrees of cognitive impairments.

Chapter 2

Method

In this project, several different methods were used: desk research, that resulted in a literature survey; interviews with a representative from Bergen Municipality and elderly computer users; a focus group; and a heuristic evaluation of the relevant websites.

As identified in chapter 1 the research addresses the following 4 research questions:

1. How do the different universal access regulations and guidelines cover the needs of older adults?

2. How does the digitalization of government take the needs of older adults into consideration?

3. Is digitalization of government something older adults understand and how do they relate to it?

4. Which ethical issues ought to be taken into consideration when it comes to digitalization of public services and older adults?

To answer question 1 the literature survey concerned with guidelines, a heuristic evaluation, interviews with elderly and a focus group were performed. Question 2 was answered with the help of the literature survey and interviews with both a representative from Bergen Municipality and with interviews with older adults. To answer question 3 the literature survey was consulted together with interviews with the older adults. The final question, 4, was answered primarily with the findings in the literature survey, but with help of the interviews and focus group.

2.1   Literature Survey

The first step in the desk research was to carry out a survey over existing literature and work within the field, beginning with defining the search terms to use. The themes of interest in the research are eGovernment and the needs of older adults when it comes

to usability and using eGovernment services. Based on this, three search terms where decided upon *"eGovernment"*, *"older adults"*, and *"usability"*. For each of these search terms synonyms were identified, which resulted in the set of search terms presented in table 2.1

TABLE 2.1: Table of the search terms used in the litterature survey

eGovernment	Older Adults	Usability
eGov	Seniors	Universal access
Digital government	Elderly	Universal design
E-government	aged	

The initial search was performed with the search engine *"Web of Science"*. This was supplemented with similar searches on *SpringerLink* and *ACM*. These searches gave about 800 unique results, many of which were not relevant for this study. The searches were performed again, and limited to results within information science[1]. This reduced the results to around 400 articles and chapters. Close to 200 of them were discarded for being about semantic technologies.

In the next phase of this survey, the results were reduced further, initially based on the abstract, and the number of a relevant articles and chapters was reduced to 40. This more manageable number of articles, was sorted into categories based on the topics they addressed. The topics include design and evaluation methods, design guidelines, eGovernment, ethics, HCI, and requirements. In table 2.2 an overview of the literature and the topics each of them covered is presented.

To help with the analysis of this survey a CAQDAS (Computer-Assisted Qualitive Data AnalysiS) program, NVIVO, was used for the coding and retrieving of the material. A CADQAS helps the researcher keep track of codes and stores data, but the researcher must still interpret the data, code the data and analyse it (Bryman, 2012). Figure 2.1 presents the different nodes under wchich the data was coded.

The results from this survey is presented in detail in chapter 3.

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[1]This was done by setting the databases to only show results from the computer science or information science disciplines.

TABLE 2.2: Overview of the literature and categories

	Design and Evaluation Methods	Design Guidelines	eGovernment	Ethics	HCI	Requirements
Anderson et al. (2004)		✓			✓	✓
Antona, Mourouzis, and Stephanidis (2007)	✓				✓	✓
Aula (2005)						✓
Ayachi et al. (2015)			✓		✓	
Becker (2004)		✓	✓			✓
Charness and Jastrzembski (2009)	✓			✓		✓
Choudrie, Ghinea, and Songonuga (2013)			✓	✓		✓
Curzon et al. (2004)			✓			✓
Czaja and Lee (2006)		✓				✓
Darzentas and Miesenberger (2005)		✓		✓	✓	✓
Dickinson et al. (2005)						✓
Edlin-White et al. (2012)	✓			✓	✓	
Frid et al. (2015)			✓	✓	✓	✓
Fuglerud (2009)						✓
Hawthorn (1998)						✓
Henry (2006)		✓		✓	✓	✓
Holland (2015)				✓		
Holzinger et al. (2008)	✓					✓
Holzinger, Searle, and Wernbacher (2010)	✓					
Leahy and Dolan (2009)			✓	✓	✓	✓
Leist and Smith (2014)			✓		✓	✓
McLean (2011)				✓		✓
Mordini et al. (2009)				✓		
Morris, Goodman, and Brading (2006)						✓
Mourouzis, Antona, and Stephandis (2010)	✓			✓	✓	
Niehaves and Plattfaut (2010)				✓		✓
Patsoule and Koutsabasis (2014)	✓	✓				
Persson et al. (2014)				✓	✓	
Pilling (2010)		✓	✓			✓
Rømen and Svanæs (2011)		✓			✓	✓
Sayago and Blat (2011)					✓	✓
Schulz and Pieper (2007)					✓	✓
Sixsmith (2013)				✓		✓
Üzüm and Göktürk (2011)			✓			✓
van Deursen and van Dijk (2008)			✓			
van Velsen et al. (2008)	✓		✓			✓
Wallace et al. (2010)			✓	✓		✓
Warf (2013)			✓	✓		
Wilkowska and Ziefle (2009)				✓		✓
Yao et al. (2011)				✓		✓

Hierarchical Nodes

```
Design                                    HCI
Guidelines

WCAG 1.0    WCAG 2.0          Usability and      Web
                             Accessibility    Accessibility

                    Requirements

Cognitive    Computer    Digital Literacy    Hearing    Physical     Vision
Impairments   Anxiety                                   Impairments
```

Non-hierarchical Nodes

```
Design and          eGovernment          Ethics
Evaluation
Methods
```
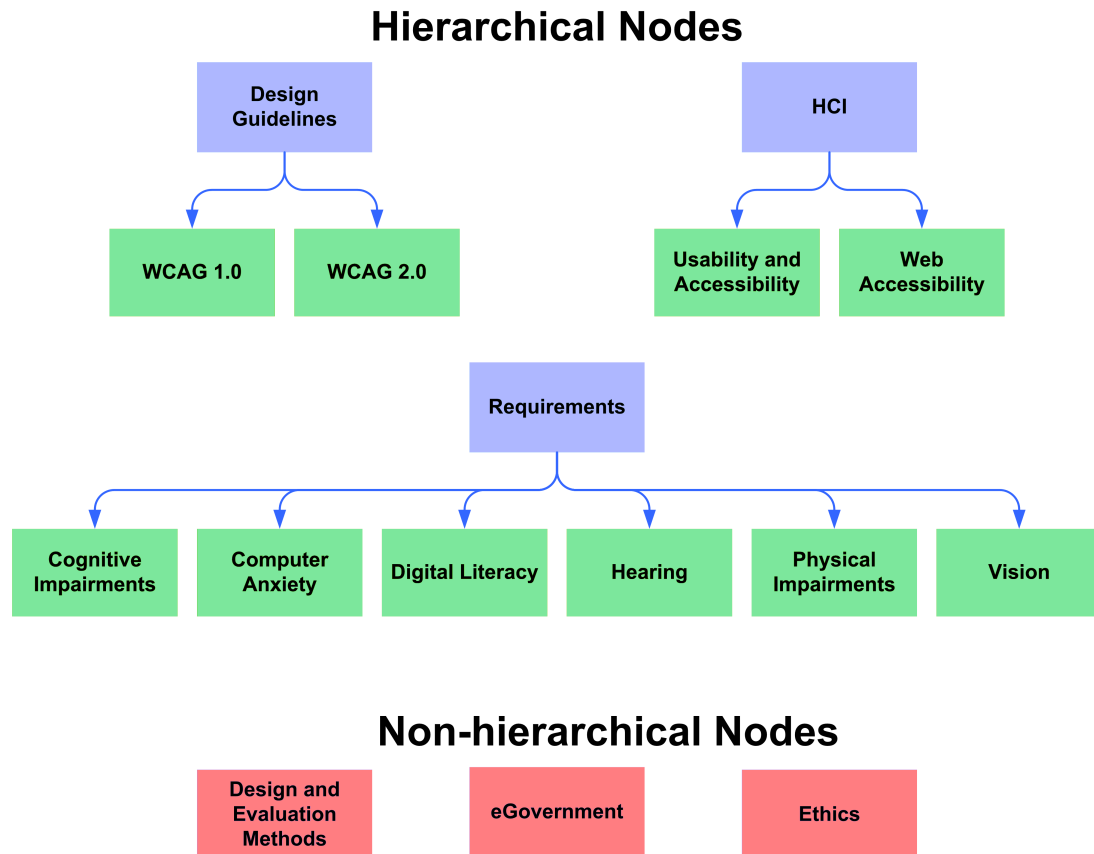
FIGURE 2.1: The different categories the literature survey was sorted into.

2.2 Heuristic evaluation

Heuristic evaluation is an inspection method for conducting usability research without the involvement of users. It is an informal method where an expert role-playing a user evaluates a website based on a set of heuristics (Sharp, Rogers, and Preece, 2011). These heuristics can be drawn from exciting sets of heuristics, or developed from design principles, or similar.

The heuristics used in this research have been drawn from Nielsen's set of heuristics (Nielsen, 2005). Two of Nielsen's heuristics are included:

- *Consistency and standards.* Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

- *Help and documentation.* Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

From the results of the interviews and the literature survey it as chosen to focus on the text size and contrasts on the website: How well do the websites zoom, and does changing the contrasts make the websites easier?

Usually there are between five and ten different heuristics and three to five experts performing the evaluation. In this research where the evaluation is one of multiple methods used, with a reduced number of heuristics, two experts has performed the evaluation. The results of this heuristic evaluation is presented in chapter 4.

2.3   Semi-structured Interviews

Bryman (2012) distinguishes between two main groups of interviews, *structured* and *qualitative*. There are two kinds of qualitative interviews, *unstructured* and *semi-structured*.

> "These different kinds of interviews share some common features, such as the eliciting of information by the interviewer from the interviewee and the operation of rules of varying degrees of formality or explicitness concerning the conduct of the interview" (Bryman, 2012).

Unstructured interviews take the form of a conversation where the interviewee decides what they want to talk about, and what they feel is relevant for the interviewer. A *structured interview* takes the same form for all interviews, and uses an interview guide that must be followed the same way for all interviews. This kind of interview gives data that can be aggregated into statistics.

In a *semi-structured interview* the interviewer is not as bound by the interview guide as they would be in a structured interview. This interview form allows the interviewer to ask follow-up questions and ask for clarifications on answers given by the interview subject (Oates, 2006; Østbye, Helland, Knapskog, and Larsen, 2013). The questions can be moved around as the conversation flows, or be skipped altogether.

Oates (2006) says that interviews can be a suitable data generation method when one wants to (p. 187):

- "obtain detailed information;

- ask questions that are complex; or open-ended, or whose order and logic might need to be different for different people;

- explore emotions, experiences or feelings that cannot easily be observed or described via pre-defined questionnaire responses;

- investigate sensitive issues, or privileged information, that respondent might not be willing to write about on a paper for a researcher that they have not met."

The data necessary in this project fits multiple of these criteria so it was decided to carry out several semi-structured interviews.

One of the interviews was a semi-structured interview with a representative from Bergen Municipality about the process for introducing "Digital by Default" to the residents in Bergen, and the sending out of information to the residents about picking a digital mailbox. Chapter 4 contains an introduction to the digital mailboxes systems.

The other interviews were conducted with older adults living in Bergen Municipality or the surrounding area. These interviews focused on different websites that the participants knew and used, mainly governmental ones; about digitalization of government services and digital mailboxes; and about the participants usability needs when using websites.

The interviews were recorded on audio to allow the interviewer to focus on the process of the interviews, which are described and analysed in chapter 5.

2.4 Focus Group

A focus group is a specific kind of unstructured interview. In a focus group, the interviewer asks the participants to discuss a specific topic or set of topics predefined by the interviewer (Bryman, 2012; Kontio, Bragge, and Lehtola, 2008). The interviewer will lead the flow of the discussion to ensure that all relevant areas of the topics are covered. A focus group will normally have from 3-12 participants (Sharp, Rogers, and Preece, 2011; Kontio, Bragge, and Lehtola, 2008; Bryman, 2012; Østbye et al., 2013) and the goal is to have the participants discuss the topics between them and come up with their ideas and meanings through conversation with each other.

By using a focus group, the interviewer is less in prominent, which can negate situations where the strength relation between the interviewer and the interviewee is uneven. This can occur in situations where there is a large age difference between them or where one part has a larger knowledge about the topic to be discussed (Oates, 2006).

The themes for the focus group were partly determined from the results in the interview with the elderly (5) and partly from the results from the heuristic analysis (4). The participants in the focus group were asked to look at screenshots of the assorted websites discussed in this project.

Aids can be used to prompt the participants in interviews, for example screenshots or photographs (Oates, 2006; Bryman, 2012). The participants in this focus group are shown screenshots of the different variants of websites to help them with the discussion. The focus group is described and analysed in chapter 6.

2.5 Participants

Rubin, Chisnell, and Spool (2008) says that before recruiting participants for user tests one should identify selection criteria. As the group interview would be discussing different variants of websites, it was decided that this was also relevant here. Participants for the interviews and focus group were selected based on different criteria. The representative from Bergen Municipality was chosen for their knowledge and experience with the introduction of "Digital by Default" in Bergen.

The elderly participants for the interview were screened on experience with computers or tablets, and the Internet. It was considered necessary that they had familiarity with items such as a browser and website, and could use them on their own. The elderly participants in the project were recruited from the researcher's network as recommended by Rubin, Chisnell, and Spool (2008) when the desired participants are under 17 or above 65 years old.

Participants in an interview need to give an informed consent (Oates, 2006). To meet this, a consent form was developed (see appendix A) and consent was obtained from the representative from Bergen Municipality, and others from the elderly computer users.

Chapter 3

Literature Survey

This chapter presents the literature relevant for this research. It begins with studies that have been done on older adults and e-government. After that is a section devoted to the visual, auditory, physical and cognivite requirements that older adults have when using computers and the Internet. Then HCI and accessibility are presented, the section on the ethics of e-government and older adults, followed by methods for evaluating useability and accessibility with older adults. The last sections of the chapter is presentations of some relevant studies, before it ends with a short summary.

3.1 E-Government

3.1.1 eGovernment in Norway

The objective of the Norwegian government when it comes to digitalization is split in fur parts (Ministry of Government Administration, Reform and Church Affairs, 2012, p. 12):

- The public sector is to be accessible online to the extent possible.

- Web-based services are to be the general rule for the sector's communication with citizens and businesses.

- A digital public sector is to result in improved services.

- Digitization of the public sector shall free up resources for areas in more need of recourses.

The eGoverment Program is primarily directed on the services that the state offers; the counties and municipalities are responsible for digitalization of services they provide. The Norwegian government will try to ensure development of common solutions and framework that can benefit both state, counties, and municipalities.

The Norwegian eGovernment program for the digital public sector is based on nine principles, here summarized (Ministry of Government Administration, Reform and Church Affairs, 2012, p. 16-18):

1. Digital communication is to be the general rule for communication with the public sector. "Digital by Default[1]".

2. The public sector is to provide unified and user-friendly digital services.

3. Login to public online services is to be simple and secure.

4. Citizens and businesses will receive mail from the public sector in a secure digital mailbox.

5. Citizens and businesses will be notified via SMS text messages and e-mail.

6. Necessary assistance is to be provided to citizens to ensure they will be able to find and use digital services.

7. Development if ICT solutions is to be viewed in the context of the public sector's work processes and organization.

8. Protection of privacy and information security are to be safeguarded.

9. Digitization measures of relevance for several services are to be coordinated.

The different sections within the public sector have already started on becoming digitized, e.g. healthcare, with e-prescriptions and digital journals; NAV, where the pension services is already digital, and the rest is to follow before 2020; the tax administration which was the first to go fully digital; and the State Educational Loan Fund[2], which handles the student financing for all students in high school or higher education.

3.1.2 eGovernment in other countries

"*Governmental Policy in many countries of the world is to increase its communications with its citizens and increase the services available via the Internet* Leahy and Dolan (2009)". The availibility of government information and services online is refered to as "eGovernment".

The USA and UK started promoting eGovernment early. In 1999 a Modernising Government white paper was published in the UK, where one of the key elements was eGovernment; in 2002 the E-government Act.1 was signed by the president of the USA (Pilling,

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[1]Digitalt førstevalg
[2]Lånekassen

2010). The aim of both of them was, among others, to increase citizen participation in government. In UK a major goal was that the citizens were to be offered choices of personalized public services intended to be based around their needs and convenience, not the providers (Choudrie, Ghinea, and Songonuga, 2013). In 2004 the UK started working towards a more digitally inclusive society with "Enabling a digital UK"(Wallace et al., 2010).

Warf (2013) presented how eGovernment was implemented around the world. He noted how there is a divide between the "western" countries and the others on how present the different nations are online. Per the UN, see table 3.1, only 3 of the 20 countries are not from Europe, the USA, Canada, Australia, or New Zealand.

TABLE 3.1: United Nations Top 25 E-government Readiness Rankings, 2012 (Warf, 2013) [3]

Rank	Country	score
1	South Korea	.9283
2	Netherlands	.9125
3	United Kingdom	.8960
4	Denmark	.8889
5	United States	.8687
6	France	.8635
7	Sweden	.8599
8	Norway	.8593
9	Finland	.8505
10	Singapore	.8474
11	Canada	.8430
12	Australia	.8390
13	New Zealand	.8381
14	Liechtenstein	.8264
15	Switzerland	.8134
16	Israel	.8100
17	Germany	.8079
18	Japan	.8019
19	Luxembourg	.8014
20	Estonia	.7987

Warf divides eGovernment into three groups: government-to-business (G2B), government-to-government (G2G), and government-to-citizens (G2C). G2C is e.g. *"for the digital collection of taxes; electronic voting; payment of utility bills, fines, and dues; applications for various types of public programs, permits and licenses; on-line registration of companies and automobiles; access to census and other public data; and reductions in waiting times*

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[3]The inconsitency between number of countries listed in the table and the caption follows from Warf (2013)

in government offices". He notes how the transition towards more eGovernment corresponds with wishes to modernize the government and reduce the public sector by making more government functions automatic.

3.1.3   eGovernment and Older Adults

Becker (2004) writes how important online governmental websites can be for older adults; the availability of information on health issues is a major reason for older adults to get computers. eGovernment offers access to a large amount of information on governmental services, e.g. social security, tax, housing, and aging. Becker says that *"offering online access to government services and resources does not automatically guarantee that individuals will be successful at getting the information they seek. (Becker, 2004)"*

Curzon, Keith, Wilson, and Whitney (2004) write about the strategies that older people use in finding information from the government. Curzon et al. has carried out tests with several older people and have tried to discover how they find information from the government, and how they would go about finding the same information with the help of the Internet. One of the main conclusions was that as the older people had already developed strategies for finding information, it was hard for them to deal with Internet navigation. The article suggests that in website development one should take well used search strategies into the design. Most of the participants in this pilot study where novice computer users.

Üzüm and Göktürk (2011) notes how with an increasingly older population *" governments indicate a strong tendency to transfer public services to the electronic platforms, to be accessed through computers, as much as possible to reduce operational public service costs and to increase accessibility to services offered".*

The European Commission was given the following six themes to foster e-Inclusion, also including older adults, by the Riga Ministerial Declaration in 2006 (Frid et al., 2015, p. 19):

1. *E-Accessibility* – make ICT accessible to all, meeting a wide spectrum of people's needs, in particular any special needs.

2. *Ageing* – empower older people to fully participate in the economy and society, continue independent lifestyles and enhance their quality of life.

3. *E-Competences* – equip citizens with the knowledge, skills and lifelong learning approach needed to increase social inclusion, employability and enrich their lives.

4. *Socio-Cultural e–Inclusion* – enables minorities, migrants and marginalized young people to fully integrate into communities and participate in society by using ICT.

5. *Geographical e-Inclusion* – increase the social and economic wellbeing of people in rural, remote and economically disadvantaged areas with the help of ICT.

6. *Inclusive e-Government* – deliver better, more diverse public services for all using ICT while encouraging increased public participation in democracy.

Ayachi et al. (2015) introduced two ways for eGovernment services to be personalized based on two different recommender systems. A proactive system that offers services that is relevant for the user based on their social media profiles and a reactive one that offers services based on the users answer to questions. Personalization can make eGovernment services more relevant and desirable to use if the services offered there reflect the needs of the user.

3.1.4 Summary

With the introduction of eGovernment in Norway, a series of guidelines was introduced. One of the most noticeable for the citizens is that the primary way of contact with different agencies is to be digital, *"Digital by Default"*[4]. Leahy and Dolan (2009) found that a common reason to introduce eGovernment was to save resources, both human and financial. In the 2013 UN eGovernment readiness ranking Norway ranked 8th. Other researchers have done work on how accessible eGovernment services are for older adults.

3.2 Requirements

As a person ages a series of different changes affect their vision, hearing, physical and cognitive abilities, and these changes have an effect on how they can interact with computers and the Internet (Anderson et al., 2004; Henry, 2006).

The following sections will outline some of these changes that happen as a person ages and how they affect their use of computers. It will also give some insight to how those changes can be counteracted by the way websites are designed.

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[4]*Digitalt førstevalg*

3.2.1 Vison

When a person ages there is several different problems that can affect their vision. Among the most common ones is problems that influences the ability to distinguish details and colours.

Visual acuity has to do with the ability to distinguish fine details. This can be caused by different conditions and diseases, e.g. presbyopia. A common solution to this problem is increased font size and the use of sans serif text, as this can make it easier for older adults to read (Hawthorn, 1998; Becker, 2004; Charness and Jastrzembski, 2009; Wallace et al., 2010; Frid et al., 2015). Having space between the icons, lines of text, and bold or semi-bold font can also make it easier for older adults to use the website (Frid et al., 2015).

Contrast sensitivity is a specific kind of *visual acuity* that influences the ability to distinguish between different items on the screen(Hawthorn, 1998; Becker, 2004; Wallace et al., 2010). Older adults can require several times the amount of contrast as younger people (Becker, 2004; Wallace et al., 2010; Frid et al., 2015).

Color discrimination is when the user have reduced sensitivity to colour. This colvers colour blind users, and older adults that often have problems distinguishing colours with a lot of blue (Hawthorn, 1998; Becker, 2004; Wallace et al., 2010; Frid et al., 2015). Hawthorn (1998), Becker (2004), Wallace et al. (2010), and Yao et al. (2011) suggests avoiding using these colours to give information. Frid et al. (2015) say that using dark colours give more visual fatigue due to the lower amount of light reflected. Hawthorn refers to studies done by Charness et al (1990) that shows a marked decline in reading performance for older adults when having to deviate from black text on white background (Hawthorn, 1998, p. 501). Using colours with low saturation or having similar foreground and background colour can make a website unusable for older adults (Becker, 2004). Colour alone should not signal information (Antona, Mourouzis, and Stephanidis, 2007).

A reduced *visual field* (i.e reduced peripheral vision), can mean that items placed on the sides of a website is hard to find for older users (Hawthorn, 1998; Becker, 2004; Antona, Mourouzis, and Stephanidis, 2007; Wallace et al., 2010; Frid et al., 2015). Items placed on the sides should be avoided, or they must be stronger to draw attention (Hawthorn, 1998; Becker, 2004). This can be done by using a larger text size and by ensuring enough contrast with the background.

Other studies done show that websites are often made in a way that makes them hard to use for older adults or other users with visual disabilities. Anderson et al. (2004) mentions a website where the only way to see which tabs are the most important are due to the bold

colours they are made with. A user unable to see colour will only see the links, and with 70+ links on the page they get hard to distinguish. Darzentas and Miesenberger (2005) mentions unlabelled graphics, undescribed videos, and poorly made tables as common problem on websites.

People that cannot see images get the same information if there is alt text on websites (Henry, 2006). Antona, Mourouzis, and Stephanidis (2007) says to help blind users information should be offered in a non-visual way. *"For instance, well-designed Web sites provide users with the option of resizing text, thereby accommodating those with low vision"* (Charness and Jastrzembski, 2009). Hawthorn (1998) and Rømen and Svanæs (2011) indicates that the size of drop-down lists and buttons have an impact on how easy they are to use.

Sayago and Blat (2011) reports on a study where the participants had all previous experience with accessibility features included in their operating system and web browser, but choose to not use them. The participants indicated that this was because when they used them, items disappeared of the screen, and this made the websites harder to use. They had to remember more about how things worked and where elements on the website was.

3.2.2 Hearing

As a person ages their hearing changes, 20% of those aged 45-54 have some problems with hearing, this increases to 75% of those aged 75-79 (Hawthorn, 1998). Older adults cannot hear the same *higher frequencies* that younger people can (Hawthorn, 1998; Charness and Jastrzembski, 2009; Wallace et al., 2010; Frid et al., 2015).

Captioning of audio material lets those with hearing problems have the same information as others (Darzentas and Miesenberger, 2005; Henry, 2006; Antona, Mourouzis, and Stephanidis, 2007). Charness and Jastrzembski (2009) suggests having critical alarms at at least 60db, so that those that have hearing loss but are not deaf can hear them. They also say that due to the difference in pitch male voices should give information while female ones can be used for warnings. Older adults often have problems with computer generated voices (Charness and Jastrzembski, 2009; Frid et al., 2015). Frid et al. (2015) suggests providing a volume control so that users can adjust it to a level more comfortable for them.

3.2.3   Physical impairments

The most common physical impairments that come with age and affect the use of a mouse, is slower and involuntary movements (Hawthorn, 1998; Aula, 2005; Charness and Jastrzembski, 2009; Frid et al., 2015). Increasing target sizes, e.g. icons and links, can help with countering the problems with moving a mouse (Hawthorn, 1998; Charness and Jastrzembski, 2009; Wallace et al., 2010; Rømen and Svanæs, 2011; Frid et al., 2015) and so can providing physical feedback (Üzüm and Göktürk, 2011). Slower movements can be helped by increasing the time given for input, e.g. double click or key-board commands (Charness and Jastrzembski, 2009).

Other users can have more serious physical problems and require that the website or program can be operated with only keyboard, voice, or other input devices (Darzentas and Miesenberger, 2005; Antona, Mourouzis, and Stephanidis, 2007; Frid et al., 2015). Holzinger et al. simply state that *"the design needs to be adapted to the end user's physical impairments (2008, p. 99)"*. Wallace et al. points out that increasing the text and minimizing functionality is not a complete solution for the problems older adults have with technology (2010).

3.2.4   Cognitive impairments

Older adults can have several different cognitive impairments. As a person ages there is changes to the way their memory works and their intelligence. *Crystalized intelligence* is the cultural knowledge and life experience a person gains while living (Hawthorn, 1998; Curzon et al., 2004; Czaja and Lee, 2006; Charness and Jastrzembski, 2009). Crystalized intelligence is little affected by aging. Older adults that use their crystalized intelligence can keep it at a high level (Curzon et al., 2004; Czaja and Lee, 2006). The *crystalized intelligence* can in some cases make up for deterioration of *fluid intelligence* (Hawthorn, 1998).

Fluid intelligence covers the skills of perception and abstract reasoning (Hawthorn, 1998; Curzon et al., 2004; Czaja and Lee, 2006). The fluid abilities normally get affected by aging, by reduced processing speed, reduced ability to solve new problems, and by changes to the memory, such as reduced ability to access previously accessed knowledge and by a reduced working memory (Curzon et al., 2004; Aula, 2005; Charness and Jastrzembski, 2009; Wilkowska and Ziefle, 2009). *Working memory* is storing and using information in the *short term memory* (Hawthorn, 1998).

In addition to changes in memory and to the fluid intelligence, cognitive impairments covers learning disabilities, language delays, dyslexia, and more serious conditions such

as mental retardation and brain injury (Hawthorn, 1998; Anderson et al., 2004; Antona, Mourouzis, and Stephanidis, 2007; Schulz and Pieper, 2007). Cogntive aging influenses older adults individually. Not all older adults aquire the same problems, some older adults have no problems (Anderson et al., 2004; Curzon et al., 2004; Aula, 2005; Frid et al., 2015). Neurological diseases like Alzheimer's disease and dementia can have an impact on cognitive abilities (Hawthorn, 1998; Aula, 2005; Frid et al., 2015). Estimates show that up to 20% of those over 65 years old suffers from mild cognitive impairment, which is changes to one aspect of cognitive functioning, without signs of dementia or significant decline in daily activities (Sixsmith, 2013).

Using consistent navigation structures, reducing the complexity of the presentation and language, or using illustrations reduces the problems for users with cognitive impairments (Darzentas and Miesenberger, 2005; Dickinson et al., 2005; Henry, 2006; Antona, Mourouzis, and Stephanidis, 2007; Wallace et al., 2010; Frid et al., 2015). Making the steps in a process clear enough for the users, so they don't have to remember the steps, encourages independent use (Sayago and Blat, 2011). Czaja and Lee (2006), Charness and Jastrzembski (2009), and Frid et al. (2015) points out that users with different cognitive impairments often need longer time to respond. By utilizing the crystalized knowledge of the potential users new systems can be made easier to use (Charness and Jastrzembski, 2009).

Czaja and Lee point out that several of the steps taken to make senior friendly websites and applications have made them more usable for the general public. See table 3.2 for an overview of these.

3.2.5 Computer anxiety

Computer anxiety is a term covering different attitudes that older adults have about computer use. Many older adults are afraid of new technology (Choudrie, Ghinea, and Songonuga, 2013; Leist and Smith, 2014), thinking they will destroy it by doing something wrong (Aula, 2005; Czaja and Lee, 2006; Pilling, 2010; Sayago and Blat, 2011; Frid et al., 2015).

This fear or apprehension to use computers can be caused by a previous bad experience (Dickinson et al., 2005; Morris, Goodman, and Brading, 2006; Wilkowska and Ziefle, 2009; Frid et al., 2015), or by being told that they should be careful so they do not break something (Aula, 2005). Sometimes error messages given can enforce this, e.g. when the older adult are told that performing an action may cause them to lose everything (Aula, 2005).

TABLE 3.2: Interface design guidelines for computer systems for older adults
(Czaja and Lee, 2006, p. 347)

Minimize visual clutter (e.g. too much information on a webpage) and irrelevant screen information
Present screen information in consistent locations (e.g. error messages) and where possible provide a standardized format across applications
Adhere to prinsiples of perceptual organization (e.g. natural grouping of information)
Highlight important screen information and ensure that options that are most important or used most frequently are visible and easily located
Provide navigational tools such as a site map or a search history tool
Use icons that are easily discriminated and meaningful
Provide location information indicating where the user currently is within an application
Avoid technical jargon and the use of complex command languages
Minimize demands on working memory (e.g. minimize the need to rcall complex operating procedures or provide aids)
Avoid automatically scrolling text
Provide feedback about actions such as task completion or text selection
Avoid complex command languages and use simple and familiar language
Minimize apportunities for error by providing action confirmation prompts (e.g. "are you sure you want to delete this text")
Provide adaptability and system flexibility for different user levels
Ensure there is adequate time to respond to prompt and queries
Use operating procedures that are consistent within and across applications
Provide easy to use on-line aiding and support documentation

In several occasions computer courses targeted to the older adults reduce or remove the problem (Aula, 2005; Morris, Goodman, and Brading, 2006). Positive experiences, and realizing that they can use the computers without problems, encourages the older adults to use new technology (Dickinson et al., 2005; Holzinger et al., 2008; Wilkowska and Ziefle, 2009; Sayago and Blat, 2011).

Connected to *computer anxiety* is the belief that many older adults have that computers and modern technology is unnecessary for them. This is partly caused by not seeing what computers etc. can offer the older adults. Motivation to overcome *computer anxiety* and work on gaining *digital literacy* often come when the older adult realize the benefits in computer use (Dickinson et al., 2005), e.g. when they realise that a typo on a computer does not involve typing the entire page again as with a typewriter (Aula, 2005) or wishes to communicate with family or friends (Wallace et al., 2010).

3.2.6 Digital Literacy

Leahy and Dolan (2009) defines *digital literacy* as the *"ability to use a computer, send e-mail, prepare material using the computer, search for information on the web and use other personal computer based tools"*. They also include the use of other technologies, with a focus on mobile, in this term. Frid et al. (2015) uses the term *e-competences* to cover much of the same meaning.

McLean (2011) state *"in an Information Age only 10% of EU persons over 65 are literate in Internet usage"*. Courses and tutoring increases the *digital literacy* in older adults (Aula, 2005; Morris, Goodman, and Brading, 2006; Pilling, 2010; Sayago and Blat, 2011). Choudrie, Ghinea, and Songonuga (2013) indicates that the government should found campaigns to increase digital literacy in older adults, as they see this as one of the mayor barriers when it comes to the use of eGovernment websites. A focus on *digital literacy* makes it possible for more people to use computers and other technologies (Mordini et al., 2009).

Fuglerud (2009) describes four different user studies carried out in Norway with elderly, cognitive impaired and/or visually impaired users. In these studies the participants were asked to perform specific task in a computer program, or in assorted web forms. In all four studies Fuglerud found that the users had problems with similar tasks. The main tasks lead to problems where: *scrolling, navigate from page to page, using the mouse precisely, formatting and using special characters, switching between windows, closing unwanted windows, uploading files, using file catalogues, using drop-down lists,* and *finding and using help.* In some cases the users did not recognize arrows indicating drop-down menus, or "i" indicating that a web form had available help at that field. Several of these actions required that the users did two actions at the same time, e.g. pressing the shift and another key at the same time.

3.2.7 Summary

As seen, older adults have several different requirements when it comes to using computers and the Internet. They might have challenges with vision, such as problems seeing details, colours and a narrowed visual field; they might have problems hearing sounds with a high frequency; and often older adults have issues moving a mouse with precision and accuracy.

Some older adults develop cognitive problems. The most common problems are with the fluid intelligence, leading to problems with abstract reasoning and gaining knew knowledge. Problems with the fluid intelligence affect the working memory. Computer anxiety

and digital literacy are closely tied together. Knowledge about computers and the Internet, and experience with using computers and the Internet can help older adults overcome their computer anxiety.

3.3 Human-Computer Interaction

Human-Computer Interaction (HCI) is a field where they study how the use of computer technology affects the users (Dix, 2009). Within HCI, computer technology covers a large range of devices, not just standard computers, but navigation systems, watches, phones, TV's etc.

One of the main principles of HCI is the notion of *usability* and the idea of *user-centered design*. *User-centered design* is a design process where the user is involved in the design and each iteration of the prototype is tested (Sharp, Rogers, and Preece, 2011). This is done to ensure that the needs of the user are taken into account during the planning and development of an artefact. Persson et al. expands on this:

> "User-Sensitive Inclusive Design (USID) as an extension of UCD. The word "centred" is replaced by "sensitive" because of the wide variety of functionality and characteristics of user groups (including users with disabilities and especially users with communication difficulties), which makes it very hard to get a small representative sample in the user group but also to design products that are accessible for all potential users." (Persson et al., 2014, p. 509)

3.3.1 Usability and Accessibility

One definition of *usability* is when a product can be used effectively and efficiently to the satisfaction of the intended user group (Henry, 2006; Bevan, 2009). Mourouzis, Antona, and Stephandis (2010) improves on this and states: *"usability is measured by the extent to which the intended goals of users are achieved (effectiveness), the resources that have been expended to achieve these goals (efficiency), and the extent to which the users find the use of the product acceptable (satisfaction)"*

Accessibility expands on the definition of usability and includes disabled users as the "intended user group" (Henry, 2006). Henry (2006) defines the differences between *"accessibility"* and *"usability"* as follows: *accessibility issues* are when people with disabilities are at a disadvantage compared to normal users. If there is an issue that affects all users, it is a *usability issue*. Schulz and Pieper (2007) gives *accessibility* a wider definition: *"accessibility does not only mean to optimize a website for disabled persons using technical*

equipment to access the web, but to grant an intellectual access to information for people with cognitive and educational problems as well as inexpert users." Mourouzis, Antona, and Stephandis (2010) states that without accessibility there is no usability; if you cannot access something, you cannot use it.

Persson et al. (2014) provides insight in how the term *accessibility* have slightly different meanings in different contexts. *Design for all, universal design, inclusive design* and *universal access* are all slighty different ways of thinking about *usability* and *accessibility* and they all define *accessibility* slightly different by emphasizing various aspects of it. The definition they end up giving is: *accessibility* is *"the extent to which products, systems, services, environments and facilities are able to be used by a population with the widest range of characteristics and capabilities (e.g. physical, cognitive, financial, social and cultural, etc.), to achieve a specified goal in a specified context"* (Persson et al., 2014, p. 524).

Leahy and Dolan says to ensure that technology is not a barrier excluding people three steps must be ensured (2009, p. 151):

- The person must know how to use the technology.

- The technology must be accessible.

- The technology must be usable.

Darzentas and Miesenberger (2005) uses books as an example on how standardised design can make problems for people with some disabilities, e.g. books which is a problem for users with print disabilities.
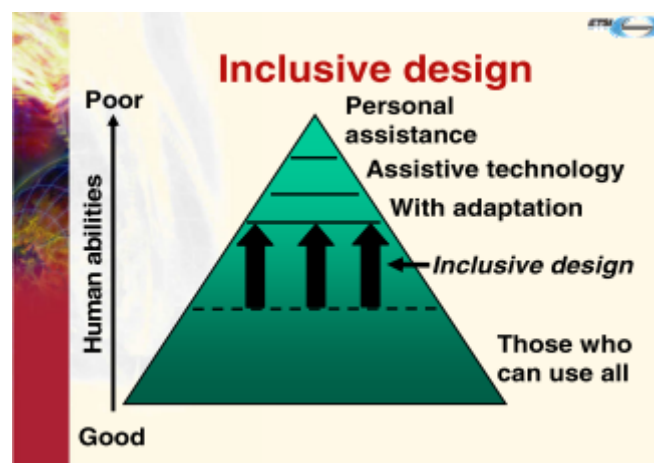
FIGURE 3.1: The Usability Pyramid (Darzentas and Miesenberger, 2005)

The usability pyramid, figure 3.1 is a visualisation on how a segment of the population can use any technology without problems, and how when you use inclusive design the barrier for how many can use a technology without any assistive aids is raised.
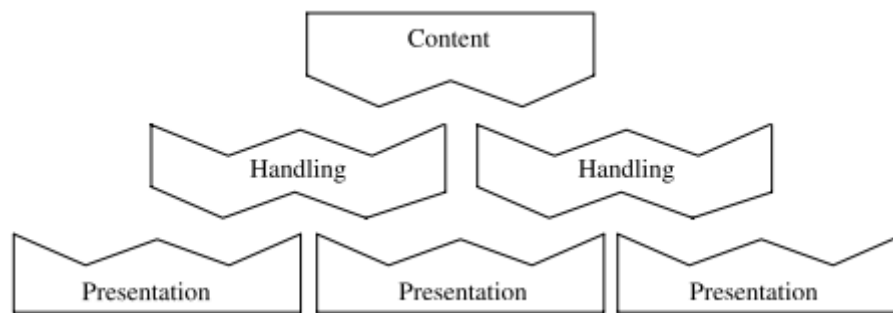
FIGURE 3.2: The Power of ICT (Darzentas and Miesenberger, 2005)

Figure 3.2 is a visualisation of the benefits from using ICT rather than e.g. print. The content is the same, but it can be handled in different ways and presented in multiple ways. The same website can be shown with a normal browser, and if well designed, presented with a text only browser or with the use of braille or text-to-speech software. By presenting the information in a way accessible for different technologies, it can accommodate the needs of different users (Anderson et al., 2004). Leahy and Dolan (2009) states that assistive technology can be life changing, but that the contents to be used with them must be made in a way that the assistive technologies, e.g. screen readers and magnifiers, can interact with them.

Leist and Smith (2014) writes about how fixing small errors can improve the accessibility in a website, e.g. making sure the HTML code is correct, and including alt tags on images. According to Ayachi et al. (2015) the best way to ensure *accessibility* is by personalization of services based on the needs of the user. The rules for Universal Design or universal access that the Norwegian government have defined is one way to achieve usability (Direktoratet for forvaltning og IKT, 2017d). Frid et al. (2015) advocates for adopting a *Design for All* perspective on development as this will ensure accessibility and usability for everyone. The main principles behind *Design for All* is summarized here (Frid et al., 2015, p. 19-20):

- *Simplicity*: only the necessary elements and operations should be offered.

- *Flexibility*: the designs must adapt to the different users' abilities.

- *Quick information*: users should quickly and easily understand what it is for and how to use it.

- *Familiar*: it should be based on the users previous understanding and knowledge, so that the user feels like it is familiar, even when new.

- *Feedback*: the user should always be informed as to what the system is doing.

- *Error prevention and handling*: the user might make mistakes. These should be fixable and the user should have a ''go back'' option.

- The user should be a part of the design and evaluation process.

According to Darzentas and Miesenberger (2005) the goal of "Design for All" is to push the line between *"'Those who can use all' and 'With adaptation' as far up as possible."*, see figure 3.1.

3.3.2 Web accessibility

"Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web (Henry, 2006)." The main goal of *web accessibility* is to make the web available for those with disabilities, it also benefits others, e.g. by making it possible to use keyboard shortcuts. According to World Wide Web Consortium (W3C) web accessibility means that people with disabilities can perceive, understand, navigate, and interact and that they can contribute to the Web (W3C, 2008). In this context, disability includes, in addition to motoric and cognitive problems, also hearing, low vision, colour blindness and dyslexia. With a lot of government information and agencies online, a web site has to be accessible to provide equal access and opportunity to people with disabilities.

Henry (2006) provides multiple tips on how to make an accessible website. Alt-text can be read by screen readers, displayed in text browsers, or show when images are not downloaded. Captions of audio provide information to deaf people, and makes the information searchable. People with cognitive disabilities have an easier time when the layout of the website is as expected. A predictable layout can also help people who need to magnify pages or who have tunnel vision. The main recommendation is to involve users with different disabilities in your project.

Schulz and Pieper (2007) tried to clarify if and how barrier-free websites can be made easier with the use of content management systems. The article begins with an attempt at clarifying what is meant by *Barrier-Free*. Schulz looks at different meanings and explains why they decide to go with the broad meaning from the BIENE AWARD. BIENE AWARD is awarded to the best barrier-free website. The choice of using their definition is that they test each website with multiple "expert" users, people with different disabilities:

> "...accessibility starts with the concept of the website and embraces the depiction and structure of contents as well. Accessibility does not only mean to optimize a website for disabled persons using technical equipment to access the web, but to grant an intellectual access to information for people with cognitive and educational problems as well as inexpert users. (Schulz and Pieper, 2007, p. 421)"

Their method of study was a survey of existing CMS's (Content-Management Software) where they only included those systems that stated that they were able to process Barrier-Free websites. The questions asked were related to the refreshing of content, with the assumption that the original website is barrier-free. Out of 37 prospective systems, 8 full questionnairs were returned. The different CMS' have checks for alternative text and titles, so they produce code that complies with general standards such as WCAG and BITV (German rules). The CMS' are unable to control that the alternative text, etc. are sensible and makes meaning. The CMS' makes sure that the code fulfils the hard requirements for barrier-free, but not the soft requirements. Soft requirements are the pure textual, for example the phrasing and structure of the text.

Sayago and Blat (2011) discovered in their study that older adults do not want to rely on anyone when they use the Internet. The older adults also refused to use any technology that made them stand out; their main motivation for using the Internet was to be social.

Ayachi et al. (2015) state " *it is very important for web-based systems that adaptive and personalized user interfaces are provided. They should be properly designed and adjusted to users' needs and capabilities.*"

3.3.3   Summary

Usability and accessibility is closely tied together. A website cannot be usable for a specific user group if it is not accessible for them. To ensure this accessibility different design methods have been utilized within e. g. web design. The different methods, such as *Design for All*, *User Centred Design*, *User-Sensitive Inclusive Design* and *Barrier-Free Design*, all have in common that they recommend the inclusion of users with different disabilities in their evaluation and research.

3.4   Design guidelines

There is many different guidelines and standards that regulate how a website, program, or computer application should be designed. The following sections will introduce some of these.

3.4.1 WCAG

The first edition of Web Content Accessibility Guidelines was published as a W3C[5] recommendation in 1999. This was a set of guidelines on how to make web content accessible for users with disabilities (W3C, 1999). It had a focus on HTML sides and on specific techniques (Anderson et al., 2004; Henry, 2006). Each of the guidelines had a set of checkpoints on how to apply the guideline in web design (Pilling, 2010).

WCAG when through a review and in 2008 the new WCAG 2.0 was published (W3C, 2008). The focus changed from specific ways of doing something within HTML to having four overarching principles. The principles are (Web Content Accessibility Working Group, 2017):

- Perceivable
  - Provide text alternatives for non-text content.
  - Provide captions and other alternatives for multimedia.
  - Create content that can be presented in different ways, including by assistive technologies, without losing meaning.
  - Make it easier for users to see and hear content.

- Operable
  - Make all functionality available from a keyboard.
  - Give users enough time to read and use content.
  - Do not use content that causes seizures.
  - Help users navigate and find content.

- Understandable
  - Make text readable and understandable.
  - Make content appear and operate in predictable ways.
  - Help users avoid and correct mistakes.

- Robust
  - Maximize compatibility with current and future user tools.

The guidelines and success criteria for WCAG 2.0 can be found in appendix C.

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[5]The World Wide Web Consortium

3.4.2 Studies about WCAG 2.0

Anderson, Bohman, Burmeister, and Sampson-Wild (2004) writes about the changes from WCAG 1.0 to 2.0. One of the major changes is how the requirements for an accessible website now also focuses on usability. The change of focus from the purely (X)HTML specific in WCAG 1.0 to the more general principles in WCAG 2.0 addresses the needs for users with cognitive disabilities.

The article describes several examples of governmental websites in Australia and USA, showing both good and bad sites. Australia's examples are a general website with information about the different states and territories, and a website about the Companion card for disabled people. The website with information about the states and terretories, www.gov.au, claims to have been designed with a main focus on accessibility and usability. Anderson et al. found that while the website has a text only alternative, this can be problematic for those with cognitive impairments, as to much text can be hard for them. The regular website contains a lot of visible cues that would be helpful to the users with cognitive impairments, but as a lot of these users use text-to-speech software, a misuse of alt tags would be problematic. Several images contain no alternative text, eleven have "spacer" as alternativ text and eight have "#". Other information on the website is given by change of colour on a map, which violates WCAG 1.0.

The other Australian website, www.companioncard.org.au, complies with level AAA in WCAG 1.0. The website used icons and other visual cues for users with cognitive impairments. The forms offered for download comes in different formats and languages, and other languages are provided through mail upon requests.

The examples from the USA are the general website for the government, the website for the IRS, a website directed towards minorities and a website for senior health. The first website, www.firstgov.gov, is an example for how a website, which is designed to be usable, has become unusable due to bad code. The website use visible cues at to indicate what section users are in, but these are only given as a colour. Users that cannot see colour, or are blind, get no help. "Skip to content" links are provided, but do nothing. Labels are provided in the code, but none are coded correctly. Anderson et al. recognizes the IRS site as a well-designed website with a clean design, but states that the website have too much text for persons with cognitive disabilities. Anderson et al. asks for more graphics and illustrations.

The third website is a website about minorities and business. The authors questions how the website directed towards minorities, can be designed in a way to almost exclude one of the minorities, the disabled. This site uses an acronym as the heading but only those using a screen-reader get an explanation for what the acronym means without searching for the

meaning. This is the only advantage the screen-reader gives, the rest of the site is almost impossible to use with a screen-reader. The authors state *"Users with or without cognitive disabilities are likely to feel disoriented on this site* (Anderson et al., 2004, p. 301)."

The last example from the USA is one of the few governmental websites in the USA especially designed to accommodate people with disabilities. The website has built in tools for making the site more usable for people with disabilities. It features tools to magnify text, increase contrast by inverting background and text colour, and a built-in text-to-speech java applet. The website is designed in a way to reduce cognitive load and to accommodate poor short-term memory. Videos with captions and transcripts of dialogue are provided to explain concepts to users.

The article concludes with saying that the coming of WCAG 2.0 is a good opportunity to change the policy on website design. It is not enough to be *accessible*, you also need to be *useful* and *usable*. Websites are designed *"for real people with real needs, and not just to satisfy a checklist of guidelines"* (Anderson et al., 2004).

3.4.3 Other design guidelines

Becker (2004) lists several different guidelines for making inclusive websites. In the USA The Rehabilitation Act was amended with Section 508 to encourage the inclusion of users with disabilities. Section 508[6] requires that governmental websites are accessible for users with disabilities. Several of the Section 508 guidelines came from the WCAG 1.0 guidelines (Pilling, 2010). The National Institute on Aging came with their own guidelines on how to make websites accessible for older adults, see table 3.3.

Czaja and Lee (2006) presented a set of design guidelines targeted towards age-related cognitive impairments, see table 3.4

Rømen and Svanæs (2011) writes about the international standard ISO 9241-171:2008, Ergonomics on human-system-interaction, and how this standard provides guidance on incorporating accessibility goals early in the design of interactive systems intended to be used in homes, in leisure activities, in public situations, and at work. The standard refers to WCAG 2.0 for accessibility of web content.

Based on literature Patsoule and Koutsabasis (2014) came up with a set of 7 principles and corresponding guidelines for redesigning websites for older adults, see Appendix B for an overview of these.

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[6] www.Section508.gov offers information on Section 508 and guidelines

TABLE 3.3: National Institute on Aging (NIA) Guidelines for Making Senior-Friendly Web Sites (Becker, 2004, p. 14)

Guideline	Description
Use sans serif typeface	Sans serif font types should be used to display information content because they are not condensed; san serif font types include Arial, Helvetica, Tahoma, and Geneva
Use 12-point or greater font size	The use of a large font size improves legibility of information content such that text body, buttons, links, images, and other textual objects are readily seen by an older adult
Use mixed-case letters for body text	The text body should be in uppercase and lowercase text to improve readability; all uppercase text should be reserved for headlines on a page
Use left justification	Text should be left justified because spacing between letters is consistently the same
Do not use patterned background images	Patterned background images should be removed from a web page because they reduce the legibility of text overlaying them
Use text effects only in headlines	Text effects including underlining, italics, bold, or strikethrough should not be used in the body of the text

The Norwegian rules for ICT is based on Web Content Accessibility Guidelines (WCAG) 2.0 level AA to ensure the usability of the website for users with differing disabilities. They include items such as alternative text for pictures, the use of colours and consistency of layout and navigation. The Norwegian regulations state that a website has to fulfil 35 specific out of the 61 success criteria. The success criteria that the Norwegian regulations cover is most of those on level A and AA in WCAG 2.0 (Direktoratet for forvaltning og IKT, 2017d).

3.4.4 Summary

Several different guidelines have been introduced here. Some of them refer to WCAG 2.0 for specifics, and others, such as the Norwegian regulations, incorporates parts of them directly. Other of the guidelines focus on a very small set of users and rules, e.g. NIA and the interface design guidelines by Czaja and Lee, which focus exclusively on older adults.

TABLE 3.4: Interface design guidelines for computer systems for older adults
(Czaja and Lee, 2006, p. 347)

Minimize visual clutter (e.g., too much information on a webpage) and irrelevant screen information
Present screen information in consistent locations (e.g., error messages) and where possible provide a standardized format across applications.
Adhere to principles of perceptual organization (e.g., natural grouping of information).
Highlight important screen information and ensure that options that are most important or used most frequently are visible and easily located.
Provide navigational tools such as a site map command languages.
Minimize demands on working memory (e.g., minimize the need to recall complex operating procedures or provide aids).
Avoid automatically scrolling text.
Provide feedback about actions such as task completion or text selection.
Avoid complex command languages and use simple and familiar language.
Minimize opportunities for error by providing action confirmation prompts (e.g., "are you sure you want to delete this text"?).
Provide adaptability and system flexibility for different user levels.
Ensure there is adequate time to respond to prompts and queries.
Use operating procedures that are consistent within and across applications.
Provide easy to use on-line aiding and support documentation.

3.5   Ethical issues

With regard to ethics, Design for All considers the right of all citizens to equal opportunities, especially in terms of the right to education and employment (Darzentas and Miesenberger, 2005).

Excluding anyone from the social platform the internet has become is *"ethically inappropriate and unacceptable"* (Darzentas and Miesenberger, 2005; Sixsmith, 2013). The difference between the ones that have access to the Internet, or digital skills, will be another way to separate people (Darzentas and Miesenberger, 2005; Mordini et al., 2009). Interfaces that are too complicated for the older adults to understand or use is depriving them the possibility of reducing their social isolation and to increase their quality of life (Wallace et al., 2010).

The Internet need to be accessible to everyone with the increase in eGovernment to provide equal opportunities to everyone (Henry, 2006; Leahy and Dolan, 2009; Choudrie, Ghinea, and Songonuga, 2013; Warf, 2013). *"e-Inclusion is necessary for social justice, ensuring equity in the knowledge society"* (Mordini et al., 2009).

The "digital divide" has its basis in both the availability of Internet for the older adults, and in the accessibility and digital literacy (Mordini et al., 2009; Niehaves and Plattfaut,

2010; Frid et al., 2015; Holland, 2015). Mordini et al. finds it morally wrong that the generations that started and lived through the digital revolution might be excluded from the use of computers and the Internet. Wilkowska and Ziefle (2009) and Holland (2015) point out that using computers and other technology is no longer voluntary.

Charness and Jastrzembski (2009) states that for ethical design one should follow the Hippocratic oath: "First do no harm". They see this as an important factor to keep in mind when you develop technologies that monitors the users, e.g. with cameras in the home. While the new technology is intended to help, it should not harm the user, either directly or through breach of privacy etc. McLean (2011) has a similar view of the ethics of developing for older adults. She sees it as a two pronged problem where you have the positive results that the development of new technology can give, and the other prong is the invasion of privacy, abuse, or misuse of the technology to harm.

Morris, Goodman, and Brading (2006) presents an analysis of the results from two different ethics surveys in the UK. One of them involved seniors in Scotland, the other in Derbyshire. In the scottish survey the looked at people over 50 and the survey in Derbyshire had participants over 55 years old. The surveys addressed the seniors' views and attitudes towards computer technology. Morris, Goodman, and Brading tries to provide an in-depth analysis on Internet and computer use and non-use.

Among the results found in the article was that the most common reason for using computers was the Internet and the most common reasons for using the Internet was email and research.

For the people who don't use the Internet the reasons given were no access to a computer (computers are too expensive) and no access to the Internet (again stating cost as a barrier). For others the reason for not using the Internet, or wanting to use the Internet or computers, was that they didn't see a reason. Several of the people polled stated they were too old to use them.

3.6 Design and evaluation methods

When designing websites and other interactive artefacts that is intended for older adults there is several different methods that can be used. *User Centred Design* is a common method within HCI. Several studies have investigated work with older adults or users with different disabilities. Some of these will be presented here, and other are included in the next section with relevant studies.

Edlin-White et al. (2012) came up with a series of common themes to consider when it came to developing for and with older adults. These themes where based on a literature survey they did and some experimental projects they did.

- Recognise that HCI work with older people is social research, based on subjective social constructs such as accessibility, usability and quality of life.

- Adopt an ethical and user-centred approach, perhaps utilising elements of Participatory Design, Accessible Design and Ethnography.

- User perspective to be taken seriously and respectfully, but self-knowledge can be incomplete or imperfect. Include supplementary perspectives.

- Allow time in the project plan to build trust with participant groups and gatekeepers, and cultivate good working relationships on an ongoing basis.

- Study settings - mainly field settings for ecological validity. Pop-up labs implanted in field settings can be effective, though time consuming.

- Recognise the challenge and difficulty of recruiting a representative sample.

- Study methods - Focus Groups and Design Workshops are effective; also questionnaires and interviews and possibly retrospective verbal protocols.

- Design all aspects of studies to accommodate participants with very varied abilities. This includes the Informed Consent process. Allow for different learning speeds and varied learning styles of older people.

- Quantitative methods with inferential statistics are unlikely to be effective unless there is a lot of time and resources and access to many participants.

- Study measures need to be appropriate to older users, and will probably include more subjective measures than mainstream HCI studies.

- Be flexible and open to change while conducting a study. Allow time for "social niceties" and off-topic digressions - some of which prove to be useful.

- Quality of life impacts of technology are important. QoL impact measurement is difficult, costly and most properly conducted over a long time period.

3.6.1 Walkthrough Method for Universal Access Evaluation

Antona, Mourouzis, and Stephanidis (2007) and Mourouzis, Antona, and Stephandis (2010) introduces ORIENT, a new variant of the cognitive walkthrough method for evaluating interactive systems in a universal access perspective. The walkthrough consists

of 4 phases; *start-up, preparation, inspection*, and *reporting*. The *start-up* determines the objectives and limitations for the evaluation. During *preparation*, which is a collaborative process, documentation is gathered on inspection background information, information on the system, and information on the different user groups. In this phase different user scenarios are created. The *inspection* is performed individually in a step-by-step procedure to assess the whole system, inspecting the perceived system qualities for each individual user group.
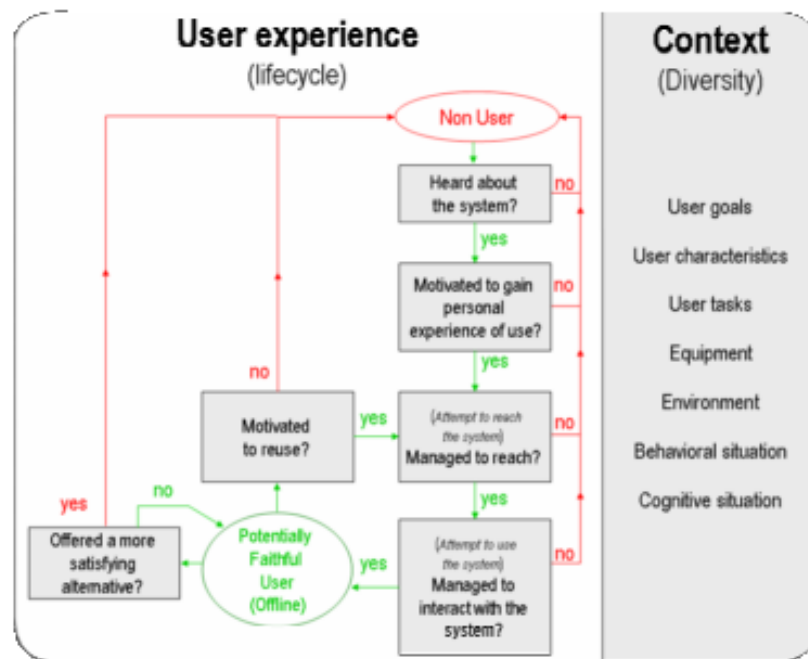
FIGURE 3.3: The UX-lifecycle as used in the ORIENT method (Antona, Mourouzis, and Stephanidis, 2007; Mourouzis, Antona, and Stephandis, 2010)

A team of 12 experts *evaluated* some services within eHealth, eGovernment, and eLearning. They had different backgrounds within web design, accessibility and usability. Each expert performed the walkthrough individually, while focusing on the context and going through each step in the UX lifecycle, see figure 3.3. *"Each inspector follows a step-by-step procedure to assess the system as a whole, inspecting the perceived system qualities for each individual user group.(Antona, Mourouzis, and Stephanidis, 2007, p. 329)"* Each individual inspectior *report* the results from their inspection, and these are gathered and summarized, first for each user group and for the entire system.

Antona, Mourouzis, and Stephanidis concluded that the use of this method was a useful way of finding strengths and weaknesses in the various systems. They found that the method did not require a large amount of training, and provided an overview of both the strength and weaknesses in the systems evaluated.

In general, the proposed model can be applied at various evaluation depths, and can be used to inspect clusters of systems, stand-alone systems, system sub-components, and/or system functions, user interfaces, devices, interaction controls, etc. (Antona, Mourouzis, and Stephanidis, 2007, p. 333).

An interactive edition of ORIENT has been tested and work had started on development of a web based variant (Mourouzis, Antona, and Stephandis, 2010).

3.6.2 Usability Metrics

Holzinger et al. (2008) have a goal of uniting existing user-centred design techniques with the rest of the software engineering life cycle. They suggest that a consolidated usability metrics model will help with this. This model should (Holzinger et al., 2008, p. 99):

- Reduce the cost of usability testing by providing a basis for understanding and comparing various usability metrics;

- Complement more subjective, expert-based evaluations of usability;

- Provide a basis for clearer communication about usability measurement between software developers and usability experts;

- Promote usability measurement practices that are more accessible to software developers who usually have a limited background in HCI or Usability Engineering.

Software metrics, a quantitative approach, has been introduced to measure aspects of usability and accessibility. Holzinger et al. have been looking at previous work, and on the needs of elderly users, and have come up with a suggestion on how to improve an existing set of metrics to take these needs into account. QUIM (Quality in Use Integrated Map) is a hierarchical model with five levels: *factors, criteria, metrics, data* and *artifacts*. Holzinger et al. (2008) presents their set of metrics' that can be used to evaluate usability and accessibility for older users as an addition to the QUIM. The result of this study is 1 new factor, acceptability, and 7 new criteria, safety, discretion, dependability, non-obtrusiveness, appropriateness, understandability, and trustworthiness (Holzinger et al., 2008, p. 103).

Holzinger, Searle, and Wernbacher (2010) stated that the HCI community have been focusing enough on usability and that it is time to include measures of utility and impact.

3.6.3 GOMS

GOMS (Goals, Operators, Methods and Selections) is a predictive model that try to predict how users will interact with the system or part of system being elevated. Goal is what the user wishes to accomplish, e.g. delete a word; operators is the different cognitive and physical actions the user has to perform to complete the goal; methods is the learned procedures needed to accomplish the whished goal, broken down in the precise steps; selection rules determines which of the different methods is the optimal in any case (Sharp, Rogers, and Preece, 2011).

Charness and Jastrzembski (2009) describes updates to the GOMS modelling technique for incorporating the changes in vision, cognitive and physical abilities in older adults. Some of the estimates for cycle times in the Model Human Processor are almost doubled. *"Thus, a good rule of thumb would be to predict that, when using the same strategy for performing a task, older adults will typically take 1.5–2 times as long as a younger adult (Charness and Jastrzembski, 2009)."*

3.7 Relevant studies

This section covers some previous studies performed on web design for older adults, and within e-Governement services for older adults.

3.7.1 Introducing the Internet to the over-60s: Developing an email system for older novice computer users

Dickinson et al. (2005) adressed the problems elderly unexperienced users might have when using an email-system. It starts out by covering some previous work (e.g. SeniorMail, a variant of Microsoft Outlook) and then continued with a project where Dickinson et al. developed an email system for senior novice computer users, called Cybrarian.

They came up with a set of guidelines to help them make their system usable for their target group. These are (summarized from Dickinson et al. (2005, p. 624)):

- Level of functionality
    - Only essential functionality for a working email system to be included.
    - Each screen to have a very clear primary function

- – The number of actions/buttons per screen to be kept to a minimum, preferably below 10

- Accessibility

  - – Larger than average clickable targets (32 and 26 pt size recommended)

  - – Larger than average fonts (14 point minimum)

  - – High contrast choice of colours for text and background

  - – Accessibility features compatible with the W3C guidelines

- User interface paradigms

  - – Simple and very consistent select and operate paradigms

  - – Clear conventions for the positions of buttons and information

  - – No new or poorly established interface paradigms which were unlikely to be understood by the user group

  - – Avoid scroll bars if possible, and definitely do not use nested scroll bars

- Terminology

  - – Terminology which is understandable by the user group

- Personalisation

  - – Some personalization to allow for people with poor eye sight or dexterity, for example the ability to easily increase text size

Dickinson et al. started development of an email system based on these guidelines. The concept was tested on experts before a paper prototype was evaluated at a workshop consisting of 9 elderly novice users. Based on the feedback from the workshops, a final prototype was made and tested on 15 users. This test was also performed on the normal Microsoft Outlook as a control system.

The user tests were split into two sessions for each user, and each was concluded with a semi-structured interview. In these interviews the users expressed a positive attitude to exploring other aspects of the computers after this introduction.

Dickinson et al. raises the idea that having the users test two different systems gives them the ability to compare then and criticise, as they have a bigger foundation for opinion. Results from the study show that the amount of errors per users is lower with the special system. During the evaluations they also tested the amount of user hesitation. The modified system had a lot less hesitations from the users, periods where they showed

clear signs of not knowing what to do next, than when they used Outlook. The researchers are crediting this to the simplified design. The article concludes with some thoughts about if the use of a very simple instructing program as a first meeting with Internet can give the confidence to explore new areas of use. Cyberian as a system is probably too simple for most users, but as a starting point for novices and for people with cognitive impairments it can be useful.

3.7.2   User Study on Older Adults' Use of the Web and Search Engines

Aula (2005) carried out a user study on relative new users of computer and the web. The main goal of the study was to find factors that affected the targeted groups attitudes to computers. A second goal was to investigate the usability of the Web as an information source. She interviewed ten older adults aged 53 – 78 (mean age 67.3 years) about why they had decided to start using computers, and observed them during a computer course. The participants where novices in the use of the web and most had had a limited use of computers before taking the courses. The participants were asked to perform different search tasks using the national variant of Google.

Aula found that for older adults to feel motivated to learn to use computers and the Internet, the benefits needed to be made clear. She discovered that for older adults to feel in control when using the Internet, the terminology should be adapted for their needs. The users found the standard language in warnings when opening pdfs or word documents confusing and generally just closed the box, thus not opening the file. This study also showed the need for the ability to scale the text, not just on the website itself but also in the text box. The text box itself should scale with the size of the font. The increased size of the box and font makes it easier for the user to move the mouse cursor to where they want.

Aula concludes that for older adults to feel competent in the use of computers and web searches they need training adapted to their needs, the older adults needed enough time to practice each skill before moving on to new tasks.

3.7.3   Using Online Public Services: A Measurement of Citizens' Operational, Formal, Infomation and Strategic Skills.

At the University in Twente van Deursen and van Dijk (2008) carried out a study on the digital skills that the Dutch government assumes every Internet user to have. In the

beginning of the article they specify the four different digital skills: *operational, formal, information* and *strategic* skills. *Operational skill* is the ability to operate the Internet with the help of a browser; being able to handle menus and hyperlinks were defined as *formal skills. Information skills* were the ability to search, select and evaluate information retrieved online, and being able to employ the information in digital media to reach specific professional or personal goals they called *strategic skills.* Each main skill was divided into multiple testable competences.

The method used in their study was an experimental survey where a random selection of people in and around Twente were called, and asked to participate if they had the required Internet experience, which was defined as someone who used the Internet more than once a month, and for other things besides email. They ended up with a selection of 109 people, spread in age, gender and Internet usage. Each participant took part in a 1.5-hour long session where they performed 9 tasks that required different digital skills.

van Deursen and van Dijk found that when it came to operational skills 80% of the tasks had been completed, 72% of the formal skill had likewise been done, 62% had been able to complete the informational skill tests, but only 25% and finished the strategic skills. The information and strategic skills did not seem to have a correlation with age or experience using the Internet, while the operational and formal skills did have a correlation with age. The Dutch government expect that anyone with access to a computer and the Internet to have these four digital skills, which van Deursen and van Dijk found to be not consistent with the result of their experiment.

3.7.4 Engineering User Requirements for e-Government Services: A Dutch Case Study

In this article van Velsen, van der Geest, ter Hedde, and Derks (2008) explained a literature and case study where they tried a technique for developing an e-government service with the needs of the user as a high priority. With the i2010 policy framework, the EU encourages the digitalization of governmental public services, with a focus on making them useable for people with basic digital skills.

van Velsen et al. used the knowledge they gained from the literature study to do a case study, where a team of researchers had a series of interviews with people who were in the target group for the application under development.

From the literature study van Velsen et al. came up with the following summarized set of requirements for e-Government systems (van Velsen et al., 2008, p. 245):

- The system must have personalized features

- The system must provide all the necessary information.

- The system must provide assistance where necessary.

- The system interface must have a good layout. (It need to be clear, consistent and intuitive.)

- The system must provide easy and comprehensive navigation.

- The system must use clear language.

- The system must be accessible.

These requirements were agreed upon in the literature study; other requirements were contradicting, e.g. when the user should log in. Some of the research they read, advocate having it early to personalize the system, where others suggest waiting until the user needs to be identified or to verify actions.

van Velsen et al. first *interviewed* potential users and case workers to generate a set of system requirements. The requirements where written in a specific format that gave a description, information on where it come from, priority and how it affected the users. Based on these requirements a set of screens, which visualized functionality and interaction, were designed to show to potential users.

Fifteen people, who had or were applying for social support, tested the prototypes using a *citizen walkthrough*. For each screen a series of questions were asked, some general, some specific for the screen in question. The users gave mixed feedback on the way it was designed, where some applauded the way information where presented, where others feel "treated like a child".

3.7.5 Redesigning Websites for Older Adults: A Case Study

Patsoule and Koutsabasis (2014) carried out a literature and case study to investigate the process of redesigning a website to be usable for older adult. They were interested in seeing the recourses and time it took to perform a redesign of an existing website to make it more usable. They did a *heuristic evaluation* of a touristic website and used their findings to redesign the site.

In the literature Patsoule and Koutsabasis identified 7 principles and 45 guidelines to ensure a usable design for older adults. A summarized list of the principles they came up with are (Patsoule and Koutsabasis, 2014, p. 565-566):

- *Visibility:* All interactive elements, information, user choices, and feedback should be clearly visible throughout the website whenever required.

- *Ease of understanding:* The presentation of information, content, and available user actions should be understandable an effective throughout the website, regardless user's experience, knowledge, reading ability and level of concentration.

- *Control and flexibility:* The user must always exert control of the interaction and the website should offer the user a range of individual choices and alternative modes of action according to his/her preferences, expectations, and capabilities.

- *Static and dynamic help:* Assistance should be provided to users when asked or at any time required while interacting, throughout the website.

- *Consistency of organising information:* All interactive elements should be functionally and visually consistent throughout the website. The layout, information, and content should be coherently organised throughout the website.

- *Efficient design:* The design of the website should be lean, predictable, functional, and attractive to the user creating a pleasant, friendly mood and inspiring confidence, both for the user's effective and satisfying interaction with the website.

- *Focused design:* The design should be effective, focusing on the object of the website, without presenting unnecessary information.

Patsoule and Koutsabasis found that there were totally 52 usability problems on the website, divided in *severe usability* problems that required immediate action, *major usability* problems, that should be given high priority, and *minor* problems.

> "The nine severe usability problems found were (1) overload of graphics and texts throughout the website; (2) visibility problems of important user information in various pages; (3) not satisfactory information organisation with regard to main user tasks; (4) not self-explanatory text for important hyperlinks and buttons; (5) not clear confirmation of booking reservation; (6) unnecessary steps/options in several pages of the booking process; (7) homepage's inability to serve the purpose of the website in terms of message and look; (8) too many steps for important user tasks; and (9) absence of quality and credibility presented by many graphic elements and low visibility of page updates (Patsoule and Koutsabasis, 2014, p. 567)."

In the redesign process, Patsoule and Koutsabasis paired the usability problems with the corresponding principles and guidelines they had used for the heuristic evaluation and sketched designs that would repair the problems. They then created an interactive prototype that was usable for the main tasks of the website.

Patsoule and Koutsabasis performed a comparative evaluation of the websites where they used controlled usability testing with interviews and questionnaires. To ensure that none

of the websites where favoured, the order of tasks the testers performed and the order of the websites where randomized. All the users performed the same tasks and answered the same questionnaire.

The evaluation showed that there where a significant increase in usability of the website after redesigning. All the participants in the usability tests had a higher success rate on the redesigned website.

3.8   Summary

This chapter has introduced the guiding principles behind eGovernment in Norway, requirements older adults might have as they age and how to help negate them, some methods of including older adults in projects and some studies done on websites for older adults.

As they age some older adults get challenges with vision, hearing, movement, memory, fear of computers, and lack of knowledge in using computers. To help with these challenges there is guidelines for website development. These guidelines regulate minimum demands on e.g. magnification and contrasts, that information cannot be shown by colour alone, and how content presented by audio or images must have an alternative form.

Some guidelines have been made to especially offset the needs older adults can have when using computers and the Internet. Anderson et al. (2004) did a study of different eGovernment websites in the USA and Australia. They found that some websites that fulfilled the requirements of being accessible, in some cases was not because the developers had not understood the principles behind the guidelines.

Different design and evaluation methods often includes users in their processes. This is a way to ensure that different user groups can use the artefact produced. In the Netherlands van Velsen et al. (2008) did a study where they developed an eGovernment website for home help. As a part of this process they interviewed users and performed user tests with older adults. Patsoule and Koutsabasis (2014) redesigned a website to become more usable for older adults.

Chapter 4

Digital Solutions for Government Communications

This chapter introduces the concept of digital mailbox and present an overview of the two systems that are approved by Difi[1] for use in the Norwegian public sector. The chapter will also give a brief introduction to Altinn, which in the past has handled a lot of the services that the digital mailbox's are intended to take over.

The next sections in the chapter present the heuristic evaluation of Digipost, e-Boks, Altinn and Skatteetatens website based on how easy it is to modify the text size and contrasts on the website, and how the website responds to these changes. The chapter ends with a short summary of the evaluation of the websites.

4.1 Digital Mailbox

The digital mailboxes are a secure verified system for receiving and storing mail sent from the government and private companies. When using digital mailbox systems the users will be required to identify themselves by logging on with an electronic ID suach as BankID, Buypass or Comfides (Direktoratet for forvaltning og IKT, 2017c; Direktoratet for forvaltning og IKT, 2017a).

Unlike email, recipients of letters in a digital mailbox can be sure that the sender is the one stated as all users have been verified with a governmentally approved electronic ID. This is the only way to receive digital mail from the government as there are regulations stating that letters sent from them must be at the highest security level. The letters sent to a digital mailbox are encrypted and stored in such a way that only the recipient can access them (Direktoratet for forvaltning og IKT, 2017b).

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[1]Direktoratet for forvaltning og IKT, eng: Agency for Public Management and e-Government

As the digital mailboxes will replace Altinn, the use of them will overlap for a time. Altinn is designated for communication between the government and the business sector, while a digital mailbox is for communication with private citizens (Direktoratet for forvaltning og IKT, 2017b).

The following sections will present the two government approved digital mailbox systems, Digipost and e-Boks, and the current system in use by most of the governmental agencies, Altinn. By March 2016, all governmental departments were required to use digital mail as their preferred way of communicating with their users.

4.1.1 Digipost

Digipost is one of the governmentally approved digital mail systems in Norway. It is available in a web browser or with the use of an Android/IOS app. Anyone above the age of 15 that has a Norwegian personal identification number can register an account with Digipost. When the users register with Digipost they must confirm their identity with either BankID or Buypass[2] (digipost.no, 2015b). In Norway Digipost has approximately 1 450 000 users. About 5000 different agencies, from both the public and private sector, send out documents through Digipost (digipost.no, 2015a). Figure 4.1 is a screenshot of the Digipost inbox in a browser window for a registered user.
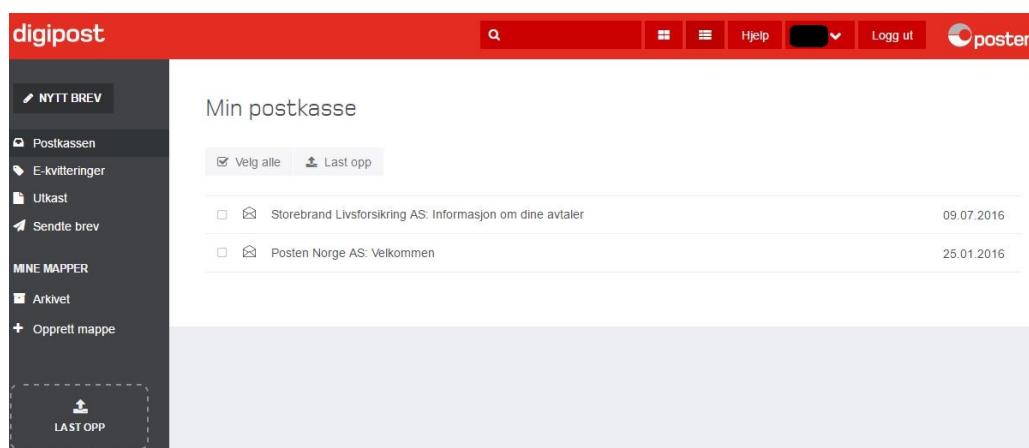
FIGURE 4.1: Screenshot of digipost's inbox

The users of Digipost can receive letters from companies, the public sector and other users. Digipost also provided the option for users to have receipts sent directly to their Digipost. Users with accounts from KLP Banken, Skandiabanken and Gjensidige Bank can have invoices sent to Digipost automatically forewarded to their Internet bank to be

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[2]These are two electronic identification systems. BankID is verified through the bank systems, and Buypass through Norsk Tipping.

paid (digipost.no, 2015b). Mail sent to Digipost can either use a unique Digipost address, or be addressed with the name and post address of the recipient.

Users have the option of setting up email notification for when letters arrive in their Digipost account. For particulaly important documents one can also be notified with a SMS (digipost.no, 2015b).

4.1.2 e-Boks

E-Boks is one of the governmentally approved digital mail systems in Norway. Users can access their e-Boks through a website or with the use of an Andriod or IOS application.

E-Boks is available and free to use for anyone above the age of 15 that has a Norwegian personal identification number. As e-Boks is tied to your personal id number it will not be affected by moving or changing your name. In the Nordic countries 11 million users have registered in e-Boks, and in 2015 their users sent 308 million documents (boks.no, 2007).

The users of e-Boks can themselves decide which of the available companies can send them digital mail. Users have the option of setting up an email notification for when letters arrive in their e-Boks. The documents in e-Boks are stored in a datacentre in Denmark. Communication between users and e-Boks is encrypted (boks.no, 2017). E-Boks allows its users to store digital copies of important documents (boks.no, 2007).
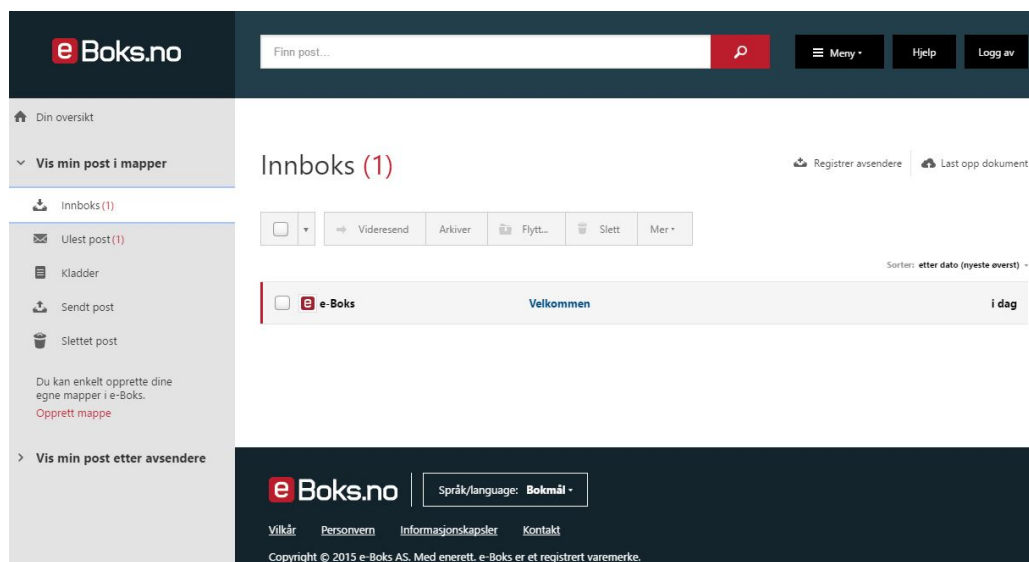
FIGURE 4.2: Screenshot of e-boks's inbox

In figure 4.2 is a screenshot of the inbox on e-Boks from a computer screen.

4.1.3 Altinn

Altinn is an Internet portal that was developed for digital communication between the government, private, and corporate users. A coalition of government agencies is responsible for the operation and further development of Altinn.

For private users Altinn is mostly a service for receiving digital information and filling out digital forms for the government. In January 2016 Altinn had 536 different services and digital forms. From Altinn's start in 2003 till October 2016 its 4 million private users and 1 million businesses or organisations have sent inn approximately 141 million digital forms and received approximately 150 million letters and resolutions (Altinn.no, 2016a).

Altinn is also a technical platform that facilitates for government agencies to make their own digital services.
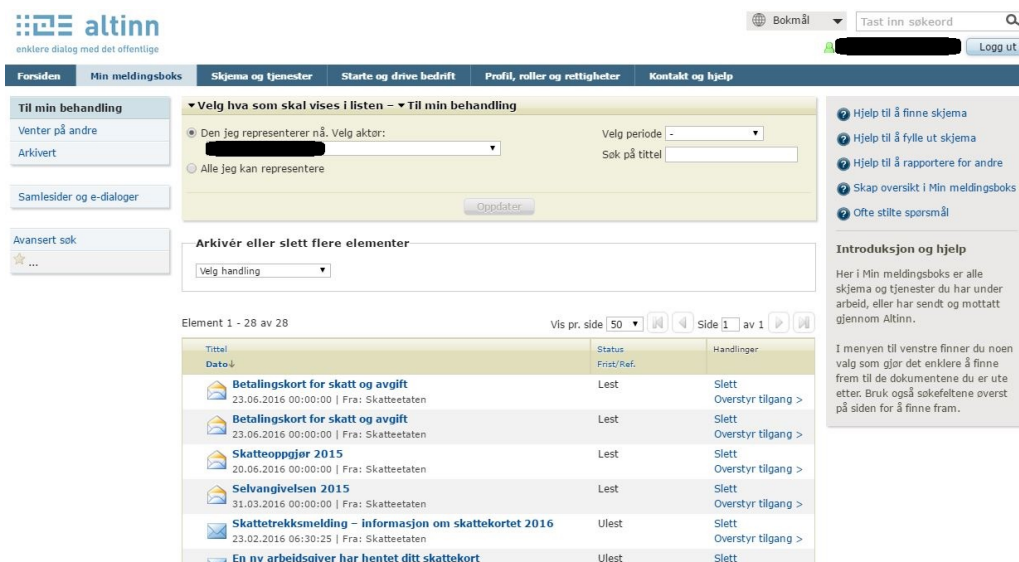
FIGURE 4.3: Screenshot of Altinn's inbox

Figure 4.3 is a screenshot of the inbox for a registered Altinn user. It shows multiple letters received from Skatteetaten.

4.2 National information systems

This section presents the two national information systems that most older adults are in contact with, Skatteetaten (The Norwegian Tax Administration) and NAV (Norwegian Labour and Welfare Administration).

4.2.1 Skatteetaten

Skatteetatens website, see figure 4.4, gives an overview of the different online services that they offer for citizens in Norway. Most of the website is devoted to information on subjects like tax cards, the tax assessment notice, and different services connected to the national registry.
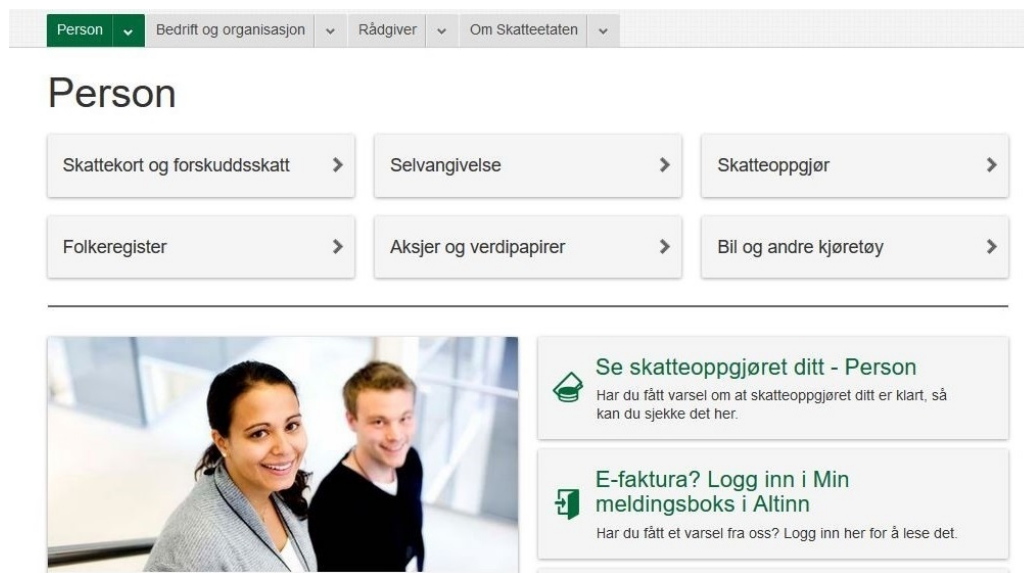
FIGURE 4.4: Screenshot of Skatteetatens website

Another part of the website has shortcuts to services in Altinn that are relevant for taxes. Users can also find shortcuts to Altinn that let them order transcripts of the information registered in the national registry or to report change of address (Skatteetaten.no, 2017).

4.2.2 NAV

The first page that a user meets on Nav gives information that an unemployed user might need. It also gives the user a hint that it might be able to find the information they on this website, and they will therefore not need to go to their Nav-office (nav.no, 2017b).

For the older adult user group the first page gives no particularly relevant information, but there is an under page devoted to pension (nav.no, 2017a). This page gives information on the different pension systems that are in use and which system any user falls under is determined by birthyear. "Din pensjon" is a service where users can get to explore their future pension.

Nav has also a logged in page "DITT NAV" where different levels of security permit the user to administer their own contact with Nav.

4.3   Evaluation of websites

This section will present the results from a heuristic valuation of the usability of the websites introduced in the previous sections. The heuristics focus on how easy it is to modify the two items that seem to have the biggest impact on usability and user experience for older adult computer users, the ability to magnify the text and the contrast between colours on the website.

4.3.1   Heuristic evaluation

Two PHD students at SLATE[3] performed a heuristic evaluation of e-Boks, Digipost, Altinn and Skatteetaten websites. One is an HCI nd interaction design expert and teaches a university course in interaction design. The evaluation was based on the two heuristics *Consistency and standards* and *help and documentation.* The experts was given a scenario where they where a user of their own gender around 65 years old. They where asked to look at the inboxes and use the help presented on the website. Both of the evaluations were performed as a 30 minute long think aloud protocol and audio recorded. The audio recordings were then played twice, and the usability problems the two experts found were written down.

As seen in table 4.1 the experts found that all the websites had text that was hard to read because of the small text size. The help on the two digital mailboxes seemed to only concern itself with the functionality of the services, not on how to personalize the services for the user. The magnification on e-Boks allowed the user to increase the text size very much, the only drawback was that when the zoom became large enough, the text next to the icons on the left navigation panel disappeared to give more space for the content in the centre of the page. On rollover the text is visible, but the expert though that for older adults it should always be visible but it could perhaps move below the corresponding icon.

The first thing the HCI expert did on the on the different websites was to search for an icon or button indicating how to magnify the text. On the Altinn footer she found "Altinn A-Å" and immediately clicked it, when it turned out to be a list of everything that is available on the website, she became disappointed. This led to her magnifying the website using the built-in function in her browser. The experts were very happy with how much they could magnify Altinn, but less impressed when the website no longer fit in the browser window.

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[3]Centre for the Science of Learning & Technology www.slate.uib.no

TABLE 4.1: The results from the heuristic evaluation

	Consistency and standards	Help and documentation
e-Boks	• Small text size. • Some menu texts so small they are almost unreadable. • Red colour in the menu can give the user the impression they have done something wrong. • When the zoom gets very large the description of the icons disappears. Rollover shows it in small letters. • The text on the grey side panel might have to low contrast.	• No icons or information on how to zoom. • The help seem to be only about how to use e-Boks, not how to personalize the website. • Very much text to go through when looking for something. • Searching for "tekst" gives a page with instructions for "Internet Explorer".
Digipost	• Small text. • Cannot magnify the page much. • Hard to read tiny black letters on white background	• No icons or information on front page about text size. • Very much text on the help pages. • Very many FAQ. • Very many help pages. Need to know what to search for. • The help seems to only be about what you can do in Digipost, not how to personalize the website.
Altinn	• Small text. • Very bad zoom, page becomes too wide for browser window. • The page is very messy, easy to get overwhelmed. • The grey text on the grey background on right side of the page, this is hard to read.	• The text size is so small its unreadable. • The text in the images in the help gets grainy when magnified a lot. • The help is an overwhelmingly long list. • The "Tips for synshemmede" is hard to find if you do not know its there. It takes 4 clicks to get there the most direct way. • Instructions say to use "ctrl ++" to magnify. Tester is using a Mac and that doesn't work.
Skatteetaten	• Small text. • The menus are overwhelming, lots of links. • If the mouse pointer is placed over the instructions on how to zoom, when the page is magnified a lot, the menu opens on rollover. • When zoomed a lot, the language option disappears. • The difference when a button is rolled over is very slight. Easy to miss.	• There is no other help than what is visible on the front page.

When the HCI expert started looking around Skatteetaten and saw the "AA" icon she exclaimed "*Ha! Found it!*" This was the only one of the website where the experts found information on how to increase the text size without searching in the help. The HCI expert was evaluating the websites on a Mac, and found it good that the information also included instructions on how to magnify websites for Mac-users. Altinn also have instructions on how to magnify the text size, but it is hidden on the bottom of one of the many subpages in the help, and the instructions are incorrect for Mac-users. A positive thing about Altinn was that on the right side of every page there was relevant information about the services on the page.

4.3.2 Assessment of the magnification and contrasts on the websites

For the evaluation of magnification tools that are either built into in the websites or the web browser have been utilized. The standard zoom feature in the browser, or ctrl++ has been the primary way of making the text bigger. To make the contrast, a plug in called "High Contrast", was installed in Google Chrome.

"High Contrast" lets the user easily change between 5 different variants of colour schemes that gives different contrasts on the websites, in addition to the normal view of the websites. Figure 4.5 shows the menu for a user. As seen in this figure, the options are increased contrast, grayscale, inverted colour, inverted grayscale and yellow black. The websites was viewed in the increased contrasts, inverted colour and yellow black.

FIGURE 4.5: The options in High Contrast

The different magnifications and contrasts where the screenshotted on a windows laptop with a standard 17" screen.

Digipost

This next section is the evaluation of Digipost's inbox. The evaluation is split into two parts. The first is about how the website handles magnifying the text and how it affects the website. The second adresses the contrast. The section concludes with a short summary.

Digipost's website was first inspected in the standard magnification, figure 4.1. This provided a basis on which to compare other magnifications of the website. The next step was to see how easy it was to magnify the webpage with the help of ctrl++. Digipost's webpage was magnified to 130%, see figure 4.6. When attempts to increase the magnification further, the size of the text decreased.
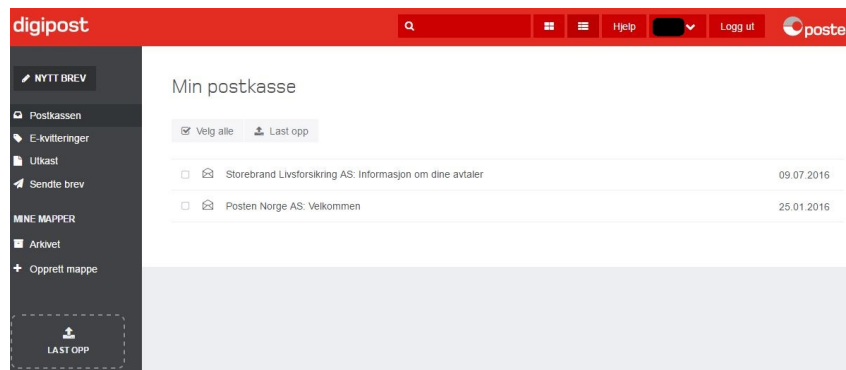
(A) Digipost's website with standard zoom
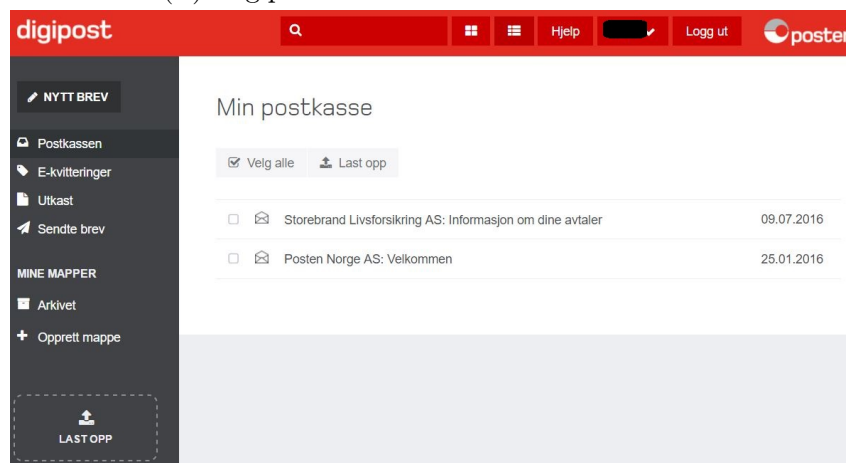
(B) Digipost's website zoomed 130%

FIGURE 4.6: The difference in Digipost's website with standard zoom and
zoomed 130%

It was not possible to adjust the contasts by using the tools discussed in the introduction to the evaluation.

In summary Digipost's website allows the user to magnify the text up to a certain point, but after this the text size decreases. This reduces the usability for the older adults, as they sometimes need to be able to increase the text size even more. The inability to change the contrasts is negative regarding the usability for those who have assorted visual impairments.

The analysis of this website, which was conducted a while ago, is no longer relevant as the website has been upgraded. On the new website it is possible to increase the magnification above 130% and to change the contrasts.

e-Boks

This next section is the evaluation of e-Boks's inbox. First it covers how the webpage handles the magnification manipulation by the user, and how this magnification effects the webpage. The following is about manipulating the colours and contrasts of the webpage. Here multiple screenshots are provided to see the apperance difference of the page. The last section is a summary of the evaluation.
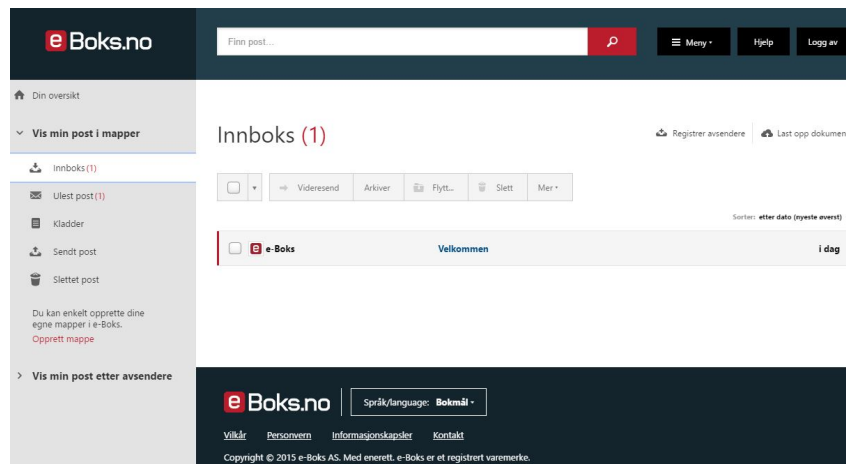
(A) e-Boks's website with standard zoom
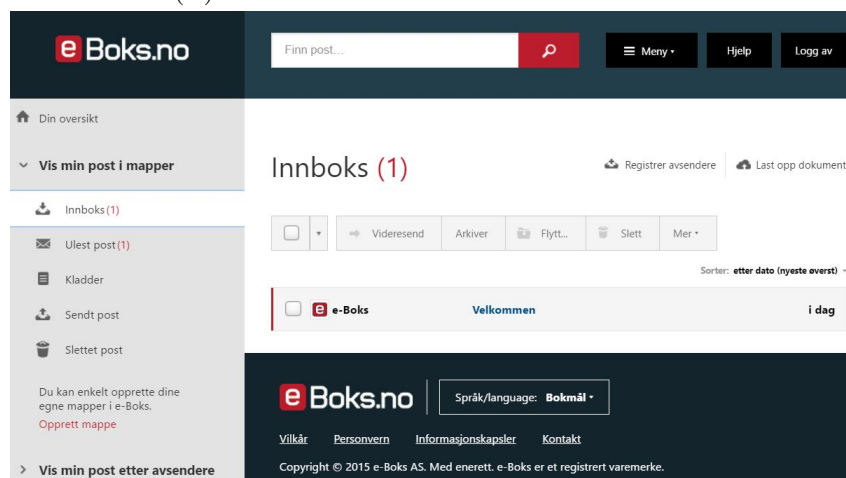
(B) e-Boks's website zoomed 130%

FIGURE 4.7: The difference in e-Boks's website with standard zoom and zoomed 130%

When the evaluation of e-Boks's website was started the first view of the website was in the standard zoom. The next step was to try to increase the size with the help of ctrl++. The first goal was to hit a magnification of 130%, see figure 4.7. This was achieved without any problems. The next step was to see if it was possible to increase the magnification more. Figure 4.8 shows how the layout changed when the zoom increased to 160%.

When viewing the website at 160% zoom, the text disappears from the sidebar. This leaves the icons alone to give information to the user about the different folders and options. When mousing over the icons the text apears, but in the text size used in the normal view of the page. The magnification reduces the amount of white space on the website to make room for the bigger icons and text.
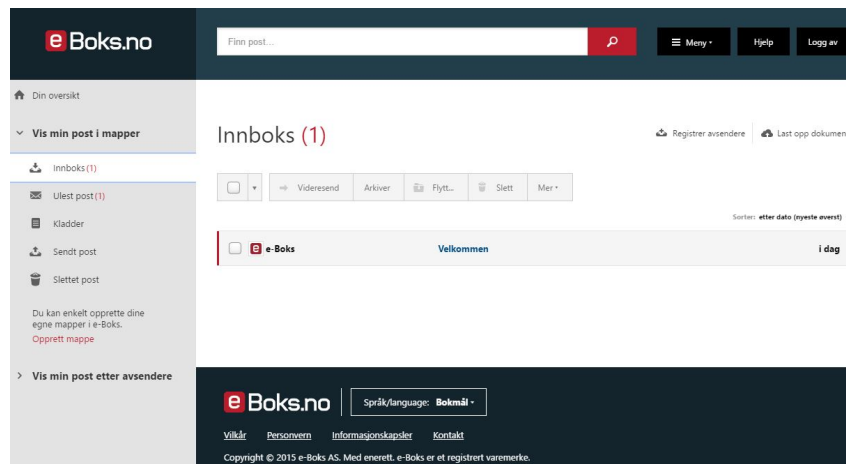
(A) e-Boks's website with standard zoom
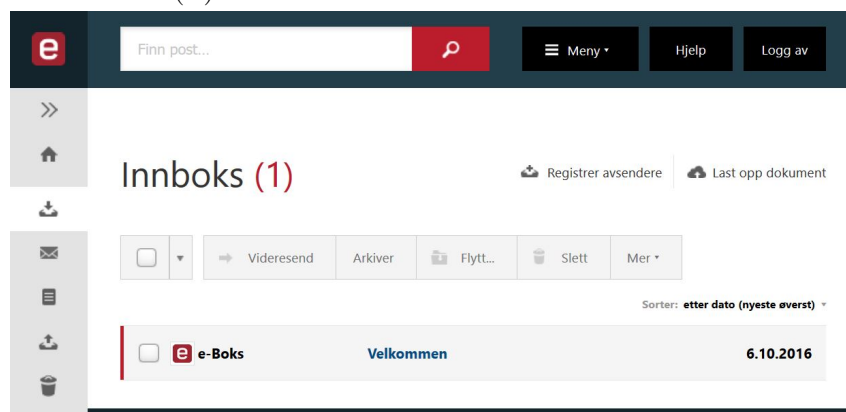
(B) e-Boks's website zoomed 160%

FIGURE 4.8: The difference in e-Boks's website with standard zoom and zoomed 160%

E-Boks's website offers no built-in way to change the contrast, and no information on how to do so. The FAQ has no information on how to adapt the webpage for visual impairments.

(A) e-Boks's website with standard colours

(B) e-Boks's website with increased contrast
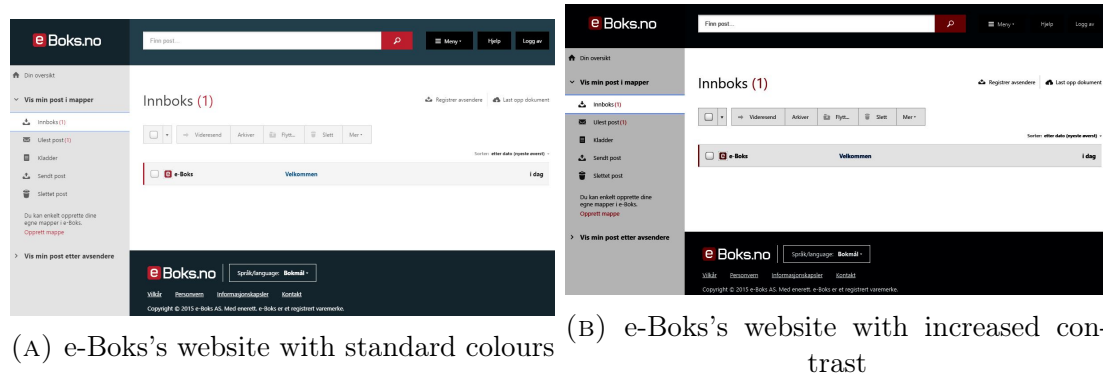
FIGURE 4.9: The difference in e-Boks's website with standard colours and increased contrasts.

In figure 4.9 the contrasts have been increased with the help of the "High Contrast" plugin described earlier, so that the difference between text and background it more pronounced. When you compare the two screenshots in figure 4.9 you can see that in the sidebar the grey background colour is darker, but the dark grey text has become black. This also goes for the other paler grey areas, such as the action bar and the list of letters. In the top bar, the dark grey has become black, and the buttons have disappeared into the background. This have left the text on them as links in white on a black background.

(A) e-Boks's website with standard colours

(B) e-Boks's website with inverted colours
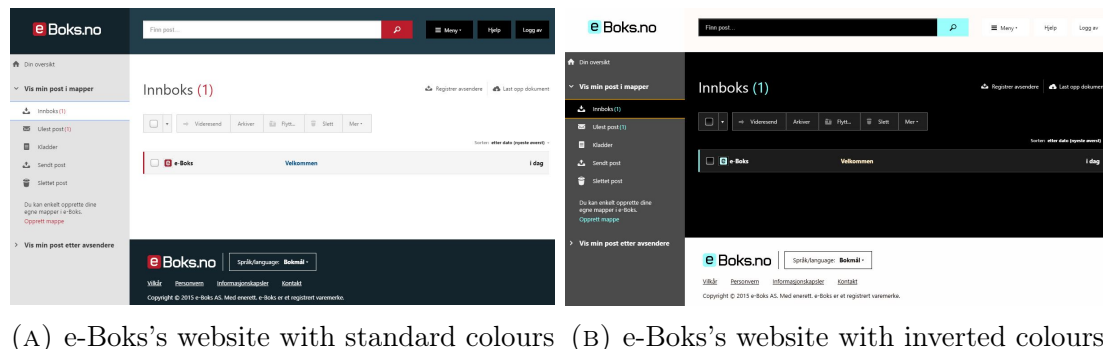
FIGURE 4.10: The difference in e-Boks's website with standard colours and inverted colours.

Figure 4.10 is the same webpage, but this time the colours have been inverted. Backgrounds that was white is now black. Black and dark greys have both become white. For most of the webpage this has no negative effect, the webpage is easy to navigate. The buttons on the top bar have, just as in figure 4.9, disappeared into the background and left the text on them as links in black. If the user has chosen to use inverted colours to remove the brightness that white backgrounds can give, both the top and bottom panels are now big white areas.

In the yellow and black edition of the webpage, figure 4.11, the readability of the items on the sidebar decreases, as the dark grey of the text is not that different from the grey of

(A) e-Boks's website with standard colours

(B) e-Boks's website with the colours changed to yellow and black.
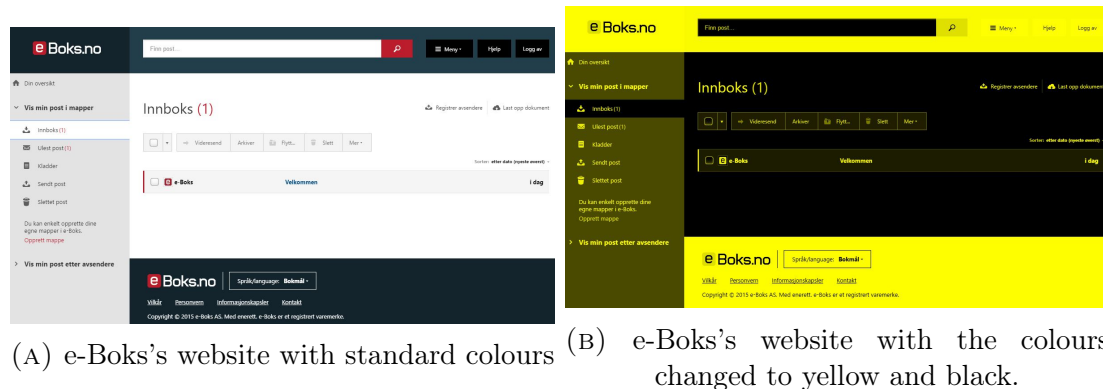
FIGURE 4.11: The difference in e-Boks's website with standard colours and the colours changed to yellow and black.

the background. The edges of the letters become a bit blurry. This is the only altering of the website that leaves the buttons in the top bar still visible, however the grey toolbar and list of letters both become harder to read.

As seen in figure 4.8, the E-Boks' website can easily be magnified by the users. When the webpage would have become too wide to fit in the screen, the layout changed to allow for a higher level of magnification. This way the text size can become large enough to be viewed easily, while still giving room for the same amount of options for the user. With increased contrast the website gives mostly the same impression as the normal webpage. Some buttons give the impression of being links, but this does not make them less usable. The inverted page becomes a lot darker, but is still easy to navigate. If this variant of the website is more usable depends on the reason the user need to change the contrasts. For some that have an easier time seeing white text on black this will be an improvement, but there is still big white areas. The yellow black variant made with this plugin makes the grey of the original website a murky yellow, on which it is not that easy to read text.

Altinn

Altinn.no has a page with information for visually impaired users. This page offers information on how to navigate around with the use of a screen reader or a refreshable braille display. It gives explanations on how the website works and what specific wordings will mean. It here explains that links starting with the words "Hjelp til..." will open a new window with online help (Altinn.no, 2016b).

On this page users will find information on how to adjust text size with ctrl++ and ctrl+-. Altinn states that they comply with WCAG 2.0 on level AA (Altinn.no, 2016a).

The evaluation of Altinn's website begins with a short section on the magnification of the website, before continuing with an evaluation on how the website becomes when the user modifies the colours. This section ends with a summary of the evaluation.
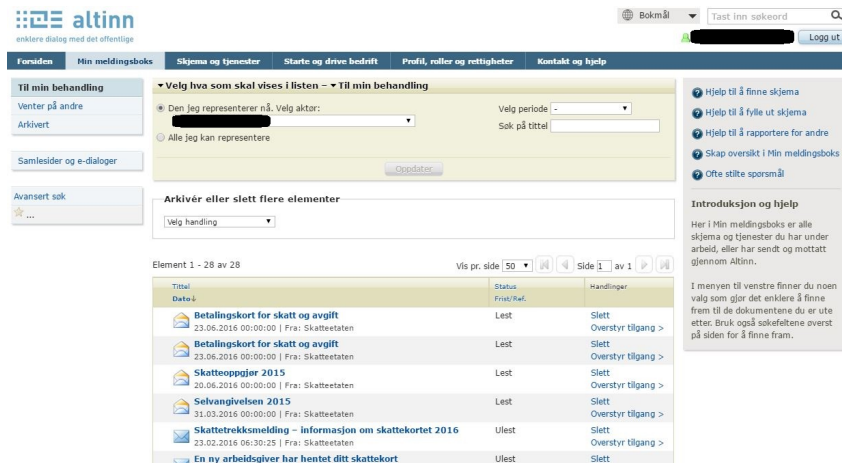
(A) Altinn's website with standard colours
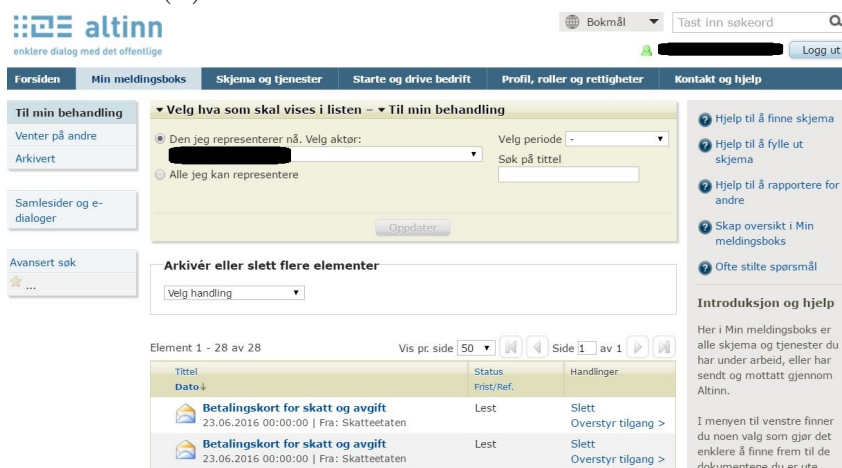
(B) Altinn's website zoomed 130%

FIGURE 4.12: The difference in Altinn's website with standard zoom and zoomed 130%

Figure 4.12 shows the Altinn inbox in a 130% magnification. At this level of magnification, the webpage still fits in a browser window, but the text is bigger.

Zooming to 160% does not change the layout of the webpage, it increases everything while keeping the same ratio between items on the page. This makes the website wider than a normal browser window.

While Altinn has a page informing on how to adjust text size, there is nothing on that page about modifying the colours or changing the contrasts.

When the webpage was viewed with increased contrasts, figure 4.13, the different elements stand out more. They are easier to distinguish from one another. The panel on the right
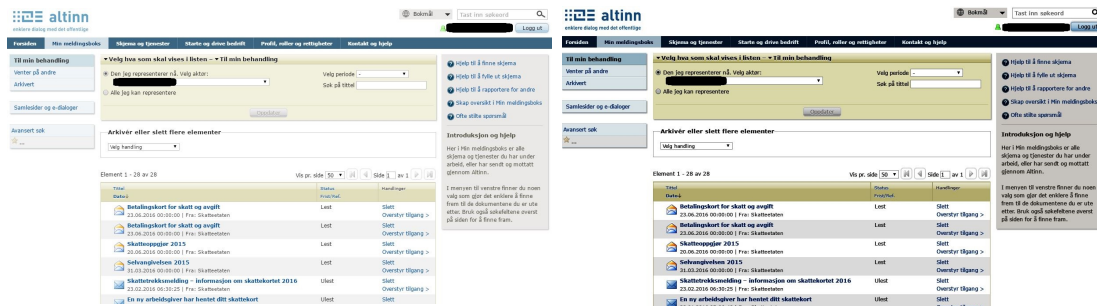
(A) Altinn's website with standard colours (B) Altinn's website with increased contrast

FIGURE 4.13: The difference in Altinn's website with standard colours and increased contrasts.

side with links to different help pages draws more attention when the box has a darker background. With increased contrasts it is easier to see that Altinn's inbox is divided into different sections. The top section lets the user choose which of the different persons he or she represents inbox is to be viewed. The right side as mentioned has to do with opening help pages relevant for the available actions, and the left side shows different stages of processing the forms or letters the users have.
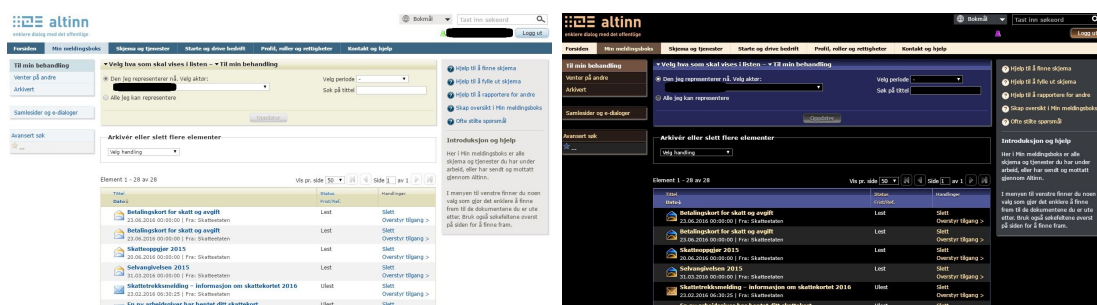
(A) Altinn's website with standard colours (B) Altinn's website with inverted colours

FIGURE 4.14: The difference in Altinn's website with standard colours and inverted colours.

In figure 4.14, the webpage is shown with the colours inverted. In this view it is possible to distinguish the different sections from each other, but it is not as easy as in figure 4.13 with increased contrasts. The webpage is very dark, as the original webpage has a lot of white and pale colours. On the menu bar it is easy to see the different buttons.

Looking at the website in yellow black mode, figure 4.15, all the colours become a bit murky. There is no clear distinction between anything on the website and the colour difference between text and background is low. Most of the text gets a muddy yellow colour while the background panels get a muddy brown yellow colour. The areas that are white in figure 4.3 and figure 4.13 are here black, just as in figure 4.14.

(A) Altinn's website with standard colours

(B) Altinn's website with the colours changed to yellow and black.
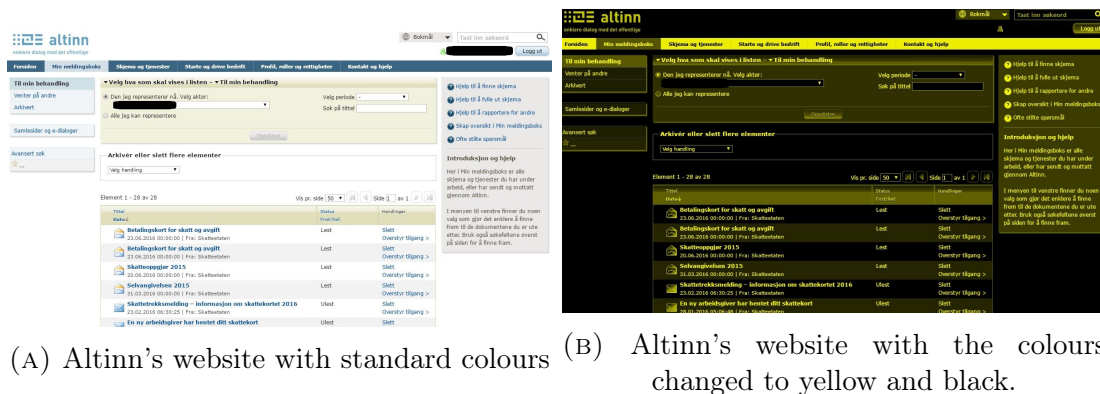
FIGURE 4.15: The difference in Altinn's website with standard colours and the colours changed to yellow and black.

As seen above Altinn provides information on how visually impaired users can navigate around on the website with the help of aids. The website responds on magnification up to a certain degree, after that the website stays the same, everything just gets larger. This means that once a user has magnified it "too much" the website gets wider than the browser can handle. At this point the usability of the page decreases for some users.

Increasing the contrasts on Altinn's page works. The deeper colours allow for easier distinction of the different items. When the colours become inverted or turned into a yellow and black variant of the website, the usability seem to be reduced. It is harder to find items in the yellow and black page, and the text gets blurry. The inverted website can be helpful for some users that have problems with light coloured websites.

Skatteetaten

The evaluation of Skatteetaten's (the Norwegian Tax Administration) website will begin with a section on the magnification and then go on to a section about the contrasts of the website. The section will end with a summary of the valuation.

When a user visits Skatteetaten's website, in the top right corner of the browser there is a mouse over hint, see figure 4.16. Here the user gets information on how to increase the text size on the website.
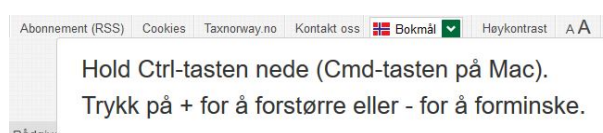
FIGURE 4.16: Skatteetaten's instructions on how to increase text size

Skatteetaten's website has a link on the top of the page, next to the one about changing text size, to a high contrast variant of the website. This variant of the website is explained in the section about contrasts.

By using this method ctrl++ the website was magnified to 140% and 160%. In figure 4.17 the page is at 140% zoom, and in this magnification the ratio of size between the items are the same, while everything is bigger. The webpage fits in a normal browser window, but there is less white space on each side. There fit less items in one browser window this way so the page is expanded vertically.
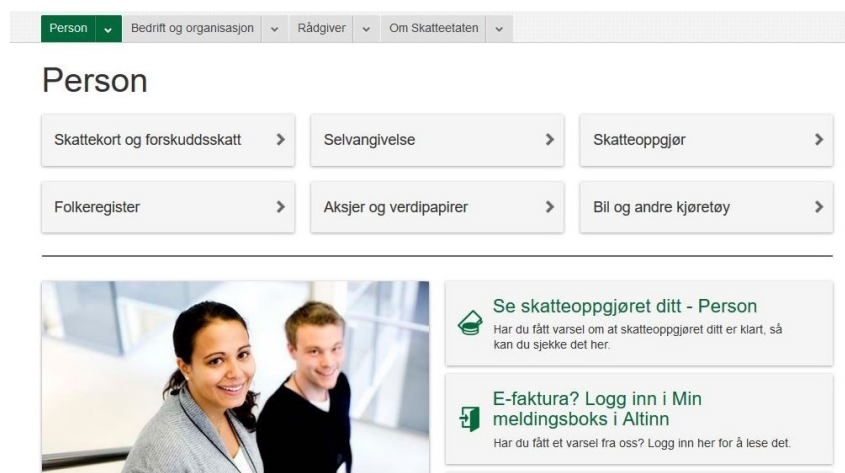
(A) Skatteetaten's website with standard zoom
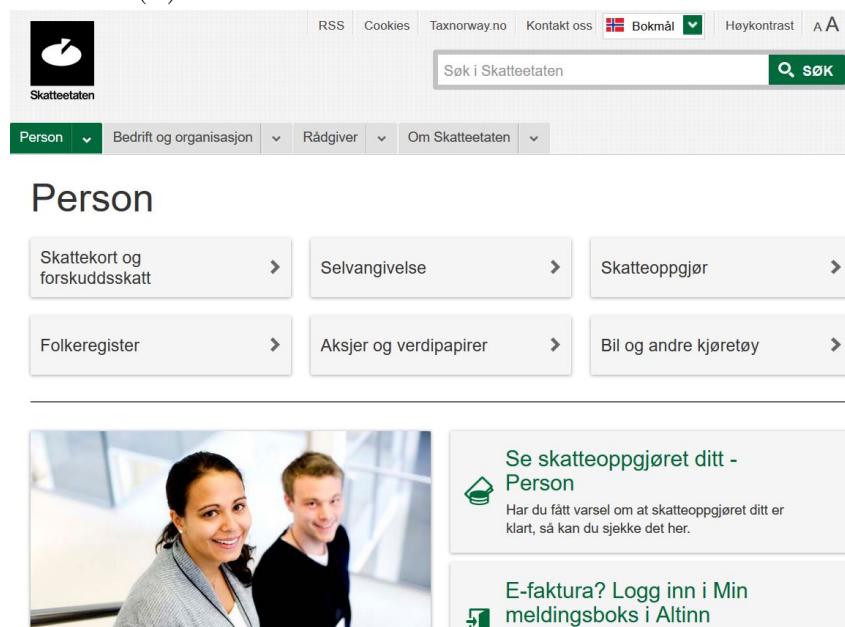
(B) Skatteetaten's website zoomed 140%

FIGURE 4.17: The difference in Skatteetaten's website with standard zoom and zoomed 140%

Figure 4.18 shows the website in 160% magnification, and the width of the webpage is the

same as in figure 4.17. Here the 3 columns with 2 rows of buttons have been rearranged to 2 columns with 3 rows. The webpage is stretched more vertically to fit the same amount of information.
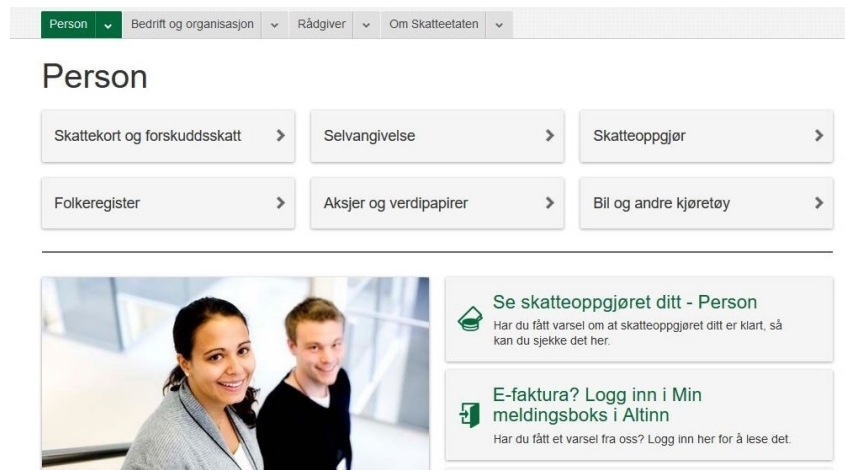
(A) Skatteetaten's website with standard zoom
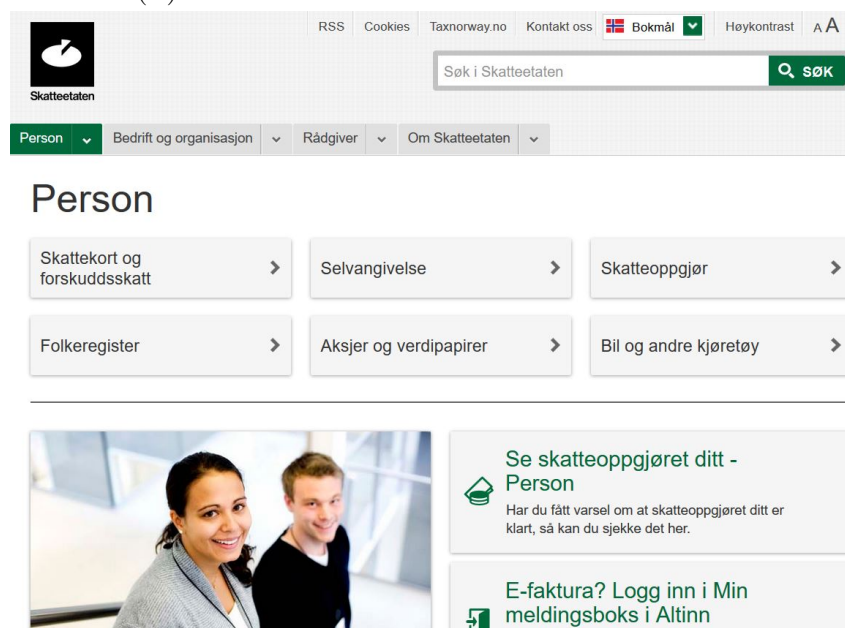
(B) Skatteetaten's website zoomed 160%

FIGURE 4.18: The difference in Skatteetaten's website with standard zoom and zoomed 160%

Figure 4.19 shows Skatteetaten's website with increased contrasts. As was the result with the other websites, it is here easier to see the different elements on the website. The picture on the page is not affected in any noticable degree by the change in contrasts.

(A) Skatteetaten's website with standard colours

(B) Skatteetaten's website with increased contrast
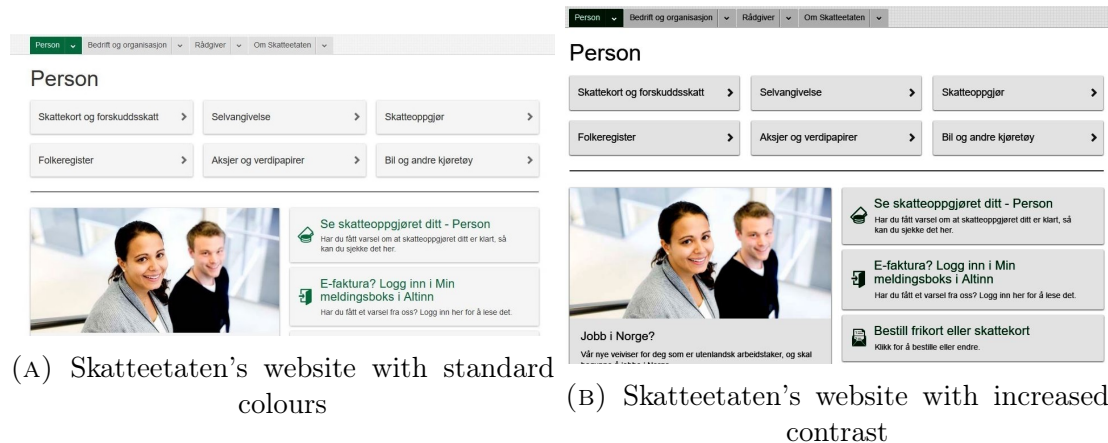
FIGURE 4.19: The difference in Skatteetaten's website with standard colours and increased contrasts.

When looking at the website with the colours inverted, see figure 4.20, the picture has been affected. The webpage has become black and dark grey, with text and effects in a lighter grey. The buttons and links are easy to see and understand what they lead to, but the information in the picture is lost due to the distortion of the image.

(A) Skatteetaten's website with standard colours

(B) Skatteetaten's website with inverted colours
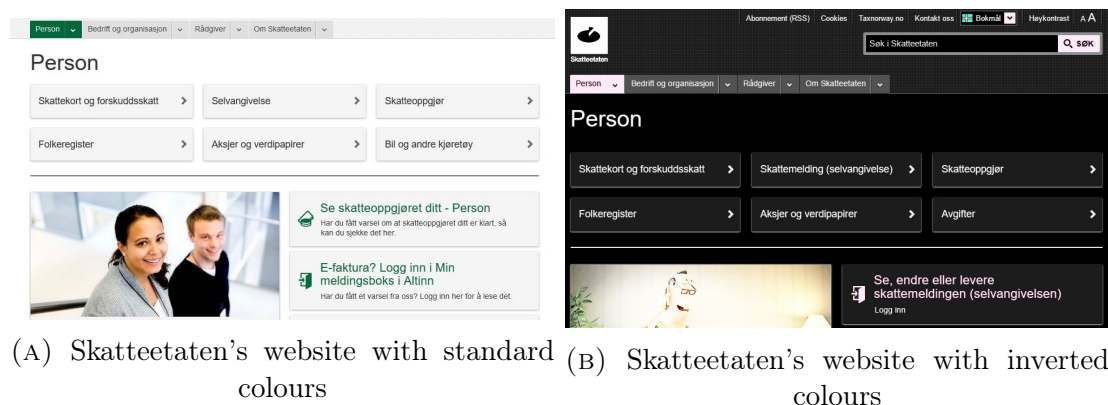
FIGURE 4.20: The difference in Skatteetaten's website with standard colours and inverted colours.

As mentioned, Skatteetaten has its own high contrast variant of the website, figure 4.21. This is a very good edition of the website in yellow and black. In this mode, the whites in the normal website, figure 4.4, have become black, and all the textboxes are a bright yellow. The text inside the textboxes is all black. The only colours besides yellow and black are the icons that indicate different actions on the website and the picture. Unlike the picture in figure 4.20 the picture is not affected by the colour changes.

(A) Skatteetaten's website with standard colours

(B) Skatteetaten's website with the colours changed to yellow and black.
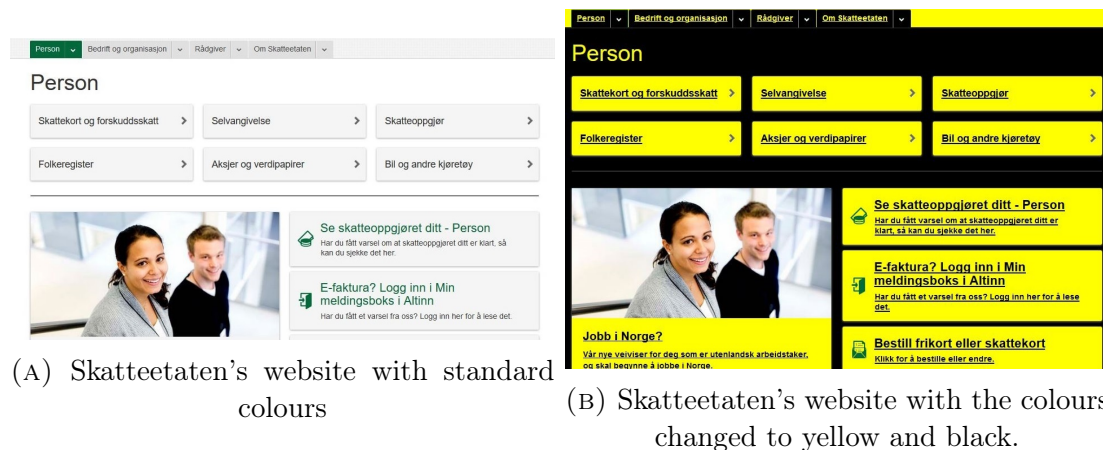
FIGURE 4.21: The difference in Skatteetaten's website with standard colours and the colours changed to yellow and black.

In summary Skatteetatens website offers information to the user on how to adjust the text size, and the website responds to allow for magnification. The layout changes as the text become bigger, to allow for the increased size of the different elements.

When it comes to the evaluation of the different contrasts, the increased colour is on this website also easy to navigate. All the elements have been easier to distinguish from the others. The inverted website can give help to those that need to reduce the amount of white areas, but besides that the yellow and black edition that Skatteetaten has made themselves is a better option. As this is one they supply it has been designed to work on their website and it leaves images alone.

4.4 Summary

In this chapter the two governmentally approved digital mailboxes, Digipost and e-Boks, have been introduced together with Altinn. Skatteetaten and NAV, the two major governmentally services that the older adults meet has also been introduced.

As seen in the heuristic evaluation and in the assesment, all the websites have small text when they are viewed in standard magnification. E-Boks and Skatteetaten websites handles user magnification on their websites best. When the elements and text become too large to fit the browser window, the websites rearrange the elements to fit within the window.

E-Boks, Skatteetaten, and Altinn are all usable with the contrasts increased. When the colours were inverted there were differences in how easy it was to find items on the page, but they were still usable. While Skatteetatens website was the only one that turned out

well in a yellow and black colour scheme, but they also was the only service that provided a high contrast variant.

Both Altinn and Skatteetaten webpages give information on how to adjust the text size, but Skatteetatens was a lot easier to find as it was situated at the top of every page.

Chapter 5

Interviews

5.1 Introduction

This chapter summarises and analyses the interviews. The interview with the representative from Bergen Municipality will be presented first, then the three interview with elderly users. The chapter ends with a summary of the different interviews and an analysis of what we might gain from them.

5.1.1 Data

Four semi-structured interviews were carried out with 1 representative from Bergen Municipality's IT department, and 3 elderly computer users. For the interviews, there were made two different interview guides. The first was made for the interview with the representative from Bergen Municipality and the second was prepared for the interviews with the elderly.

The interviews were audio recorded, resulting in 1 hour and 9 minutes of recordings. The recordings where transcribed in 21 pages. The transcripts were read to identify themes of interest.

The norwegian quotes can be found in Appendix F.

5.2 Interview with a representative from Bergen Municipality

The interview with the representative from Bergen Municipality was a semi-structured interview aimed at finding out if there was made any special considerations when introducing "Digital by Default" and encouraging its citizens to pick and use a digital mailbox.

TABLE 5.1: Interview guide for semi-structured interview with a
representative from Bergen Municipality

Would you please talk about your role during Bergen Municipality's process when starting "Digital by Default"?
What ideas and plans have during the start of "Digital by Default"?
Was there taken any extra care when it came to groups in thepopulation that have a low digital presense?
During this process, it was sent out information to the recidents. A letter was sent out through Altinn. Was this something that went out to all the recidents at the same time?
Was some population groups selected to start the process?
Was some population groups, f.ex. imigrants, the elderly or people living in institutions delayed in this process?
Some people, often the elderly, does not feel confident or safe using digital solutions. They may have been not keeping up with the digital development the last decades. Was there taken any extra care when it came to information for them?
Was extra information to some population groups, something that was concidered?
Was the information sendt out in multiple languages?
Was the higher needs for information in these groups, the elderly or imigrants, something that was considered during this process?

First the representative was asked to describe the process they used when introducing digital mailbox to the citizens of Bergen, and from there the interview guide, see table 5.1, was used to get more specific information.

At the start of this interview the representative gave an overview of the process of introducing the citizens of Bergen Municipality to the new system. They had an internal discussion about how to do it, and made the decision to send out a digital message to everyone over 18 living in Bergen Municipality, which was about 241 000 people. The message was only sent digitally, and was not mailed on paper to those that chose not to review it online. A press release was also posted on the municipality website, and two notices were posted in a local newspaper in a section devoted to information from the Municipality.

5.2.1   Sending out Information

On the question about any special considerations they might have taken to reach specific groups of citizens, the representative said that they had had discussions about it, but had decided on a standard message to everyone, and that people who had questions could contact them. The representative said that in theory you could have chosen everyone above 65, or 60, and sent them targeted information, or visited arenas where elderly people where often present, but where were they to start? These things all cost money,

so they decided on standard information to everyone, as that gave the highest return for their effort.

5.2.2 Questions Received

According to the representative they had received questions from elderly people about how to opt out of the system, or the guardians of elderly people. People have also had sought assurances about how to do it, and confirmations that the actions they performed was right.

The representative said that if you want to give information in different languages, then you also need to have staff that can answer questions in those same languages. Steps also need to be taken so ensure the accuracy of the content in the translations.

There have been a lot of discussions in the media and people contacting Bergen Municipality, about why they could not just continue using Altinn. The representative said that the decision was for businesses and organisations to continue to use Altinn, and that private communications to individuals should go through the new digital mail system. People that have contacted Bergen Municipality about digital mailboxes, often wondered why Bergen Municipality cannot use email, which has wide use. The Municipality get a lot of questions about when this move away from Altinn is going to take place, but as of May 2016 the only answer they can give is "*No, we cannot say, as there have not been made a decision as to that yet*".

As of May 2016 approximately 75% of the digital mail that Bergen sends out still goes to Altinn, 22% goes to Digipost, and the rest to e-Boks. In December 2015 approximately 30 000 users were registered with Digipost, and this increased to 45 000 by March 2016. The representative thinks that the reason for the low number of users is that most people do not see the point of having a separate digital mailbox. Skatteetaten, Lånekassen, and the Norwegian Public Roads Administration[1] (NPRA) all have their own systems that work well, and provide the information the users need.

5.2.3 Digitalisation in Bergen Municipality

Bergen Municipality is in the forefront of introducing digital solutions both to the internal systems and to the public. This is partly caused because the IT-department is interested in new solutions, and partly because of political encouragement. The IT-department was

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[1]Statens vegvesen

working on integrating existing public registries and services into the digital forms used by Bergen Municipality.

The representative talks enthusiastically about how, with automatic lookups to Skatteetaten, Nav, and the people's register, that applying for kindergarten or reduced parent payment can be made easier for the users. By having the information automatically collated, the users do not need to make digital copies of papers issued by the government and send with their applications, they will only need to confirm the information that is already there. With the system working this way, users only need to send in pappers only if there have been big changes.

Bergen Municipality has been working on a way to make the information sent through the id-Porten filter, so that it only goes to those for whom it is relevant. Two examples the representative provides, that is relevant from the last year, is that instead of sending information about "datokjøring" to everyone, it would only be sent to those who have a driver's license or a car. The other example is that instead of encouraging everyone in Bergen to not light their fire on days with inversion, only those with old fireplaces in Bergen city centrum would receive a message. These changes required cooperation with the Bergen Fire department and with NPRA to gain access to their registers. A pilot of this service was in testing in the end of May 2016.

5.3   Intervju with 3 elderly persons

As a part of this study semi-structured interviews were carried out with 3 different elderly people, who had varying experience with computers. This following section introduces them and gives a summary of the interviews.

All three of the interviewees where asked the same questions, see table 5.3, about prior knowledge of digital governmental services and the digital mailbox, about websites they used and liked, or did not like, and if they knew why they preferred those websites over others in the category. Finally, to give an idea and an overview on the problems the elderly face navigating online, and how to compensate for that, and how to make websites more accessible for this age group, they were asked about any tools or memory aids they used to navigate around on websites they visited.

TABLE 5.2: Table of the interviewees

Name	Age	Gender
Jan	76 - 80	Male
Audun	71 - 75	Male
Inger	71 - 75	Female

The names used where chosen by the interviewees, as well as the age group they identify with as shown in table 5.2.

TABLE 5.3: Interview guide for elderly computer users

General iformation about the interviewee:
May I have your name, and which age group you belong to? 60-65, 66-70, 71-75 or 76-80?
How often do you use a computer or tablet?
I was wondering if you have some websites you use regularly? I am interested in knowing which experience you have with different websites. Some examples are newspapers, Internet bank or governmental services like NAV or Skatteetaten?
Some questions about public services:
What do you think about more and more public services becoming digitalized?
Do you have experience with BankID?
Have you ever used a digital mailbox such as Digipost or e-Boks? These are not regular email providers.
Have you ever used any other governmental service online? Examples can be NAV, Altinn or Skatteetaten.
What do you think about more and more of NAV's services becoming digitalized?
What do you think about that the Norwegian government and more and more municipalities will be sending out letters digitally rather than as regular mail?
About different websites, and how they are to use:
Is there something special about these websites that make you find them easier to use?
Is there something special about these websites that makes them easier to use?
Can you tell me about some websites that you find hard to use?
Is there something specific that makes these websites harder to use?
If you could change something about a website you visit regularly, to make it easier to use , what would that be?
Do you use any programs to make a website easier to use? Such as text-to-speech software or a magnifier?
Is there anything else you do to make it easier to navigate online? An example can be written down instructions over what icons mean, which buttons to press, step by step guides?
Anything else you want to tell me about using the Internet and websites?

5.3.1   Intervju with Jan

The first person interviewed was Jan, an elderly man between 76 and 80 years' old. He had some previous experience with the use of computers, to an extent where he read newspapers daily, booked tee-times, and did his tax returns digitally. He also had experience with email and purchased travel tickets. He used Internet banking, and when asked if he had a bankID, a secure system used for online verification issued by the bank, he assumed this to mean that he logged on with a code. When asked a follow up question on this, he did not understand that there is a difference.

When asked about a digital mailbox and whether he uses one, Jan asks if this is the same as email. After the concept was explained, and he has had a bit of time to think, he says *"the development is going that way, even if you like it or not, it's just the way it is. I think that for the most of you this is ok, but I think that a lot of people my age, and younger will struggle with it."* Jan says that he thinks that the biggest problem for the elderly is the training and knowledge on the use of computers.

On a question about 2-3 websites he regularly uses, that he finds easy to navigate and operate, he takes us to his computer. At this point he gets very focused on getting the laptop started and getting online. He has big problems getting the Internet to work so he can show the websites. After several restarts of the computer, the interviewer interrupts and turns on the Wifi. The start page he uses is startsiden.no[2]. He points out different websites he visits regularly, including Facebook[3], an Internet bank, and Gmail[4]. He states that none of these are easier or harder than the others to use.

On a question about websites he finds difficult, he talks about websites devoted to genealogy and digital church books. The difficulty he finds in these websites is regarding the use of them, unclear instructions on the next step in the process. He is asked if he, given the option, would make any changes to any of these websites mentioned previously. He answers by outlining the use he has on different websites, but when pressed states that the websites work well enough for him.

The final question asked of him is if he uses any accessibility software, such as a magnifier or text-to-speech, or memory aids to navigate around programs or websites. He answers that on the computer he uses no such aids, but on his cell phone, he both zooms on websites, and uses speech-to-text to navigate and write messages. *"It is faster, right? Than trying to hit the letters."*

His closing statement is:

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[2]http://www.startsiden.no/
[3]http://www.facebook.com
[4]https://mail.google.com/mail/

"I'm so lucky that I have had this computer 10, 12, 13 years, so I have gotten used to it, right, and basically I get my needs covered, in those areas I use the machine. The only thing I find bad, is the development in regards to the banks use of computers. I find they have gone to fast and too far and I miss the office down at xxx, that they used to have, right. Now there is neither people down there, nor an ATM even. So, I find they have gone a bit too fast in the digitalisation of bank services. This is a bit like what can happen with public services. It can happen there too, if they go to fast."

5.3.2 Intervju with Audun

Audun is a man between 71 and 75 years old. His prior use of computers dates back to the early 1980's when he used an MS-DOS program to keep employee register for the company where he worked. He uses computers daily, and speaks enthusiastically on how the use of computers makes thing easier. Every morning he logs on to his laptop, goes to startsiden.no and navigates through the links there to different newspapers. He uses Internet banking, knows what bankID is, but does not use it.

Audun knew what Digipost was, and he used it. (He logs on using his Buypass card issued by Norsk Tipping). Audun got a Digipost account because he got an offer for it, he said it might have been on an email from Posten, after moving. E-boks was not an alternative he had heard of. The pension slips no longer come as regular mail but directly to his digital mailbox. Later in the interview he tells about how when he helped sell a house and needed to report some things to Skatteetaten he had his first meeting with "Digital by Default". The support person he talked to on the phone said he was going to send a form to them, and that the seller could find it in their digital mailbox. Because the seller did not have a digital mailbox, nor wanted one, they had to request the form sent as normal mail.

On the question about websites he finds easy to use, he answers that he generally does not have any problems. After a few visits most websites are for him unproblematic to use. The biggest problem he has when it comes to using different websites, is the amount of unnecessary information he must navigate around. He brings up buying airplane tickets, and how it gives a lot of questions and that it is unclear that you do not need to answer all of them to continue. When asked if he could modify any websites he uses regularly, he talks about how *"we a bit older, we see a bit worse"*, and how some websites, for example startsiden.no have changed their fonts to a smaller one, and when he zooms, sometimes the content becomes too wide for his screen. He would like to be able to magnify the text, but have the width of the website stay the same.

Audun does not use any special software to magnify, just the one built in to his web browser. He does not use any text-to-speech software. On the question about memory aids, he says that he has started to write down notes about websites and procedures, *"because a lot of pages are very similar. So, then you don't remember immediately, is it this, or that, right? I have had several."* Audun says that he threw away all those post-it notes because of the interview.

5.3.3   Intervju with Inger

Inger is a woman between 71 and 75 years old. Inger used an iPad, that she recieved from her grandchildren to access the Internet. Before she got the iPad she had never used a computer. She accesses the Internet daily and has Startsiden.no as her homepage. Among the websites she uses is an Internet bank, Facebook, and newspapers. She has and uses bankID to log on to websites such as Altinn.

She does not like that information from the government and municipality will come as digital mail. For her own sake, it is not a problem, but she says her husband does not use computers, nor does he want to use computers, and he is unwilling to learn how to use her iPad. Inger means that instead of opting out of getting digital mail you should opt in.

When she is asked about what websites she uses regularly she mentions Facebook and two of the larger Norwegian newspapers. She does not know why she prefers these over others, but she finds them easy to navigate around. The only websites she can recall every finding difficult to use, on first attempt, is a page from Bergen Municipality about housing modifications and Norsk Tipping. She thinks they were difficult because she hadn't visited them before, now she finds them not easy, but not hard to use. *"No, I don't feel any need for that, now. I'm not that old yet."*, is the answer she gives when asked if she would like to make any modifications to websites, such as colour, text size or other things.

Inger says she uses no tools or programs, such as magnifying or text-to-speech, when she uses her iPad, but on a direct question if she zooms while on websites she admits to doing this. If she is unsure how to find something on a website, even websites she has visited before, she googles something she remembers that the website was about. She says that this normally helps her finding the right website page.

At the end of the interview Inger says that she is lucky. She has children and grandchildren that help her when she cannot figure out how to do something on her iPad. She makes a point of saying that others are not so lucky, so there should be course offeringon how to use computers and the Internet, as it makes everything so easy.

5.4 Summary

The process Bergen Municipality engaged in when introducing digital postbox did not do anything extra to reach the elderly people in arenas where they operate, but this was also not their goal. Bergen Municipality is aware that it might be necessary to take an extra step to reach everyone, but from a cost-benefit prospective it is not sensible to devote extra recourses to introduce "Digital by Default" or digital mailbox to this group of users at this time. By not giving out information in multiple languages, Bergen Municipality has shown a precedence when it comes to targeting information to minorities, and this case shows the same for digital minorities, such as the elderly.

The relative low number of users of the digital solutions might be because people do not see the need, and with people not wanting to have another service they need to check for information. Some of the users who do not use these digital solutions want the government and Bergen Municipality to send out information via email. Email is not a secure and verified system such as Digipost and e-Boks, which is why it cannot be used for official mail. People do not understand this difference.

Bergen Municipality is working on systems that will make the digital systems interactive and more user-friendly. These changes will benefit minorities both when it comes to language and digital barriers. The new system they have been testing will also make it easier to get information to elderly people who might have been put off by the perceived complexities of the digital mailboxes.

All three elderly computer users that were interviewed found computers to be a benefit for them, and talk about how easy it is to do things for themselves online. They all did their taxes online. Of the three, only one had heard of digital mailbox and used it. Jan did not live in Bergen, and thus did not get the digital information letter from Bergen Municipality, but he subscribed to the newspaper where Bergen had placed notices about choosing a digital mailbox. Inger had not heard of digital mailbox, but being among the group that got the letter in Altinn, she should have. There is a possibility of her seeing the notice about a letter, but not opening it as she did not find it relevant for her. As she and other elderly people seem to find the use of Internet and digital solutions like Altinn and an Internet bank a benefit, there is a possibility that with more targeted information she and others like her would have chosen to use it. This indicates that to get an increase in the number of users that chose a digital solution, targeted information might help.

The elderly users indicated that a part of the digital barrier is from lack of instruction in the use of computers. Both Jan and Inger indicate that they think other elderly people do not use the digital solutions because of fear. They are afraid of doing something wrong,

or breaking something by accident. To counter this Jan and Inger suggest that the elderly should be offered courses in the use of computers, or tutoring in how to use them. Inger says *"Now, I have children that, of course, have helped me to progress, and I can ask them all the time. I'm lucky like that, but I feel for those that don't have that option, for them there should be something."*

Audun indicates that for him the biggest problem is the text size online, and Jan says that sometimes when he zooms on a website, he finds it problematic that the site expands to wider than his screen. These issues will be explored more in the focus group that was conducted as a part of the project.

Chapter 6

Group interview

This chapter presents the group interview that was performed. It begins with information on an additional website that was included in the focus group. Then the interview and results are described. The chapter ends with a short summary.

6.1 Preparation

In the preparation for the group interview a set of screenshots of Startsiden.no were taken. Startsiden.no was chosen to be included due to its familiarity to the interviewees (*cf* chapter 5). This was considered a safe point with which to start the group interview, to let the participants get used to the format of the interview.

6.1.1 Brief introduction on Startsiden.no
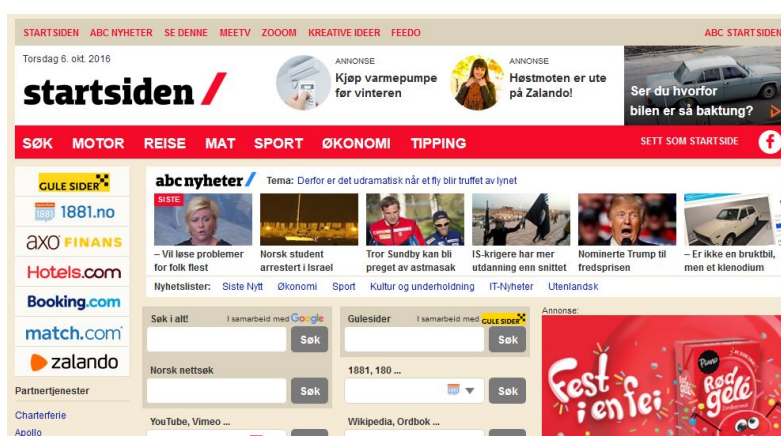
FIGURE 6.1: Screenshot of Startsiden.no

Startsiden.no, see figure 6.1, is a website that provides news articles and different online services. The website has a section with various search engines where users can choose to

search, for example only Norwegian sites, phone numbers, or using the standard Google search. It uses explanatory language to indicate how the different searches are performed. "Search everything", "Norwegian web search", phonebooks, Wikipedia, etc. You can also search for airplane tickets and other travels items. Other parts of the website have links to email providers, Internet banks, lottery, horoscopes, weather, and similar items. The website is also full of commercial links.

Appendix G presents the other screenshots of this website presented to the participants.

6.2 Group interview

6.2.1 Participants

The participants from the first round of interviews were invited to a focus group interview and were joined by another elderly woman. In the end only Inger and the new woman, Erna, were able to attend. It was then decided to use a group interview instead of a focus group interview. Erna is a woman between 76 and 80 years old. She has some experience using Internet bank, online newspapers, email, and similar services. Erna has only used a windows desktop computer. Inger, introduced in chapter 5, only has experience using an iPad which she use for similar activities.

Wallace et al. (2010) recommend that focus groups with older adults should be kept small, as older adults have a tendency to divert from topics.

6.2.2 Interview

The interview was performed as a conversation between the interviewer and the participants. The websites were discussed one at a time. To indicate the size the websites would have on a laptop screen a set of printouts were given to the participants, see appendix E for an example of these. These screenshots formed the basis for the discussion.

First the normal website was shown together with the magnifications of them, then the website was shown together with the increased contrasts, inverted colours, and in a yellow and black variant, see figure 6.2 for an example of these, others are included in appendix D. Erna and Inger both had their own copy of them on paper, and these paper screenshots formed the basis for their conversations. They would point at the relevant image or hold it up to show to each other what they meant. For Digiposts website only the magnifications where discussed, as in chapter 4.
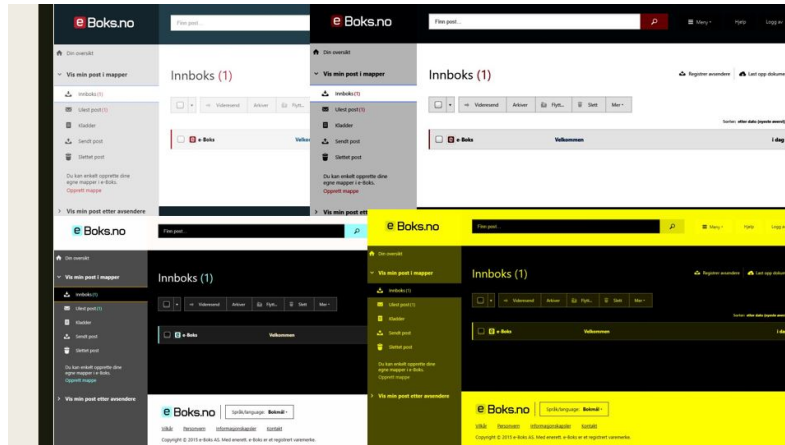
FIGURE 6.2: Example of the slides shown to participants

When the interview started the participants were not told what was the difference between the variants of each website. They were only asked to tell which they preferred, and why. After the first two websites where discussed, the participants had realized that the first set if images they were given for each website was a series of magnifications, the first one presented for each of them was at 130%, except Skatteetaten where it was 140%. For those websites where increasing the magnification had altered the layout of the website a 160 % magnification was included.

When it seemed they had nothing more to say about a website, the next set of screenshots were presented.

6.2.3 Data Collection

The group interview was recorded on audio with the help of an application on an Android phone. The interview itself took 59 minutes, with time before for explanations of the procedure. A decision was made to not transcribe everything the paticipants said, as they frequently started talking about unrelated topics. The audio recordings where listened to several times to identify and write down what the participants said about the different websites.

6.2.4 Results

The results from the group interview will be presented in two tables. Table 6.1 show results related to the magnification, and table 6.2 the results from the discussion about the colours. Blank cells in the tables are where the participants didn't comment on that specific variant of the website. The Norwegian quotes are available in Appendix H.

TABLE 6.1: Results from the group interview on the magnified websites

Website	Regular size	Enlargment 1	Enlargment 2
Startsiden	Some of the letters here blend together	Erna and Inger both find the text here clearer	[1]1
Skatteetaten	Very small letters	Erna and Inger says that this is nice to look at	They like this, but feel they are not old enough to require it.
Altinn	It is possible to read this	It is more enjoyable to use this. They feel that they take in the material on the website in a different way	[2]1
Digipost		They express frustration that this is not the standard text size	[3]1
e-Boks		Erna and Inger says that in this size it is nice	They do not like that the text disappears from the sidebar, as they do not know what the icons mean.

As seen in table 6.1 they are in agreement that the larger text makes the website better. They comment that those websites are nicer to look at, the text is clearer, and that the websites are more enjoyable to use. After they have looked at a few of the different websites Erna says, *"I don't understand why it cannot always be like this on ours"*. The larger magnifications are less popular. Inger says, *"This is very magnified. When it get this big I think: I'm not that old!"* Neither of them had ever seen the icon on Skatteetatens website, figure 4.16, informing them on how they can magnify the page.

When looking at figure 4.18, Erna thinks out loud, *"Imagine how nice if I could magnify it so much that I don't need to use glasses with the screen."*. Later on in the interview Inger says *"It gives so much more. This is amazing. I must say, really amazing. You get a sense of achievement"*.

Erna and Inger did not like the way the different changes on the websites affect the images. They feel that while everything else on the page changes, the images should stay the same. When they were looking at the different variations of Startsiden Erna said *"I found that the one that was only magnified was best, for the pictures where clearer there. This is ok enough to read, but the images got worse."*

THey found Skatteetatens high contrast website too bright, the yellow colour is very sharp for them. This is the only yellow and black website on which they can read the text. The only website on which they like the inverted colours was Altinn, where Inger found the

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[3]These are not presented at the group interview as the text size here got smaller when the zoom increased more.

TABLE 6.2: The results from the contrast discussion

	Standard colour	Increased contrast	Inverted colour	Yellow and black
Startsiden	In the normal view of the website Erna and Inger find the pictures best, but the text is easier to read in the increased contrast	Erna and Inger likes the text best in this website, but the images do not look nice	Erna says this is horrible	They do not like this one
Skatteetaten		Erna and Inger both find this variant of the website better	Erna and Inger said that this website is very dark	Both Erna and Inger says that they find this website too bright in colour
Altinn		Erna indicates she likes the normal website best, while pointing out this one	Inger found this clearer, and she prefers blue colours. Erna says she can use this	Too hard to read on
e-Boks		Erna and Inger prefers this one	The find this usable, but do not like it	The text is hard to read here, the letters are hard to see

blue colour nice, and said: *"I find blue nice, and it became sort of clearer."* Erna responded to this: *"I prefer the websites the way they look. But I could use this one."* She here points first to the image with increased contrast, then to the one with inverted colours that Inger like.

As the interview progressed they used less time to discuss the different variants of the website. When the last one, e-Boks, was presented they just stated that they prefer *"this one"*, pointing at the one with increased contrasts. They were very clear that their preferred the website with increased contrast over the websites with inverted colours, or the yellow and black.

In the end, Erna and Inger agreed that the ideal website for them has increased contrasts, and has been magnified to 130%. The larger text and sharper colours make them want to use more websites, as they felt they would be able to enjoy using websites when they had an easier time seeing the material on the screen.

6.3   Summary

In this chapter Startsiden was included in the suite of websites presented in the interview based on its familiarity to the participants. The group interview with Erna and Inger has been described and the results from their discussion was presented in tables 6.1 and

6.2. Both participants showed a preference for websites with a larger text size, but not too large, and that the websites have clearer contrasts between the different areas and between text and background.

Chapter 7

Discussion

In this chapter the findings from the different parts of the research are discussed in relation to the four research questions. The questions that was introduced in chapter 1 is:

- How do the different universal access regulations and guidelines cover the needs of older adults?

- How does the digitalization of government take the needs of older adults into consideration?

- Is digitalization of government something older adults understand and how do they relate to it?

- Which ethical issues ought to be taken into consideration when it comes to digitalization of public services and older adults?

The research questions will be discussed one at a time, and then summarized in the last section.

7.1 How do the different universal access regulations and guidelines cover the needs of older adults?

Older adults have certain needs when using computers and the Internet, *cf* chapter 3.2. A common problem among older adults is seeing small letters and some have trouble with specific colours or low contrasts. Websites that require that the user have previous knowledge on how to operate it, or demands that the user remember multiple steps and actions can cause problems.

The principle behind web accessibility according to Henry (2006) and W3C (2008) is that users with different disabilities or challenges should be able to understand, navigate, and interact with websites. The different challenges faced by the older adults fall into this

category and the different guidelines for web accessibility and universal access should then ensure that the websites are usable, also for older adults.

The different regulations and guidelines for universal access and web accessibility have specific points about the use of colour and contrasts, the size of text and ability to magnify websites, for example WCAG 2.0 Guideline 1.4 that regulates resizing text and minimum contrasts between background and text (see appendix C for details); the NIA guidelines in table 3.3, say text should be 12pt or bigger and that patterned backgrounds should be avoided. The redesigning guidelines by Patsoule and Koutsabasis only say that *"The text content should be easily readable"*. Dickinson et al. (2005), on the other hand, say that text should be larger than normal, at least 14pt and that the current W3C guidelines should be followed. The Norwegian regulation incorporates the rules in WCAG 2.0 level AA .

In the heuristic evaluations the experts found that the text size on the different websites they inspected was very small. This impression was supported by the interviews with the older adults and the focus group. In the interview with Audun he said that he wished he could zoom the text larger, without content moving out of the browser window. Erna and Inger preferred the websites when they were zoomed to about 130%.

Similarly, the different guidelines have specifications on making the navigation of the websites easier. Czaja and Lee (2006) wish screen information to be presented in consistent locations and if possible to use a standard format. WCAG 2.0 states: *Make Web pages appear and operate in predictable ways*. This is supported by Patsoule and Koutsabasis (2014) that say that the layout and elements of websites should be consistently displayed. When Jan was asked in his interview about problems he had with different websites, he said that the biggest problems he had was when he didn't know what the next step was in a given procedure. Inger said that when she didn't know where to go on a website to find what she wanted, she googled something she remembered from the correct page. The ability to search in that way is, according to van Deursen and van Dijk (2008), information skill, which only 62% of their testers could complete.

In the heuristic evaluation when the e-Boks website was zoomed sufficiently, the text on the sidebar was removed to make space for bigger icons. The text was still available as a rollover, but the text was then in the normal size. This makes it impossible for those that need that high level of magnification to read this hint. Altinn, who comply with WCAG 2.0 level AA, satisfies the requirements for an accessible website, but the heuristic evaluations still showed problems encountered by older adults.

Altinn contains a large amount of information, so that visitors who are new, or inexperienced, might feel overwhelmed when they use it. When the website was zoomed more

than 160% some of the content on the website moved out of the browser window, as the page became too wide. Altinn do contain help to explain issues for the item the visitor is currently accessing. The help and documentation for the website is very large and covers many topics. Dickinson et al. (2005) recommended that to make websites usable for older adults each page should have no more than 10 actions or buttons. They also recommended not using scrollbars. Altinn follows the WCAG guideline and organizes the help and documentation hierarchically, but unless the visitor knows what they are looking for, there is a large amount of content to search through. In the help, in a section called *"Tips for synshemmede*[1]*"* visitors will find instructions on how to magnify the website with "ctrl++". This tip is only accurate for visitors not using Macs.

Websites that follow the accessibility guidelines, but are still not accessible, were also found on eGovernment websites in other countries. Anderson et al. (2004) mentions a website in the USA, firstgov.gov, where there is "*skip to content*" links that should take the user past the headers etc., but that actually does nothing. The website also uses colour alone to indicate location on the website. Another example they gave was a website in Australia, where alt-tags was provided for all the images, but several of the alt-tags had either *spacer* or just a #.

The impression is that while the guidelines take most of the needs of older adults into consideration, unless the guidelines are followed with a focus on users with different disabilities, the websites are still not accessible or usable for them.

7.2 How does the digitalization of government take the needs of older adults into consideration?

The Norwegian government has a goal that the public sector should be accessible online, and that the primary form of communication with its citizens should be through web services. To accomplish this, they developed a set of principles, among them "Digital by Default". "Digital by Default" means that digital communication is the standard solutions and citizens have to *opt out* to receive letters in the regular mail. Inger was of the opinion that it should be *opt in* instead. Both Inger and Audun have family and friends that refuse to use computers. Jan, who himself uses computers, find the concept of the digital mailboxes confusing. He does not see the difference between them and his email, nor does he have a digital ID, which is a requirement for signing up for a digital mailbox.

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[1]Tips for the visually impaired

Internationally eGovernment is on the rise as countries wish to use their resources in more efficient ways (Üzüm and Göktürk, 2011; Warf, 2013), but by doing so they might exclude one of the population groups, older adults. To be able to use digital services older adults need to have the knowledge on how to use them, the access to computers and the Internet (in Norway two out of three between the ages of 65 and 74 use the Internet), and the digital services needed to be made accessible for them. The users also need to know about the digital services.

Bergen Municipality sent a letter, through Altinn, to all their citizens that were older than 18 informing them that they should pick a digital mailbox. The representative that was interviewed said that they had no plans of sending out information in the regular mail; Difi[2] on the other hand sent out a letter to those who had not picked a digital mailbox encouraging them to do so, see appendix I. To raise the number of people who use digital mailboxes, there might be a need for more targeted information; the representative from Bergen Municipality, however, said that after discussions they decided not to target specific groups of potential users due to the cost. The decision was made to instead explain how to opt out of *"Digital by default"* to those who contacted them for more information. The representative also said that they had had to reassure users during the process of signing up to a digital mailbox that the user was doing it correctly.

In a study by van Deursen and van Dijk (2008) it was revealed that even though governments expect their citizens to have a certain set of skills, gained by just having access to computers and the Internet, this was not the case. Older adults in particular have problems with *computer anxiety* and lack of *digital literacy*, which can cause them to abstain from the use of computers, which leads to a *digital divide*.

In the heuristic evaluation the two experts found that the Norwegian websites had several problems that made them hard to use for the older adults, even though they were accessible. The websites, in some cases, contained large amounts of text, something that can overwhelm the older adults and place a large strain on working memory. In table 3.2, one of the guidelines pointed out by Czaja and Lee (2006) is that designers should strive to reduce the visual clutter. Altinn, as an example, was very "messy" according to the heuristic evaluation. Another of the guidelines state "*Provide easy to use on-line aiding and support documentation*". A general theme from the heuristic evaluation was that the help, on the websites that provided help, contained large amounts of text.

Several of the studies carried out about *computer anxiety* point out that for older adults to overcome their anxiety they need targeted information on how to use the web services, and confidence in using them. In some cases, for example the UK and Finland, this was

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[2]Direktoratet for forvaltning og IKT

accomplished by providing computer courses or supporting computer courses for older adults. Jan and Inger said in their interviews that they felt Norway should offer courses for older adults in the use of computers. Inger considers herself lucky, as she has children and grandchildren that can help her, but she points out that other older adults do not.

Various studies show that it is important that users with different disabilities are a part of the development of accessible systems. As seen previously, even when the guidelines that should ensure accessible websites are followed, the websites are not necessarily accessible to everyone. Dickinson et al. (2005), Aula (2005), Henry (2006), van Velsen et al. (2008), and Patsoule and Koutsabasis (2014) all performed different studies where they included older adults in their projects. These projects showed that by including the older adults in the evaluations the websites or programs became more accessible for this user group.

van Velsen et al. (2008) performed a study where they developed an eGovernment service for a social service, where older adults were one of the main target groups. In the development process they made sure to include older adults as their evaluators to ensure that the resulting application took their needs into consideration.

7.3 Is digitalization of government something older adults understand and how do they relate to it?

The representative from Bergen Municipality said in the interview that they received questions from citizens about why they could not use their email instead of signing up for a digital mailbox. Older adults and legal guardians of older adults contacted them with questions on the process of opting out of receiving digital letters. According to Dickinson et al. (2005) older adults need to understand the benefits of digital services to be willing to learn how to use them.

Jan did not know there was a difference between digital mailboxes and email, and he was concerned that the digitalization process of governmental services would go as fast as the digitalization of bank services. Where he lives there is no longer any ATMs or people to talk to in the bank, and he worries what will happen if the governmental services go the same way. Curzon et al. (2004) found in their study that older adults have made strategies for how they find governmental information, and that changing these strategies was hard for the older adults.

During the interview with Inger, she talks about how her husband is unwilling to learn how to use computers or tablets. He is used to receiving his tax assessment in paper format and wants to continue with that, whereas Inger receives her tax assessment digitally. Inger

has used other digital services from Bergen Municipality and even though she found the website complicated to use in the beginning, she no longer finds it hard.

Audun is positive towards computers. He receives his pension slips directly in his Digipost account, the digital mailbox he selected. For himself he does not find digitalization problematic, but he did encounter issues with "Digital by Default" when he helped someone sell a house. The friend did not have a digital mailbox and Audun had to call Skatteetaten and request a form sent through the regular mail.

Jan and Inger indicated in their interview that training in how to use computers and the Internet might persuade more older adults to use digital services. Choudrie, Ghinea, and Songonuga (2013) support this by stating that increased digital literacy in older adults can increase the use of eGovernment services in this population group.

7.4   Which ethical issues ought to be taken into consideration when it comes to digitalization of public services and older adults?

Darzentas and Miesenberger (2005) find it ethically wrong to exclude anyone from the Internet as it has become an important social platform. Other researchers, such as Sixsmith (2013) and Mordini et al. (2009) agreed and said that digital skills, or the lack of digital skills, can work as a way to separate people. Both Inger and Audun said in their interviews that they have people close to them that do not know how to use computers or that are unwilling to use computers.

The European Commission includes in their themes to foster e-Inclusion a point about *"Ageing"* that older adults should be empowered to fully participate in the economy and society, that they should be able to continue to live independently, and that their quality of life should be enhanced. This implies that an effort needs to be made to make eGovernment webservices accessible, usable, and available for older adults. Availability for older adults is not just making the web services, they also need to know how to use them (Becker, 2004).

The introduction of "Digital by Default" in Norway implies an expectation that all adults, also older adults, have access to the Internet and computers. Two out of three older adults between the age of 65 and 74 in Norway use the Internet and studies done in the UK showed that the main reasons for not using the Internet was the cost of acquiring a computer, the cost of an Internet service, or the idea that the user was too old to use

technology (Morris, Goodman, and Brading, 2006). Other studies also link the *"Digital Divide"* to computer anxiety and digital literacy.

According to Charness and Jastrzembski (2009) the Hippocratic oath *"First do no harm"* should be the starting point for ethical design. This corresponds with McLean's (2011) two prong view of the ethics of design for older adults, where one of the prongs is concerned with the deliberate or accidental potential for technology to harm. The development and evaluation methods described in chapter 3 includes users in their processes. By including older adults in their projects van Velsen et al. (2008) and Patsoule and Koutsabasis (2014) found that they could make web services that was easier to use for older adults.

7.5   Summary

Older adults, as group, have challenges when it comes to, amongst others, vision, hearing, computer anxiety, and digital literacy. These challenges have an impact on how we include older adults in the digital society. As seen in this chapter these challenges have an impact on how web services should be developed; it is important to also include users with different problems and disabilities in the processes.

eGovernment websites are one area where it is important to ensure that the websites are accessible for older adults, to not exclude them from the society. Some ethical issues regarding older adults and eGovernment have been discussed in this chapter, amongst them "Digital be Default" and e-Inclusion.

Chapter 8

Conclusion

8.1   Results

The goal of this study was to look at how different regulations and guidelines take the needs of older adults into consideration, and how the process of digitizing the government considers the needs of older adults. As seen, the guidelines are not enough on their own, they need to be implemented by designers and developers that understand the reasons behind them, not only for older adults but also for users with disabilities.

Many older adults experience apprehension and anxiety towards computers and the Internet. To encourage older adults to overcome this, they need to learn certain digital skills. Without this training, it can be hard to overcome the digital divide. For older adults, it is not enough to make the web services available, they will also need to be accessible.

Some older adults find eGovernment services a good thing, but for others (e.g. those lacking digital skills) there is a barrier to overcome. Only one of the older adults interviewed had signed up for a digital mailbox, and others had not heard of them.

There are several ethical issues that need to be considered when societies become digitalized. The Internet is becoming an important social arena, and for those without access to the Internet, either by choice or by lack of knowledge and abilities, they risk being excluded. In the UK, a study showed that sometimes older adults considered themselves too "old" to use new technologies. As more services become web based they will not be included. Another important issue is to neither deliberately nor accidentally cause harm by introduction new services. This can for example be in cases where there is a breach of privacy.

8.2 Research limitations

Only a small number of older adult were included in this study, because of this it is hard to draw any general conclusions on how older adults relate to the digitalization of Norway's eGovernment. There is also the fear of "*Impression management*[1]" where the interviewee gives an answer they think the interviewer will want to hear (Østbye et al., 2013). With a larger number of interviews the influence of the results would not be as large.

For the group interview, if it had been conducted with the intended number of participants, the results might have been more diverse. Older adults are often concerned with if they scored better or worse than others, and compare themselves with each other (Barros, Rêgo, and Antunes, 2014). With more participants, of both genders, there might have been more discussion about what is good or bad with the different websites, whereas now, Inger and Erna were mostly in complete agreement.

8.3 Contributions to research

In this study, it has been shown that when governments become digital, it is important to consider who the users of the services will be, and how to make the digital government usable and accessible for different groups.

8.4 Future research

This study has shown that there is need for more research on how the older adults in Norway view eGovernment, and how they use the web services provided. Another area that could be investigated more thoroughly is how accessible and usable the Norwegian eGovernment websites are for a larger number of older adults.

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[1]Translated from Norwegian

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Appendix A

Consent forms for interviews

Forespørsel om deltakelse i forskningsprosjektet

"Digital Government and Older Users"

Bakgrunn og formål
Formålet med studien er å finne ut om innføringen av digitalt samfunn ivaretar eldre brukeres behov. Dette er en del av en masteroppgave ved Institutt for informasjons- og medievitenskap ved Universitetet i Bergen.

Du er bedt om å delta på bakgrunn av din stilling hos Bergen Kommune.

Hva innebærer deltakelse i studien?
Deltakelse i denne studien innebærer et kvalitativt intervju som ikke vil vare mer en 45 minutter. Spørsmålene vil i hovedsak handle om prosessen rundt innføring av digital postboks i Bergen Kommune. Intervjuet vil bli spilt inn.

Hva skjer med informasjonen om deg?
Alle personopplysninger vil bli behandlet konfidensielt. All informasjon vil bli anonymisert. Kun intervjuer og hennes veileder vil ha tilgang til intervjudataene. Lyd- og tekstfiler vil ikke lagres over internett eller i skyen.

Prosjektet skal etter planen avsluttes 1.12.2016. Ved prosjektets slutt vil alle data destrueres.

Frivillig deltakelse
Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli slettet.

Dersom du har spørsmål til studien, ta kontakt med Kine Lohne de Nijs, tlf: 97 66 01 75 epost: kfi010@student.uib.no, eller hennes veileder Barbara Wasson, epost: barbara.wasson@uib.no.

Samtykke til deltakelse i studien

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

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Forespørsel om deltakelse i forskningsprosjektet

"Digital Government and Older Users"

Bakgrunn og formål

Formålet med studien er å finne ut om innføringen av digitalt samfunn ivaretar eldre brukeres behov. Dette er en del av en masteroppgave ved Institutt for informasjons- og medievitenskap ved Universitetet i Bergen.

Hva innebærer deltakelse i studien?

Deltakelse i studien innebærer deltakelse på et intervju med varighet opp til 1 time. Spørsmålene vil handle om vaner på internett og nettsider. Intervjuet vil spilles inn og transkribert i etterkant. Etter transkribering vil lydfilene slettes.

Hva skjer med informasjonen om deg?

Alle personopplysninger vil bli behandlet konfidensielt. All informasjon vil bli anonymisert. Kun intervjuer og hennes veileder vil ha tilgang til intervjudataene. Lyd- og tekstfiler vil ikke lagres over internett eller i skyen.

Prosjektet skal etter planen avsluttes 1.12.2016. Ved prosjektets slutt vil alle data destrueres.

Frivillig deltakelse

Det er frivillig å delta i studien, og du kan når som helst trekke ditt samtykke uten å oppgi noen grunn. Dersom du trekker deg, vil alle opplysninger om deg bli slettet.

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Samtykke til deltakelse i studien

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

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Dato / sted   signatur

Forespørsel om deltakelse i forskningsprosjektet

"Digital Government and Older Users"

Bakgrunn og formål
Formålet med studien er å finne ut om innføringen av digitalt samfunn ivaretar eldre brukeres behov. Dette er en del av en masteroppgave ved Institutt for informasjons- og medievitenskap ved Universitetet i Bergen.

Hva innebærer deltakelse i studien?
Deltakelse i studien innebærer deltakelse på en fokusgruppe med varighet opp til 1.5 timer. Spørsmålene vil handle om forskjellige varianter av nettsider. Intervjuet vil spilles inn og transkribert i etterkant. Etter transkribering vil lydfilene slettes.

Hva skjer med informasjonen om deg?
Alle personopplysninger vil bli behandlet konfidensielt. All informasjon vil bli anonymisert. Kun intervjuer og hennes veileder vil ha tilgang til intervjudataene. Lyd- og tekstfiler vil ikke lagres over internett eller i skyen.

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Samtykke til deltakelse i studien

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

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Dato / sted   signatur

Appendix B

Redesign Guidelines

TABLE B.1: Guidelines for redesigning websites for older adults (Patsoule and Koutsabasis, 2014)

	Principles		Guidelines
1	Visibility: All interactive elements, information, user choices, and feedback should be clearly visible throughout the website whenever required	1	All the elements of the website should have suitable default size
		2	There should be appropriate form of feedback with clear indication of any change that may happen
		3	The most important content of the website should be visible and directly presented, where possible
		4	The colours, textures, and graphics should be properly chosen
		5	There should be blank space, properly sited between the elements of the website
		6	The text content should be easily readable
		7	All interactive data should be visible
2	Ease of understanding: The presentation of information, content, and available user actions should be understandable and effective throughout the website, regardless user's experience, knowledge, reading ability, and level of concentration	1	The content should be provided in a format that does not require great user experience and advanced reading literacy
		2	Each interactive element should be perceived and be understandable, without the need of documentation
		3	There should be clear indication of the action that the user should do to interact effectively

	Principles		Guidelines
		4	There should be clear indication of whether a mandatory or an optional action is requested by the user
		5	The content should be presented in the best possible way depending on the case as to achieve the desired objective
		6	The content should be presented in a normal and conceptual form and sequence
3	Control and flexibility: The user must always exert control of the interaction and the website should offer the user a range of individual choices and alternative modes of action according to his/her preferences, expectations, and capabilities	1	There should be controlled navigation at all times
		2	There should be controlled actions in dynamic content (e.g. sounds, videos, etc.)
		3	The size of all elements of the website should be adjustable in accordance with user's requirements
		4	There should be an option to choose alternative ways of presenting non-text elements of the website
		5	There should be a possibility to correct or cancel any action
		6	There should be an option to overcome any repeatable element or action
		7	There should be a possibility to control the unexpected changes that may occur during the interaction
		8	There should be an option to select ways of searching content according to user preference
4	Static and dynamic help: Assistance should be provided to users when asked or at any time required while interacting, throughout the website	1	Assistance should be provided during navigation
		2	Assistance should be provided in the execution of an operation
		3	Assistance should be provided in the execution of an operation
		4	Assistance should be provided while searching
		5	Assistance should be provided while completing forms
		6	Major helping elements should be provided for inexperienced – with the web users

	Principles		Guidelines
5	Consistency of organising information: All interactive elements should be functionally and visually consistent throughout the website. The layout, information, and content should be coherently organised throughout the website	1	All elements of the site should be consistently displayed
		2	There should be a layout consistency
		3	The conceptual organisation of information should be consistent
		4	There should be navigation consistency
		5	The actions required should be consistent
		6	The design style and format should be consistent
		7	There should be terminology consistency
6	Efficient design: The design of the website should be lean, predictable, functional, and attractive to the user creating a pleasant, friendly mood and inspiring confidence, both for the user's effective and satisfying interaction with the website	1	There should be wise selection of the components in the website. Any distraction should be avoided
		2	Efficient ways to perform any action should be provided
		3	The content should be presented in a diffuse spirit of friendliness
		4	The design should be predictable with regard to the way of performing actions
		5	Any surprises in the design should be avoided
		6	The design should inspire trust
7	Focused design: The design should be effective, focusing on the object of the website, without presenting unnecessary information	1	The purpose of each component that constitutes the website as well as the overall purpose of the website should be clear
		2	The function and content of each element should be clear
		3	Locating specific information should be easy
		4	The presentation of the most important information for the success of the purpose of the website should be unequivocal
		5	The information should be displayed in a hierarchical way of importance through the website

Appendix C

WCAG 2.0 Guidelines

WCAG 2.0 Guidelines

This section is normative.

> Principle 1: Perceivable - Information and user interface components must be presentable to users in ways they can perceive.

> Guideline 1.1 Text Alternatives: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
>
> Understanding Guideline 1.1

1.1.1 Non-text Content: All non-text content that is presented to the user has a text alternative that serves the equivalent purpose, except for the situations listed below. (Level A)

How to Meet 1.1.1
Understanding 1.1.1

- **Controls, Input:** If non-text content is a control or accepts user input, then it has a name that describes its purpose. (Refer to Guideline 4.1 for additional requirements for controls and content that accepts user input.)
- **Time-Based Media:** If non-text content is time-based media, then text alternatives at least provide descriptive identification of the non-text content. (Refer to Guideline 1.2 for additional requirements for media.)
- **Test:** If non-text content is a test or exercise that would be invalid if presented in text, then text alternatives at least provide descriptive identification of the non-text content.
- **Sensory:** If non-text content is primarily intended to create a specific sensory experience, then text alternatives at least provide descriptive identification of the non-text content.
- **CAPTCHA:** If the purpose of non-text content is to confirm that content is being accessed by a person rather than a computer, then text alternatives that identify and describe the purpose of the non-text content are provided, and alternative forms of CAPTCHA using output modes for different types of sensory perception are provided to accommodate different disabilities.
- **Decoration, Formatting, Invisible:** If non-text content is pure decoration, is used only for visual formatting, or is not presented to users, then it is implemented in a way that it can be ignored by assistive technology.

> Guideline 1.2 Time-based Media: Provide alternatives for time-based media.
>
> Understanding Guideline 1.2

1.2.1 Audio-only and Video-only (Prerecorded): For prerecorded audio-only and prerecorded video-only media, the following are true, except when the audio or video is a media alternative for text and is clearly labeled as such: (Level A)

How to Meet 1.2.1
Understanding 1.2.1

- **Prerecorded Audio-only:** An alternative for time-based media is provided that presents equivalent information for prerecorded audio-only content.
- **Prerecorded Video-only:** Either an alternative for time-based media or an audio track is provided that presents equivalent information for prerecorded video-only content.

1.2.2 Captions (Prerecorded): Captions are provided for all prerecorded audio content in synchronized media, except when the media is a media alternative for text and is clearly labeled as such. (Level A)

How to Meet 1.2.2
Understanding 1.2.2

1.2.3 Audio Description or Media Alternative (Prerecorded): An alternative for time-based media or audio description of the prerecorded video content is provided for synchronized media, except when the media is a media alternative for text and is clearly labeled as such. (Level A)

How to Meet 1.2.3
Understanding 1.2.3

1.2.4 Captions (Live): Captions are provided for all live audio content in synchronized media. (Level AA)

How to Meet 1.2.4
Understanding 1.2.4

1.2.5 Audio Description (Prerecorded): Audio description is provided for all prerecorded video content in synchronized media. (Level AA)

How to Meet 1.2.5
Understanding 1.2.5

1.2.6 Sign Language (Prerecorded): Sign language interpretation is provided for all prerecorded audio content in synchronized media. (Level AAA)

How to Meet 1.2.6
Understanding 1.2.6

1.2.7 Extended Audio Description (Prerecorded): Where pauses in foreground audio are insufficient to allow audio descriptions to convey the sense of the video, extended audio description is provided for all prerecorded video content in synchronized media. (Level AAA)

How to Meet 1.2.7
Understanding 1.2.7

1.2.8 Media Alternative (Prerecorded): An alternative for time-based media is provided for all prerecorded synchronized media and for all prerecorded video-only media. (Level AAA)

How to Meet 1.2.8
Understanding 1.2.8

1.2.9 Audio-only (Live): An alternative for time-based media that presents equivalent information for live audio-only content is provided. (Level AAA)

How to Meet 1.2.9
Understanding 1.2.9

Guideline 1.3 Adaptable: Create content that can be presented in different ways (for example simpler layout) without losing information or structure.

Understanding Guideline 1.3

1.3.1 Info and Relationships: Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text. (Level A)

How to Meet 1.3.1
Understanding 1.3.1

1.3.2 Meaningful Sequence: When the sequence in which content is presented affects its meaning, a correct reading sequence can be programmatically determined. (Level A)

How to Meet 1.3.2
Understanding 1.3.2

1.3.3 Sensory Characteristics: Instructions provided for understanding and operating content do not rely solely on sensory characteristics of components such as shape, size, visual location, orientation, or sound. (Level A)

How to Meet 1.3.3
Understanding 1.3.3

Note: For requirements related to color, refer to Guideline 1.4.

Guideline 1.4 Distinguishable: Make it easier for users to see and hear content including separating foreground from background.

Understanding Guideline 1.4

1.4.1 Use of Color: Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. (Level A)

How to Meet 1.4.1
Understanding 1.4.1

Note: This success criterion addresses color perception specifically. Other forms of perception are covered in Guideline 1.3 including programmatic access to color and other visual presentation coding.

1.4.2 Audio Control: If any audio on a Web page plays automatically for more than 3 seconds, either a mechanism is available to pause or stop the audio, or a mechanism is available to control audio volume independently from the overall system volume level. (Level A)

How to Meet 1.4.2
Understanding 1.4.2

Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether or not it is used to meet other success criteria) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

1.4.3 Contrast (Minimum): The visual presentation of text and images of text has a contrast ratio of at least 4.5:1, except for the following: (Level AA)

How to Meet 1.4.3
Understanding 1.4.3

- **Large Text:** Large-scale text and images of large-scale text have a contrast ratio of at least 3:1;
- **Incidental:** Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
- **Logotypes:** Text that is part of a logo or brand name has no minimum contrast requirement.

1.4.4 Resize text: Except for captions and images of text, text can be resized without assistive technology up to 200 percent without loss of content or functionality. (Level AA)

How to Meet 1.4.4
Understanding 1.4.4

1.4.5 Images of Text: If the technologies being used can achieve the visual presentation, text is used to convey information rather than images of text except for the following: (Level AA)

How to Meet 1.4.5
Understanding 1.4.5

- **Customizable:** The image of text can be visually customized to the user's requirements;
- **Essential:** A particular presentation of text is essential to the information being conveyed.

Note: Logotypes (text that is part of a logo or brand name) are considered essential.

1.4.6 Contrast (Enhanced): The visual presentation of text and images of text has a contrast ratio of at least 7:1, except for the following: (Level AAA)

How to Meet 1.4.6
Understanding 1.4.6

- **Large Text:** Large-scale text and images of large-scale text have a contrast ratio of at least 4.5:1;
- **Incidental:** Text or images of text that are part of an inactive user interface component, that are pure decoration, that are not visible to anyone, or that are part of a picture that contains significant other visual content, have no contrast requirement.
- **Logotypes:** Text that is part of a logo or brand name has no minimum contrast requirement.

1.4.7 Low or No Background Audio: For prerecorded audio-only content that (1) contains primarily speech in the foreground, (2) is not an audio CAPTCHA or audio logo, and (3) is not vocalization intended to be primarily musical expression such as singing or rapping, at least one of the following is true: (Level AAA)

- **No Background:** The audio does not contain background sounds.
- **Turn Off:** The background sounds can be turned off.
- **20 dB:** The background sounds are at least 20 decibels lower than the foreground speech content, with the exception of occasional sounds that last for only one or two seconds.
  Note: Per the definition of "decibel," background sound that meets this requirement will be approximately four times quieter than the foreground speech content.

> How to Meet 1.4.7
> Understanding 1.4.7

1.4.8 Visual Presentation: For the visual presentation of blocks of text, a mechanism is available to achieve the following: (Level AAA)

1. Foreground and background colors can be selected by the user.
2. Width is no more than 80 characters or glyphs (40 if CJK).
3. Text is not justified (aligned to both the left and the right margins).
4. Line spacing (leading) is at least space-and-a-half within paragraphs, and paragraph spacing is at least 1.5 times larger than the line spacing.
5. Text can be resized without assistive technology up to 200 percent in a way that does not require the user to scroll horizontally to read a line of text on a full-screen window.

> How to Meet 1.4.8
> Understanding 1.4.8

1.4.9 Images of Text (No Exception): Images of text are only used for pure decoration or where a particular presentation of text is essential to the information being conveyed. (Level AAA)

Note: Logotypes (text that is part of a logo or brand name) are considered essential.

> How to Meet 1.4.9
> Understanding 1.4.9

Principle 2: Operable - User interface components and navigation must be operable.

Guideline 2.1 Keyboard Accessible: Make all functionality available from a keyboard.

> Understanding Guideline 2.1

2.1.1 Keyboard: All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. (Level A)

Note 1: This exception relates to the underlying function, not the input technique. For example, if using handwriting to enter text, the input technique (handwriting) requires path-dependent input but the underlying function (text input) does not.

Note 2: This does not forbid and should not discourage providing mouse input or other input methods in addition to keyboard operation.

> How to Meet 2.1.1
> Understanding 2.1.1

2.1.2 No Keyboard Trap: If keyboard focus can be moved to a component of the page using a keyboard interface, then focus can be moved away from that component using only a keyboard interface, and, if it requires more than unmodified arrow or tab keys or other standard exit methods, the user is advised of the method for moving focus away. (Level A)

Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

> How to Meet 2.1.2
> Understanding 2.1.2

2.1.3 Keyboard (No Exception): All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes. (Level AAA)

> How to Meet 2.1.3
> Understanding 2.1.3

Guideline 2.2 Enough Time: Provide users enough time to read and use content.

> Understanding Guideline 2.2

2.2.1 Timing Adjustable: For each time limit that is set by the content, at least one of the following is true: (Level A)

- **Turn off:** The user is allowed to turn off the time limit before encountering it; or
- **Adjust:** The user is allowed to adjust the time limit before encountering it over a wide range that is at least ten times the length of the default setting; or
- **Extend:** The user is warned before time expires and given at least 20 seconds to extend the time limit with a simple action (for example, "press the space bar"), and the user is allowed to extend the time limit at least ten times; or
- **Real-time Exception:** The time limit is a required part of a real-time event (for example, an auction), and no alternative to the time limit is possible; or
- **Essential Exception:** The time limit is essential and extending it would invalidate the activity; or
- **20 Hour Exception:** The time limit is longer than 20 hours.

Note: This success criterion helps ensure that users can complete tasks without unexpected changes in content or context that are a result of a time limit. This success criterion should be considered in conjunction with Success Criterion 3.2.1, which puts limits on changes of content or context as a result of user action.

> How to Meet 2.2.1
> Understanding 2.2.1

2.2.2 Pause, Stop, Hide: For moving, blinking, scrolling, or auto-updating information, all of the following are true: (Level A)

- **Moving, blinking, scrolling:** For any moving, blinking or scrolling information that (1) starts automatically, (2) lasts more than five seconds, and (3) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it unless the movement, blinking, or scrolling is part of an activity where it is essential; and
- **Auto-updating:** For any auto-updating information that (1) starts automatically and (2) is presented in parallel with other content, there is a mechanism for the user to pause, stop, or hide it or to control the frequency of the update unless the auto-updating is part of an activity where it is essential.

Note 1: For requirements related to flickering or flashing content, refer to Guideline 2.3.

Note 2: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

Note 3: Content that is updated periodically by software or that is streamed to the user agent is not required to preserve or present information that is generated or received between the initiation of the pause and resuming presentation, as this may not be technically possible, and in many situations could be misleading to do so.

Note 4: An animation that occurs as part of a preload phase or similar situation can be considered essential if interaction cannot occur during that phase for all users and if not indicating progress could confuse users or cause them to think that content was frozen or broken.

How to Meet 2.2.2
Understanding 2.2.2

2.2.3 No Timing: Timing is not an essential part of the event or activity presented by the content, except for non-interactive synchronized media and real-time events. (Level AAA)

How to Meet 2.2.3
Understanding 2.2.3

2.2.4 Interruptions: Interruptions can be postponed or suppressed by the user, except interruptions involving an emergency. (Level AAA)

How to Meet 2.2.4
Understanding 2.2.4

2.2.5 Re-authenticating: When an authenticated session expires, the user can continue the activity without loss of data after re-authenticating. (Level AAA)

How to Meet 2.2.5
Understanding 2.2.5

Guideline 2.3 Seizures: Do not design content in a way that is known to cause seizures.

Understanding Guideline 2.3

2.3.1 Three Flashes or Below Threshold: Web pages do not contain anything that flashes more than three times in any one second period, or the flash is below the general flash and red flash thresholds. (Level A)

Note: Since any content that does not meet this success criterion can interfere with a user's ability to use the whole page, all content on the Web page (whether it is used to meet other success criteria or not) must meet this success criterion. See Conformance Requirement 5: Non-Interference.

How to Meet 2.3.1
Understanding 2.3.1

2.3.2 Three Flashes: Web pages do not contain anything that flashes more than three times in any one second period. (Level AAA)

How to Meet 2.3.2
Understanding 2.3.2

Guideline 2.4 Navigable: Provide ways to help users navigate, find content, and determine where they are.

Understanding Guideline 2.4

2.4.1 Bypass Blocks: A mechanism is available to bypass blocks of content that are repeated on multiple Web pages. (Level A)

How to Meet 2.4.1
Understanding 2.4.1

2.4.2 Page Titled: Web pages have titles that describe topic or purpose. (Level A)

How to Meet 2.4.2
Understanding 2.4.2

2.4.3 Focus Order: If a Web page can be navigated sequentially and the navigation sequences affect meaning or operation, focusable components receive focus in an order that preserves meaning and operability. (Level A)

How to Meet 2.4.3
Understanding 2.4.3

2.4.4 Link Purpose (In Context): The purpose of each link can be determined from the link text alone or from the link text together with its programmatically determined link context, except where the purpose of the link would be ambiguous to users in general. (Level A)

How to Meet 2.4.4
Understanding 2.4.4

2.4.5 Multiple Ways: More than one way is available to locate a Web page within a set of Web pages except where the Web Page is the result of, or a step in, a process. (Level AA)

How to Meet 2.4.5
Understanding 2.4.5

2.4.6 Headings and Labels: Headings and labels describe topic or purpose. (Level AA)

How to Meet 2.4.6
Understanding 2.4.6

2.4.7 Focus Visible: Any keyboard operable user interface has a mode of operation where the keyboard focus indicator is visible. (Level AA)

How to Meet 2.4.7
Understanding 2.4.7

2.4.8 Location: Information about the user's location within a set of Web pages is available. (Level AAA)

How to Meet 2.4.8
Understanding 2.4.8

2.4.9 Link Purpose (Link Only): A mechanism is available to allow the purpose of each link to be identified from link text alone, except where the purpose of the link would be ambiguous to users in general. (Level AAA)

How to Meet 2.4.9
Understanding 2.4.9

2.4.10 Section Headings: Section headings are used to organize the content. (Level AAA)

How to Meet 2.4.10
Understanding 2.4.10

Note 1: "Heading" is used in its general sense and includes titles and other ways to add a heading to different types of content.

Note 2: This success criterion covers sections within writing, not user interface components. User Interface components are covered under Success Criterion 4.1.2.

Principle 3: Understandable - Information and the operation of user interface must be understandable.

Guideline 3.1 Readable: Make text content readable and understandable.

Understanding Guideline 3.1

3.1.1 Language of Page: The default human language of each Web page can be programmatically determined. (Level A)

How to Meet 3.1.1
Understanding 3.1.1

3.1.2 Language of Parts: The human language of each passage or phrase in the content can be programmatically determined except for proper names, technical terms, words of indeterminate language, and words or phrases that have become part of the vernacular of the immediately surrounding text. (Level AA)

How to Meet 3.1.2
Understanding 3.1.2

3.1.3 Unusual Words: A mechanism is available for identifying specific definitions of words or phrases used in an unusual or restricted way, including idioms and jargon. (Level AAA)

How to Meet 3.1.3
Understanding 3.1.3

3.1.4 Abbreviations: A mechanism for identifying the expanded form or meaning of abbreviations is available. (Level AAA)

How to Meet 3.1.4
Understanding 3.1.4

3.1.5 Reading Level: When text requires reading ability more advanced than the lower secondary education level after removal of proper names and titles, supplemental content, or a version that does not require reading ability more advanced than the lower secondary education level, is available. (Level AAA)

How to Meet 3.1.5
Understanding 3.1.5

3.1.6 Pronunciation: A mechanism is available for identifying specific pronunciation of words where meaning of the words, in context, is ambiguous without knowing the pronunciation. (Level AAA)

How to Meet 3.1.6
Understanding 3.1.6

Guideline 3.2 Predictable: Make Web pages appear and operate in predictable ways.

Understanding Guideline 3.2

3.2.1 On Focus: When any component receives focus, it does not initiate a change of context. (Level A)

How to Meet 3.2.1
Understanding 3.2.1

3.2.2 On Input: Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised of the behavior before using the component. (Level A)

How to Meet 3.2.2
Understanding 3.2.2

3.2.3 Consistent Navigation: Navigational mechanisms that are repeated on multiple Web pages within a set of Web pages occur in the same relative order each time they are repeated, unless a change is initiated by the user. (Level AA)

How to Meet 3.2.3
Understanding 3.2.3

3.2.4 Consistent Identification: Components that have the same functionality within a set of Web pages are identified consistently. (Level AA)

How to Meet 3.2.4
Understanding 3.2.4

3.2.5 Change on Request: Changes of context are initiated only by user request or a mechanism is available to turn off such changes. (Level AAA)

How to Meet 3.2.5
Understanding 3.2.5

Guideline 3.3 Input Assistance: Help users avoid and correct mistakes.

Understanding Guideline 3.3

3.3.1 Error Identification: If an input error is automatically detected, the item that is in error is identified and the error is described to the user in text. (Level A)

How to Meet 3.3.1
Understanding 3.3.1

3.3.2 Labels or Instructions: Labels or instructions are provided when content requires user input. (Level A)

How to Meet 3.3.2
Understanding 3.3.2

3.3.3 Error Suggestion: If an input error is automatically detected and suggestions for correction are known, then the suggestions are provided to the user, unless it would jeopardize the security or purpose of the content. (Level AA)

How to Meet 3.3.3
Understanding 3.3.3

3.3.4 Error Prevention (Legal, Financial, Data): For Web pages that cause legal commitments or financial transactions for the user to occur, that modify or delete user-controllable data in data storage systems, or that submit user test responses, at least one of the following is true: (Level AA)

How to Meet 3.3.4
Understanding 3.3.4

1. **Reversible:** Submissions are reversible.
2. **Checked:** Data entered by the user is checked for input errors and the user is provided an opportunity to correct them.
3. **Confirmed:** A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

3.3.5 Help: Context-sensitive help is available. (Level AAA)

3.3.6 Error Prevention (All): For Web pages that require the user to submit information, at least one of the following is true: (Level AAA)

1. **Reversible:** Submissions are reversible.
2. **Checked:** Data entered by the user is checked for input errors and the user is provided an opportunity to correct them.
3. **Confirmed:** A mechanism is available for reviewing, confirming, and correcting information before finalizing the submission.

Principle 4: Robust - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

Guideline 4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies.

4.1.1 Parsing: In content implemented using markup languages, elements have complete start and end tags, elements are nested according to their specifications, elements do not contain duplicate attributes, and any IDs are unique, except where the specifications allow these features. (Level A)

Note: Start and end tags that are missing a critical character in their formation, such as a closing angle bracket or a mismatched attribute value quotation mark are not complete.

4.1.2 Name, Role, Value: For all user interface components (including but not limited to: form elements, links and components generated by scripts), the name and role can be programmatically determined; states, properties, and values that can be set by the user can be programmatically set; and notification of changes to these items is available to user agents, including assistive technologies. (Level A)

Note: This success criterion is primarily for Web authors who develop or script their own user interface components. For example, standard HTML controls already meet this success criterion when used according to specification.

Appendix D

Slides from group interview
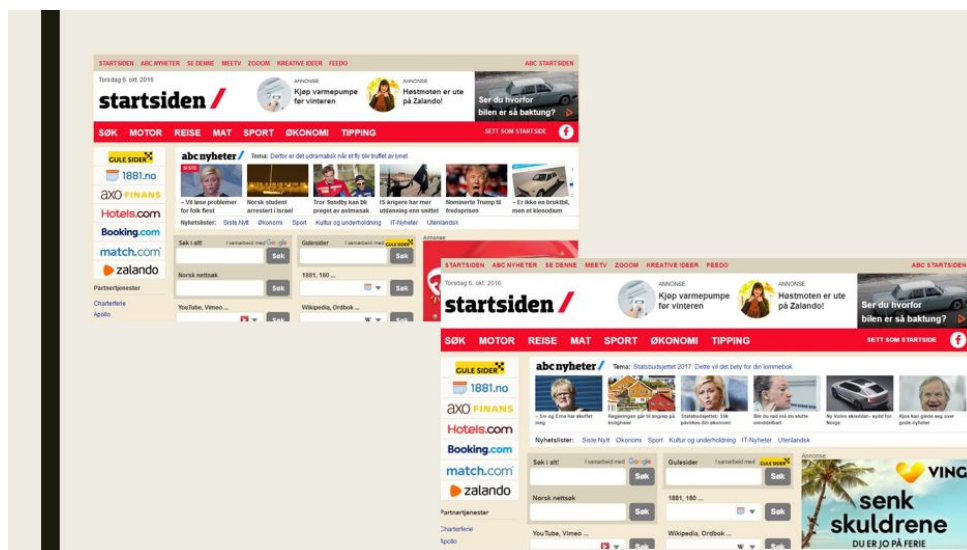
FIGURE D.1: Slide 1, as presented to the focous group participants

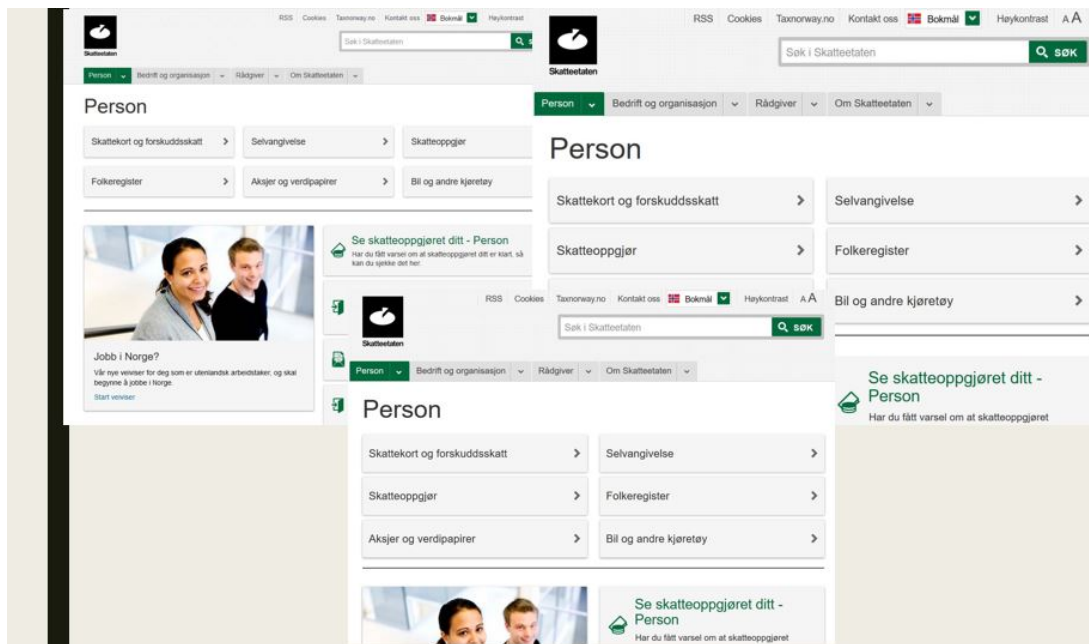FIGURE D.2: Slide 2, as presented to the focous group participants

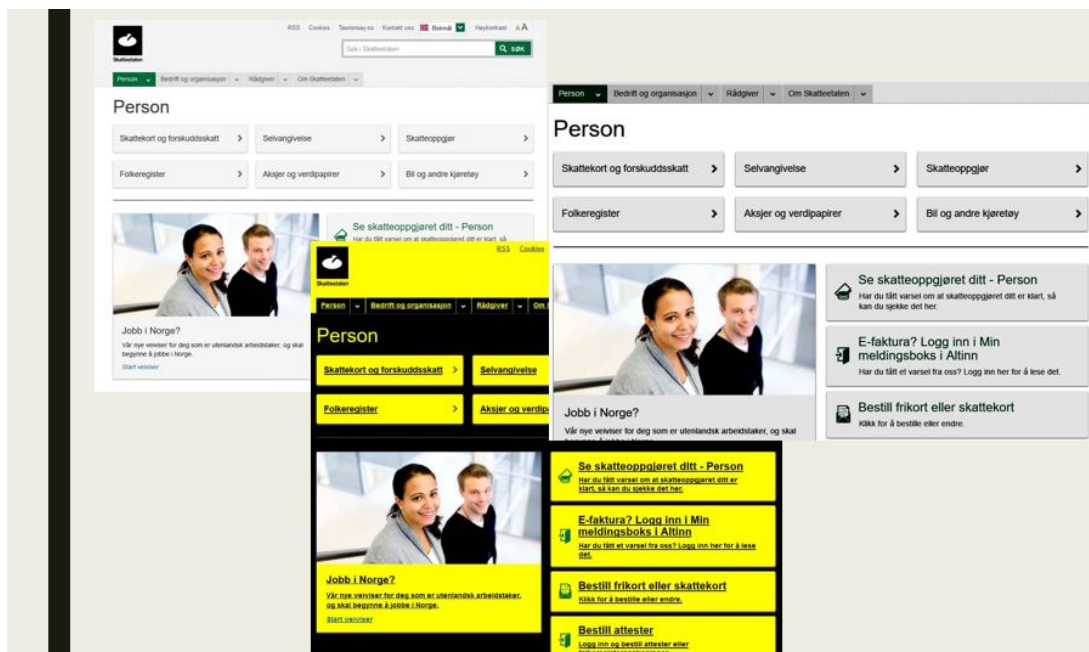FIGURE D.3: Slide 3, as presented to the focous group participants

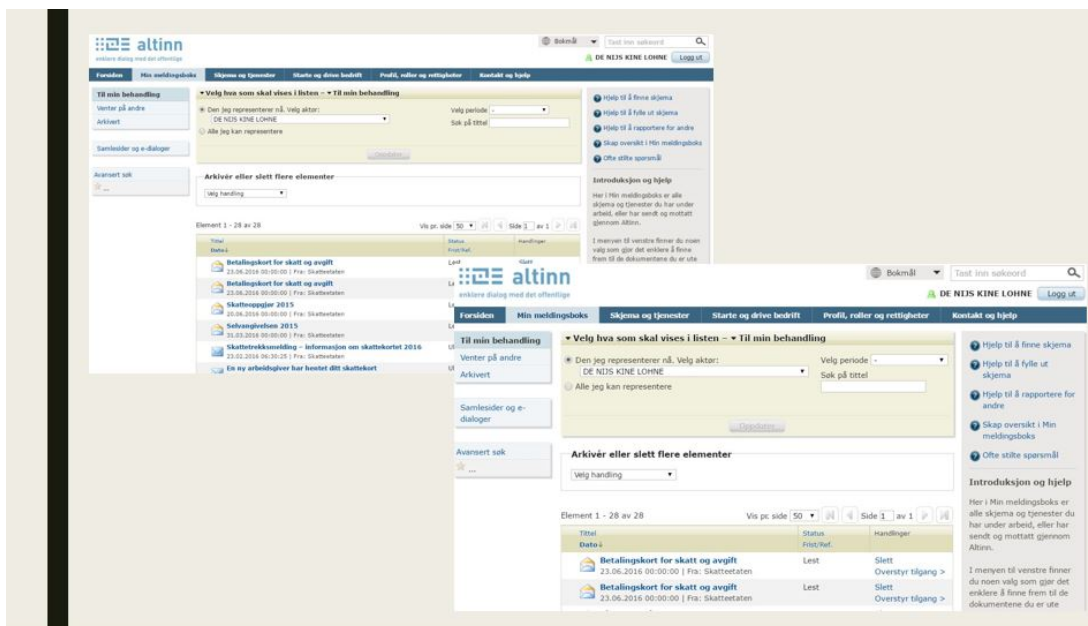FIGURE D.4: Slide 4, as presented to the focous group participants

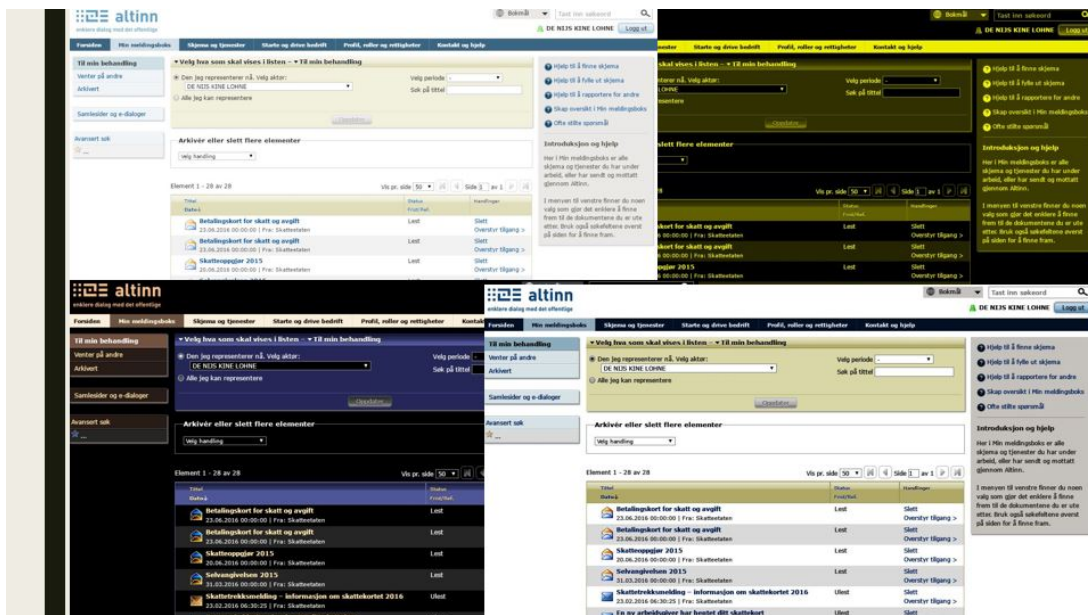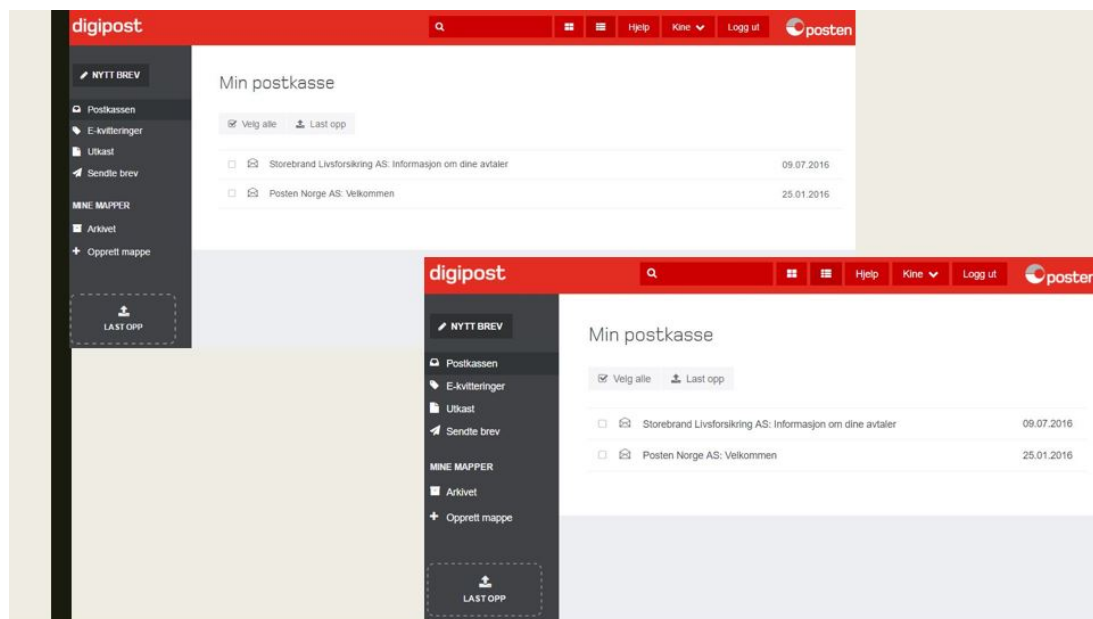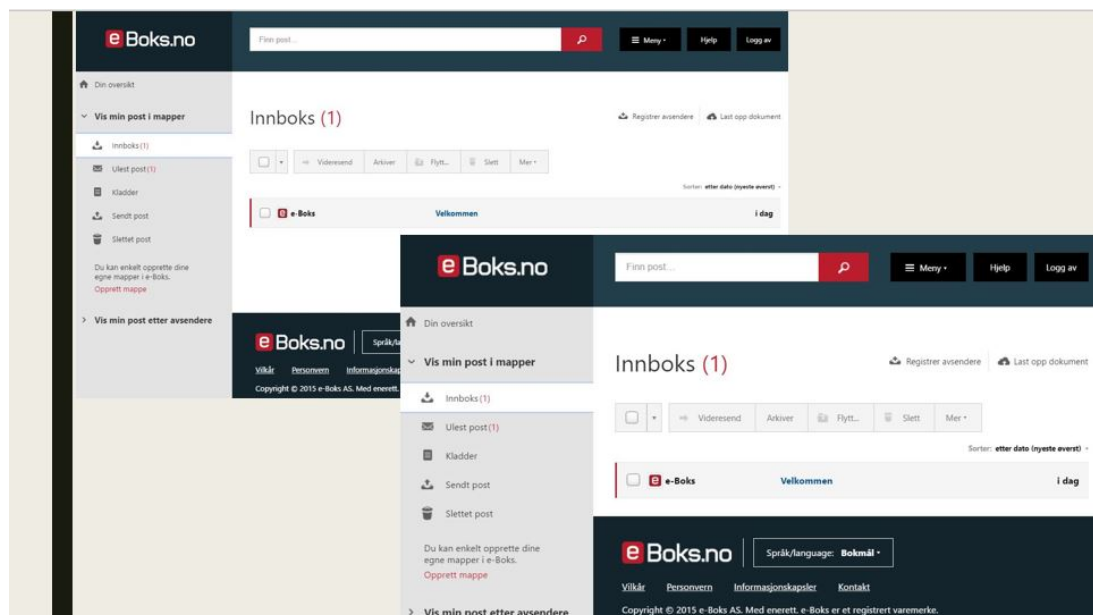FIGURE D.5: Slide 5, as presented to the focous group participants

FIGURE D.6: Slide 6, as presented to the focous group participants

FIGURE D.7: Slide 7, as presented to the focous group participants

FIGURE D.8: Slide 8, as presented to the focous group participants

Appendix E

Fullsize Screenshots of e-Boks' website

On the following 6 pages is the different variants of e-Boks that the participants in the group interview recieved. Each of them are scaled to fit in one page.
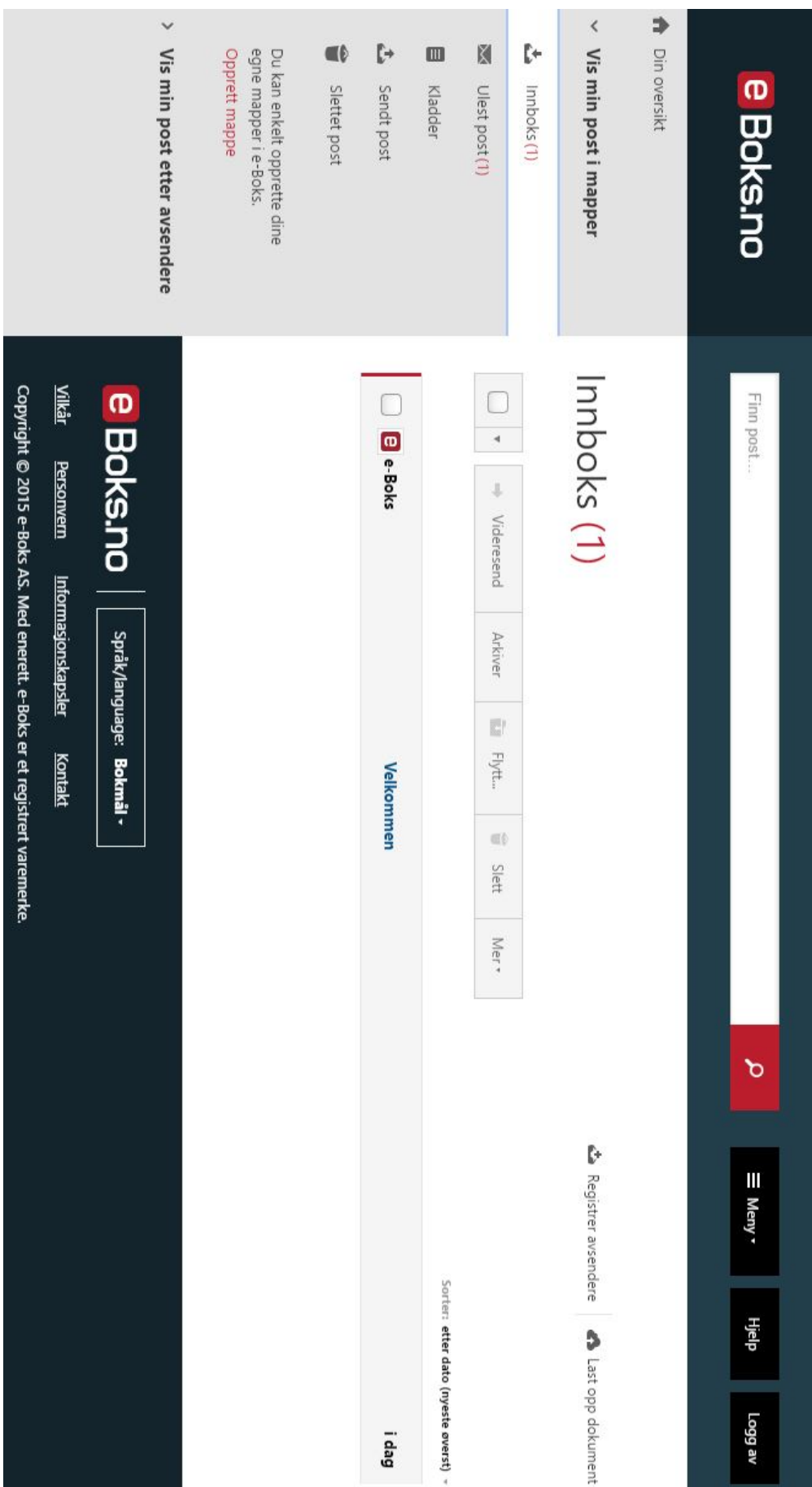
FIGURE E.1: The standard view of e-Boks.
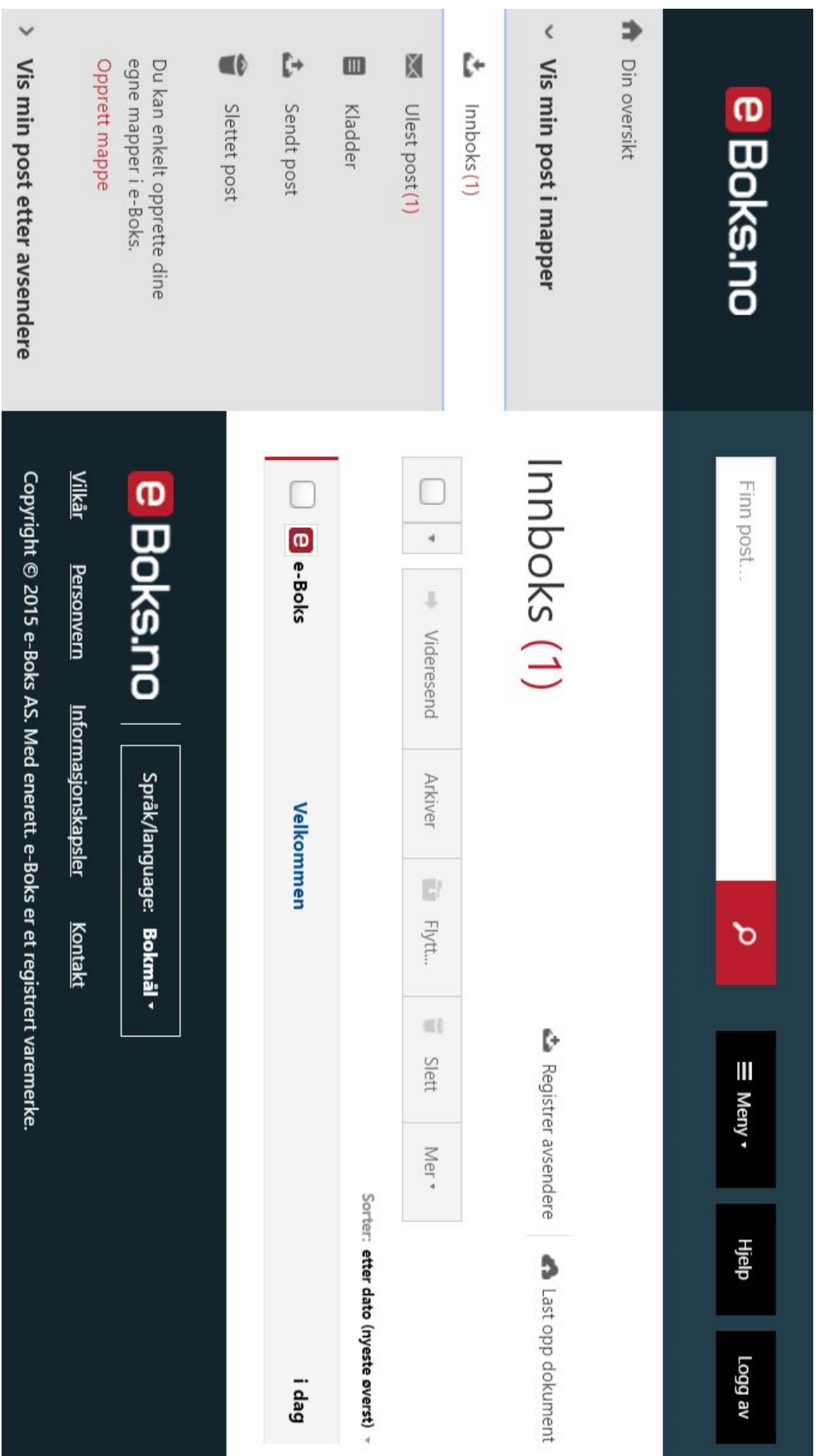
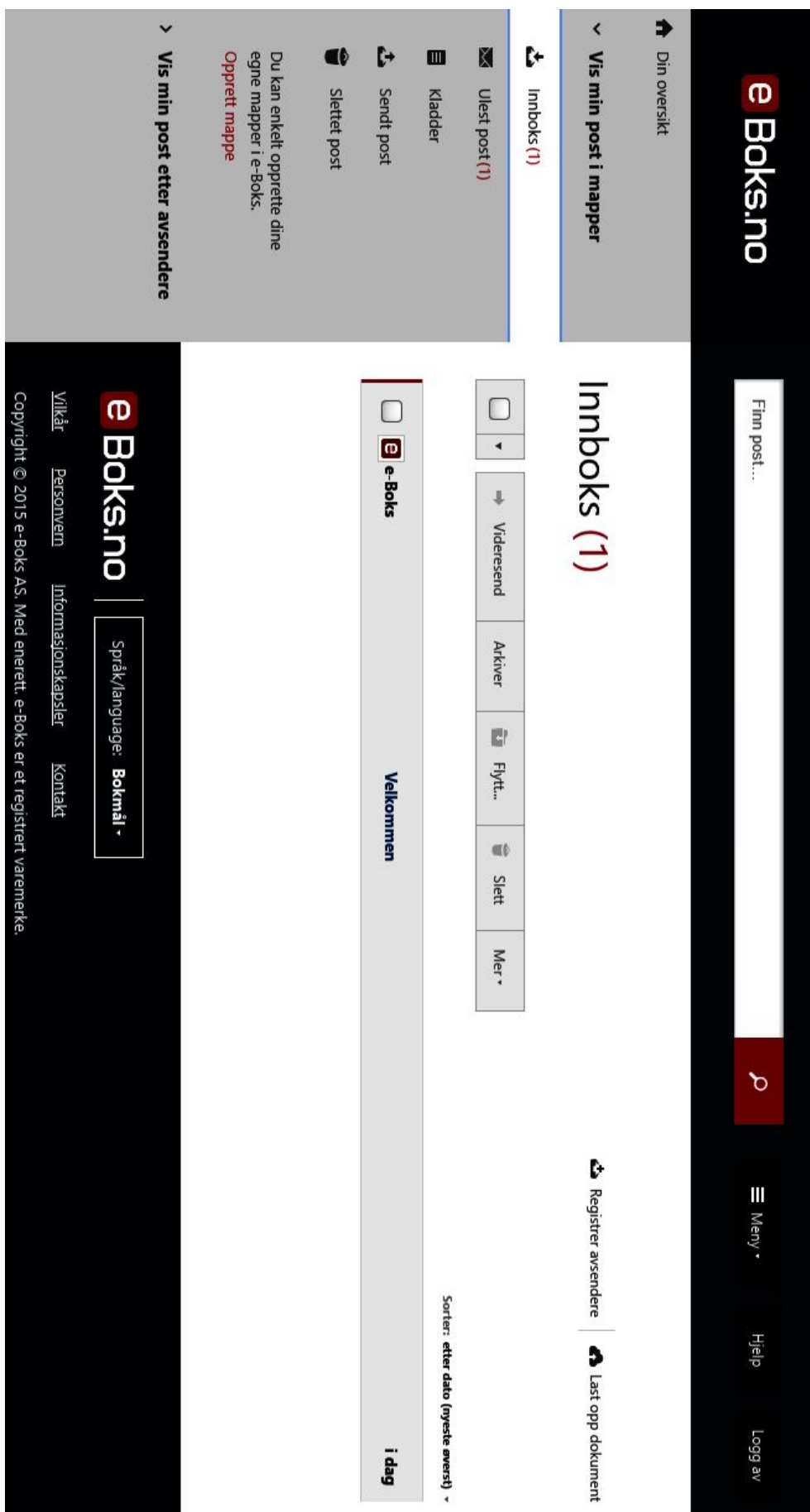FIGURE E.2: e-Boks magnified to 130%.
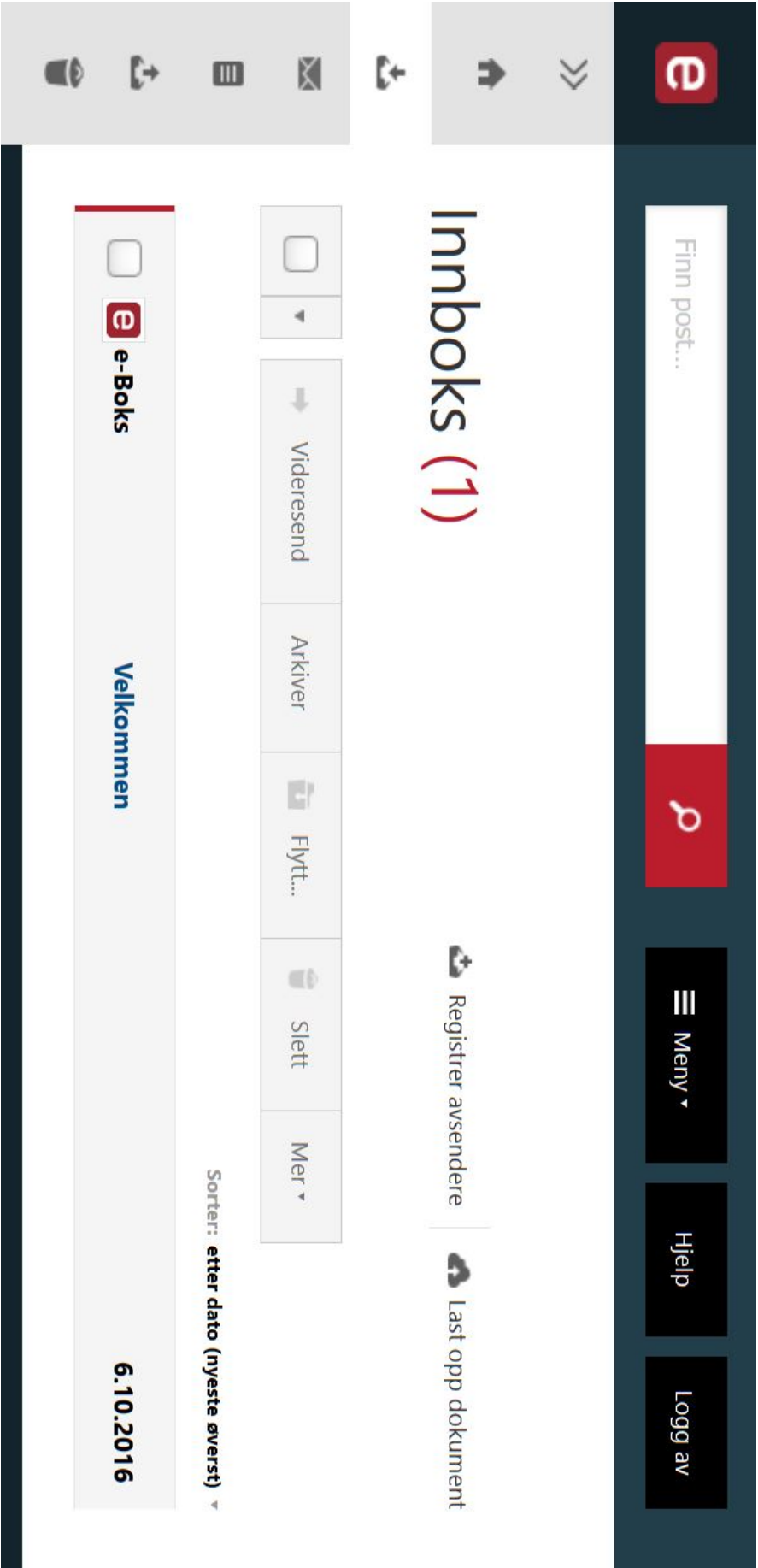
FIGURE E.3: e-Boks magnified to 160%.

FIGURE E.4: e-Boks with increased contrasts

FIGURE E.5: e-Boks with inverted colours.
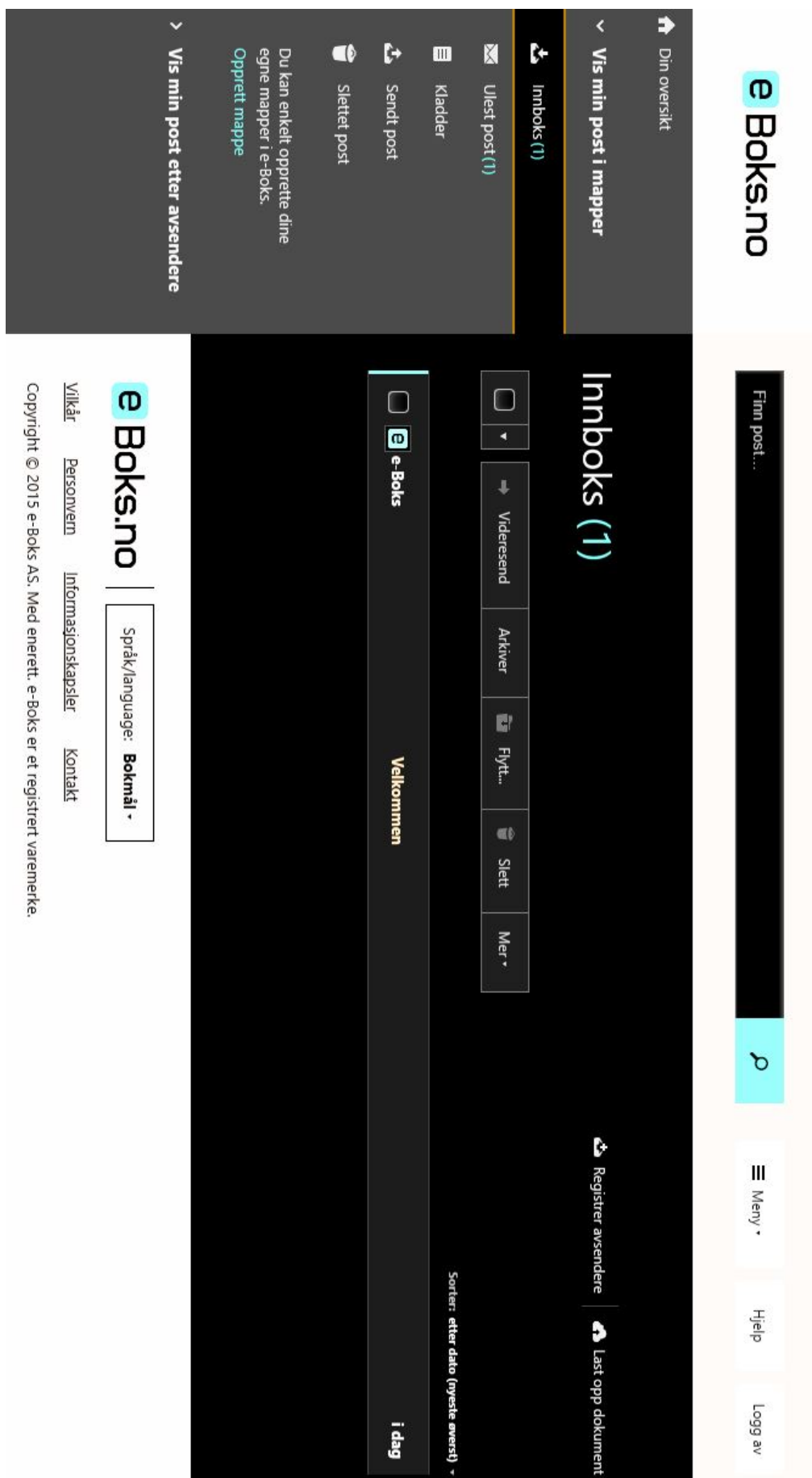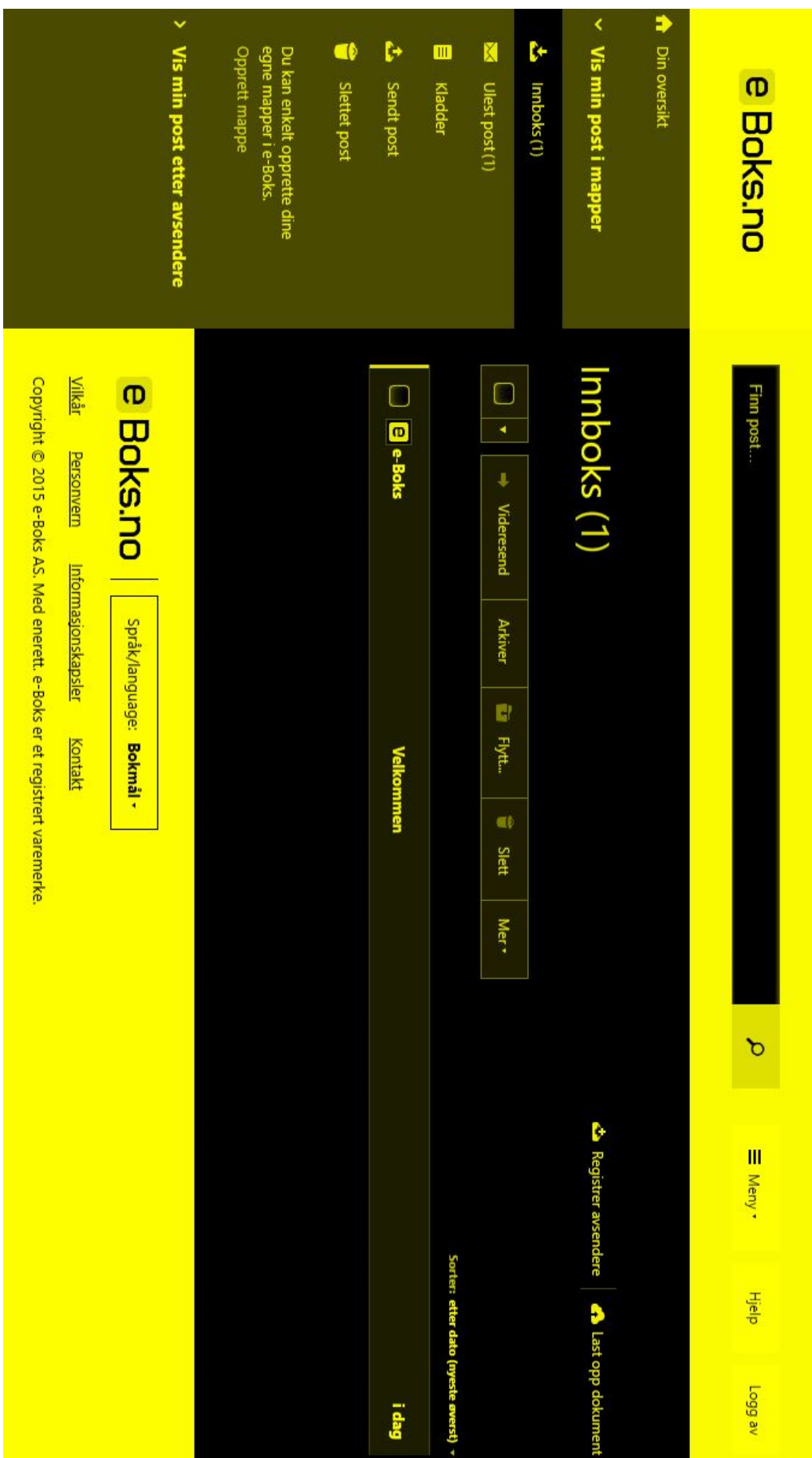
FIGURE E.6: e–Boks with the colours turned yellow and black.

Appendix F

Quotes from interviews

Representative Bergen Municipality: Nei, det kan vi ikke si, for det er ikke tatt stilling til det enda.

Jan: Nei, men altså utviklingen går denne veien der, enten man liker det eller ikke, sånn er det. Men jeg tror nok igjen at for de aller fleste er det dere greit, men jeg tror nok at den del mennesker i min aldersgruppe, og kanskje litt yngre og vil nok streve en del med akkurat det.

Jan: Ja, det går jo mye fortere ikke sant? Enn å forsøke å treffe bokstavene.

Audun: Nei, du vet vi litt eldre, vi ser jo litt dårligere. De har jo endret noen sider. Startsiden har jo mye mindre skrift synes jeg. Men selvfølgelig hvis du då skal øke skrift-størrelsen blir siden for stor. Da kommer en del utenfor siden og greier. Jeg syntes det at, av og til er skriften litt for liten.

Audun: Ja, jeg er begynt å skrive huskelapper, altså, det er jeg. For det er mange sider som er liksom er veldig like. Så husker du ikke helt med en gang, var det den eller den, sant. Så jeg har hatt en del.

Inger: Nei, jeg føler ikke jeg har noen behov for det, nå. Jeg er ikke så gammel.

Inger: ... Nå har jeg barn selvfølgelig som har hjulpet meg frem, og jeg kan spørre de hele tiden. Sånn der er jeg heldig, men jeg føler for de som ikke har det burde man gjerne ha noe....

Appendix G
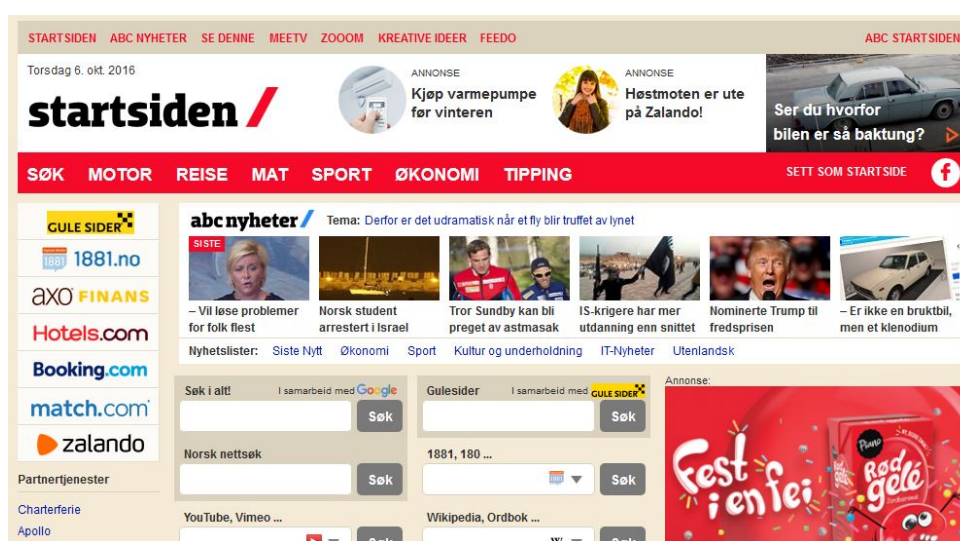
Screenshots Startsiden

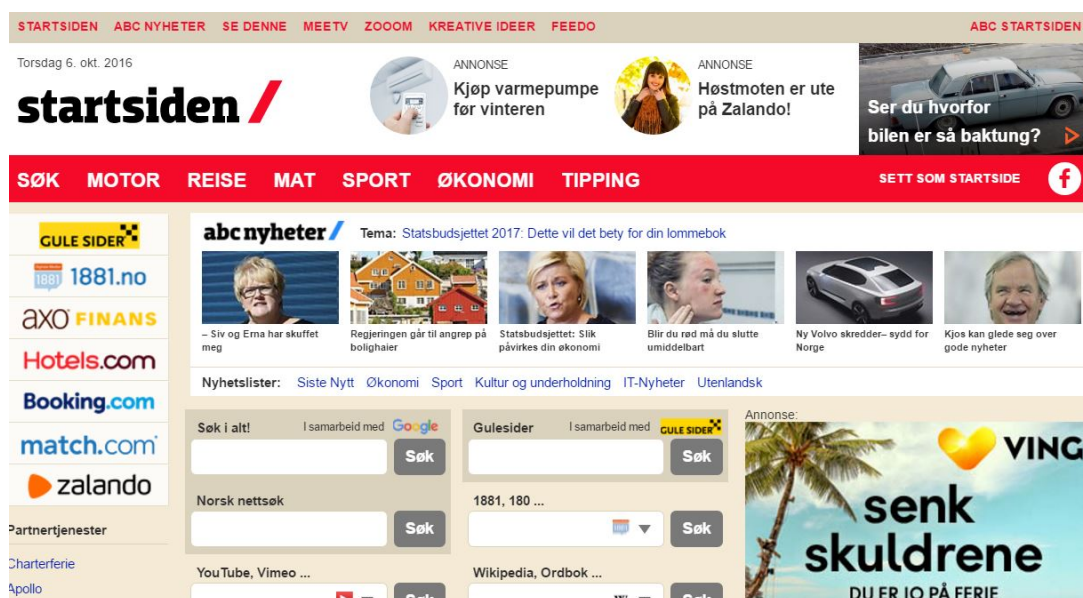FIGURE G.1: Startsiden's website without zoom

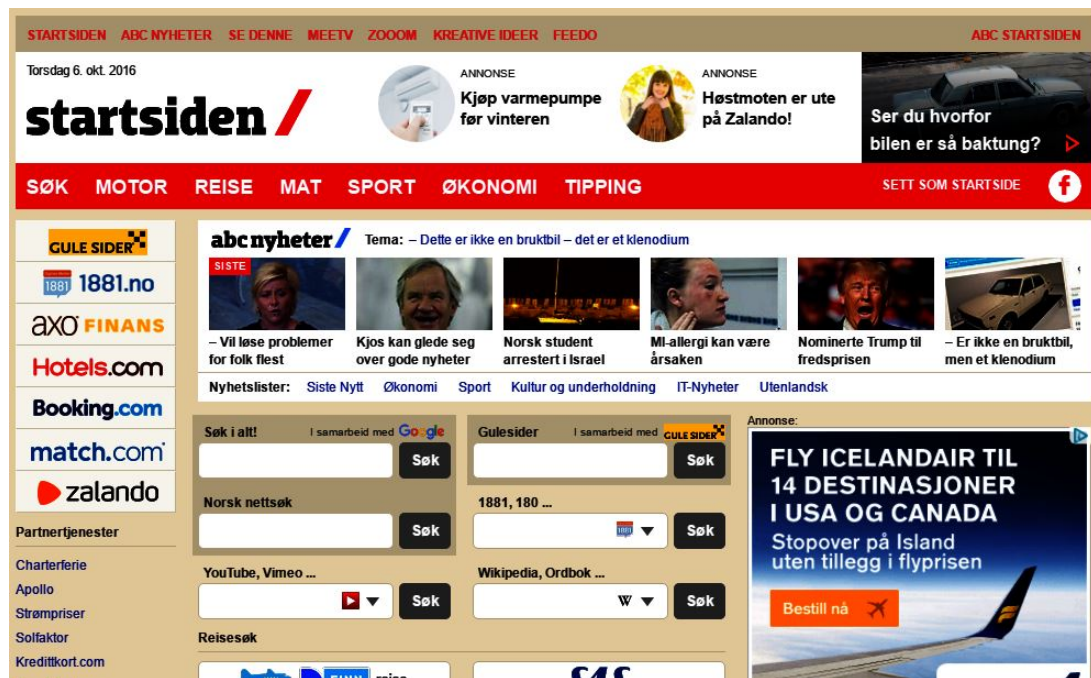FIGURE G.2: Startsiden's website zoomed 130%

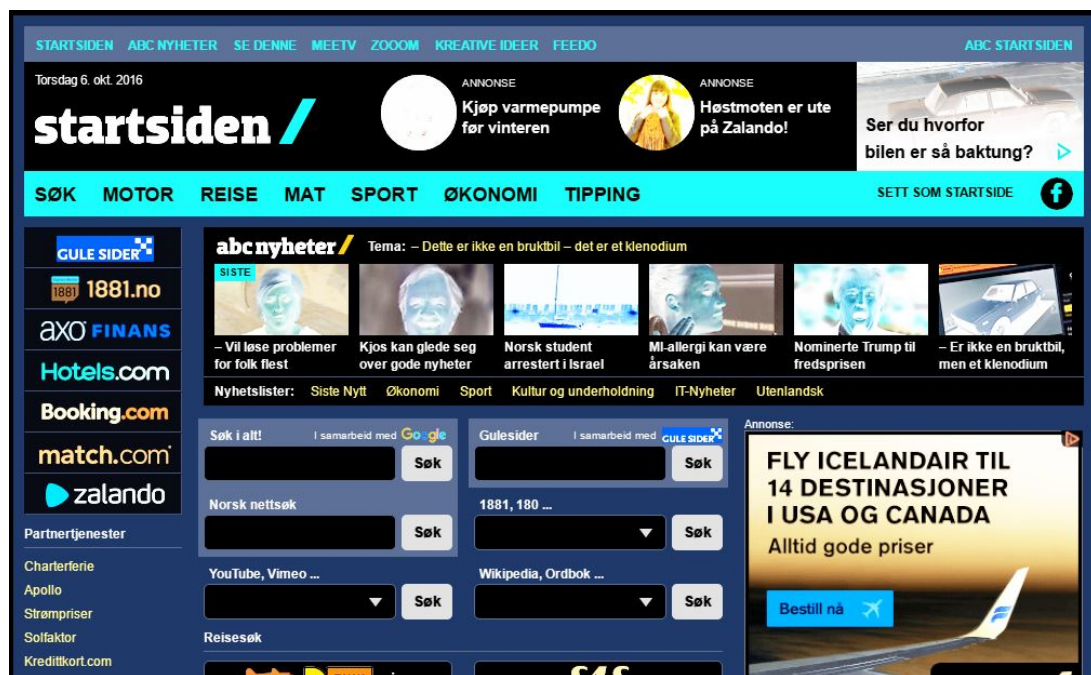FIGURE G.3: Startsiden's website with increased contrast

FIGURE G.4: Startsiden's website with inverted colour

FIGURE G.5: Startsiden's website with the colours changed to yellow and black

Appendix H

Quotes from group interview

Erna: Jeg skjønner ikke hvorfor det ikke alltid kan være sånn på våres.

Inger: Denne er jo veldig forstørret. Når det blir så stort så tenker jeg «Så gammel er ikke jeg.»

Erna: Tenk hvor greit om jeg kunne ha forstørret så mye at jeg ikke trenger å bruke briller med skjermen.

Inger: Det gir så mye mer. Dette var helt fantastisk. Det må jeg si, helt fantastisk altså. Du får en mestringsfølelse.

Erna: Jeg synes den som bare var større var best, for der var bildene klarere. Greit nok å lese, men bildene ble dårligere

Inger: Jeg syntes blått er fint, og det ble liksom klarere.

Appendix I

Letter from Difi

difi Direktoratet for
forvaltning og IKT

	Vår dato	Vår referanse
	oktober 2016	14/00687

Til deg som ikke har opprettet din digitale postkasse

Du får dette brevet fordi du ikke har opprettet en digital postkasse. Ved å opprette din egen digitale postkasse bidrar du til å redusere kostnader og å gjøre kommunikasjonen fra det offentlige sikrere, raskere og mer miljøvennlig.

Skatteoppgjør, vedtaksbrev, helseopplysninger og annen sensitiv informasjon kan ikke sendes på vanlig e-post.

Med en digital postkasse kan du samle post fra det offentlige sikkert på ett sted. Du kan lagre posten så lenge du ønsker.

Dette må du gjøre for å velge digital postkasse:

1 Gå til www.norge.no og klikk «Velg digital postkasse»

2 Velg enten Postens Digipost eller e-Boks

3 Følg instruksjonene fra Digipost eller e-Boks for å opprette postkassen

Mer informasjon om digitalisering av offentlig sektor finner du på **www.norge.no**. Dersom du har opprettet digital postkasse etter 19. september, kan du se bort fra dette brevet.

Vennlig hilsen
Steffen Sutorius
direktør

Direktoratet for forvaltning og IKT (Difi)   brukerstøtte@difi.no   **Oslo**   **Leikanger**
Postboks 8115 Dep, 0032 Oslo   Telefon: 800 30 300   Besøksadresse: Besøksadresse:
Org.nr.: NO 991 825 827   www.difi.no   Grev Wedels plass 9   Skrivarvegen 2