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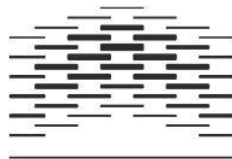
in

Universal Design of ICT

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ICT barriers in job-application websites

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1.1 Preface

This research will report on any information and communication technology (ICT) barriers of different job-application webpages on the Norwegian marked. The research was initiated as a proposal from Høgskolen i Oslo og Akershus (HiOA), and will consider both accessibility and usability factors. The research has given me the opportunity to understand and apply different research methods, as well as learn to use new technology when investigating the job-application webpages.

The process has given me the opportunity to listen to, learn from and work with very talented person in the field of universal design of ICT. I would like to thank my supervisor, Norun Christine Sanderson, for her guidance, discussions and patience. I would like to thank Anthony and Weiqin for their thorough feedback from each semester submission. The ability to discuss it with you helped me see things in a new light. I wish to thank my Mom and Dad for their encouraging words, it means a lot. I would also like to thank Julie for her warm love and support.

Finally, I want to thank WebCruiter and Seniornett. WebCruiter for letting me meet with them on several occasions, and to use their webpage for my observations. This shows to me an initiative to improve their product to become universally designed. And Seniornett for being engaged and eager to contribute in shaping ICT in the most universally designed way possible.

Christian Solstad Westgaard

Oslo, May 15, 2017

1.2 Summary

Creating Universally designed solutions, is a principle and practice that ensures accessibility and usability for information and community technology products. This in turn ensures equal participations in society.

Previous research done in the United States, suggest that there are shortcomings and barriers on several job-application webpages that leads to discrimination (Lazar, Olalere, and Wentz, 2012).

The purpose of this thesis is to discover how well the job-application webpage are suited for the diversity in the population. To do this, this research looks at three commonly used job-application webpages on the Norwegian marked, and investigates for any universal design barriers. Seniors are chosen for participations in interviews and observation on one of the job-application webpages for looking at usability. Accessibility investigation is done by using criteria from WCAG 2.0 to look for barriers. To narrow the field of search, theory that job-application webpages are online forms is applied.

This research also manually investigates three job-application webpages for usability, by applying Nielsen's ten usability principles (1994).

Findings in this research indicates that there are barriers on the investigated webpages. This research recommends that the job-application webpages create their user-platform in a universally designed matter based on the existing standards, principals and guidelines that exists for accessibility and usability.

2 Table of contents

2.1 Figure List

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CV	Curriculum Vitae. Contains personal information relevant for job-applications
CV-elements	Different categories in an application used to group information. "Education", "Work experience" etc.
Form control	The different types of user input that occurs in online forms.
Missclicks	When the user miss the content or object wanted to hit with the user device (Mouse, trackpad, touchpad).
Tab/tabbing	Using the tab-key on a keyboard to navigate to next element in a website.
Tag <>	Used in HTML to use activate different codes. Each tells the browser something.
User-client	Different types of devices the user can use to access internet. Smartphones, tablets, computers etc.
Zoomable	Whether the webpage allows the user to zoom in the browser.

3 Introduction

In our continuously technical evolving society, we lean more to the use of computers, tablets and smartphones to perform activities. This has been the trend for many years, and thus companies try to exploit the processing power in our modern technologies. A direct result has been the demand for tasks, programs and applications to continuously become more time efficient. This is also the case with job-application webpages. As we have moved well beyond the use of post-mail, and only a small percentage of employment letters are filed via email, numbers from as early as 2001, said that approximately 90% of large companies have and use recruitment pages (Cappelli, 2001). The job-application webpages have since then developed in pace with the rest of our browsing technology, and one study found the relevance between pages that were easy to navigate and had an appealing designed to be more favorable for the organization behind the recruitment (Braddy, Meade, & Kroustalis, 2008). A job-application webpage is created to ease the application process, as well as digitalize it. But are they accessible for the diversity of the public? This thesis will consider both how accessibility and usability are upheld with job-application webpages.

3.1 Topics covered by this study

In the starting phase of this thesis, with the collecting of background knowledge, it was hard to find previous study specifically on barriers in information and communication technology (ICT) of job-application webpages. It was therefore necessary to look into different categories related to the topic, some of them including, background on the focus group, barriers related to the focus group, ICT-forms, the job-application process, and universal design of ICT. However, there were one study very relevant to this thesis.

This thesis will build partly on a previous study and findings by Lazar et al. (2012) suggesting that there are already several unique problems identified with job-application webpage. They conducted a study were 16 blind, screen-reading users, attempted to apply for job, via 16 job-application webpages in the United States. The outcome showed that only 28.1% of the application attempts could be completed without assistance.

While Lazar et al. (2012) focused on visually impaired persons, there are other groups who would be interesting to consider, as a direct consequence of inaccessible job-application webpage, is that many people are prevented from the possibility or right to apply for job(s).

As this is highlighting the benefit of a recruitment page to both be appealing and smooth to operate. It raises the question of a page can be this, and universally designed?

This thesis will investigate three different job-application webpages, on the Norwegian marked, and find out how accessible and usable they are for a focus group. This will be done by investigating how they are responding to usability testing, and how they relate to certain of the guidelines in the Web Content Accessibility Guidelines (WCAG)-standards. This would require automatic and manually testing of the job-application webpage, as well as user-testing. A number of guidelines from the WCAG 2.0 will be followed and checked. On different levels of the guideline, certain success criteria are used to determine how well a web page is, Perceivable, Operable, Understandable and Robust.

When this thesis is using the term accessibility, and in particular web accessibility, it has the values from The World Wide Web Consortium (W3C) in mind. They aim for people with disability to perceive, understand, navigate, interact and contribute with the web, all the while emphasizing that web accessibility also will benefit users without disability (World Wide Web Consortium, 2016a). Making assistive technology part of the accessible webpages is a key part for involving all users. Accessibility will be further discussed in Section 4.

When usability is used in this thesis, it is meant as in when Jakob Nielsen (2012) explains usability for web to be "how easy user interfaces are to use." Also, Nielsen's ten usability steps (1994) will be used when evaluating the job-application webpages later in this thesis (Section 6.3).

Following the manually investigation, observation and interviews of a focus group will take place, using the job-application webpage WebCruiter. The focus group will be seniors (in this thesis it will be the age of 55-74). For the observation, the participants would be asked to fill in a mock job-application, with a few pre-made tasks to follow. The tasks will be to fill in a job-application form, proceed through the application, and upload a pre-made document. After the observation, an interview will take place, to follow up on the mock job-application session. The results will then be analyzed, to evaluate if there could be improvement, or are any barriers to be found, if so this will be suggested. The investigation of the existing webpage can be read in Section 6. Recommendations for solutions to shortcomings can be read in Section 7.

Job-application webpage can tailor their product, based on client demands. This thesis will also consider the differences in public and private job-application webpage (Research question 3), to discover if there are any noteworthy differences from a usability perspective.

3.2 Background

3.2.1 How the marked is working for the public sector

When a public web-page wants to create job-application webpage, it always will be put on "call for bids". Here different requirements are asked of the companies, as well as price. The requirements include the ability to search and filter applications (back end of the application, for the company/county) and certain requirements of how it will look (front end, for the employee). One of the requirements is for the page to be universally designed.

3.2.2 What is job-application webpage?

Before the internet era, people applied for jobs, by filling in application letters, and deliver them by mail or hand to the employers. This practice changed with the up rise of computer technology and importantly, the internet. And after 2001, as email became a household feature, many company sought to recruit via the internet (Nakamura, Shaw, Freeman, Nakamura, & Pyman, 2009). E-recruiting were driven by the companies on their own terms, and used email as the primary source for receiving applications. However, that changed with the dedicated job-application webpage coming onto the scene. They would do what employers had done for years

in non-electronic (word) form, now it would be possible to fill in your résumé directly into the web. It contained every trait of a CV, education history, work experience history, other traits and with the possibility to upload or write a personal application letter. This application is then sent and stored in a database for the customer of the job-application webpage holder. It has been widely reported that the use of application forms and with it following database of résumés can reduce the cost variable cost of recruitment (Nakamura et al., 2009).

Other e-recruiting services such as employment sections and searchable databanks, provide similar features as some of the investigated sites in this thesis. However the employment portals, pages such as [finn.no](1)[1], [jobreg.no](2)[2], [jucan.no](3)[3] and [karriereportalen.no](4)[4] only provide listings over the available job, if a person wants to apply for the job, they will be directed to a job-application webpage, or referred to send an email. The searchable databases, often used in recruitment agencies (Manpower etc.), works so the person in search for a job, fill in a résumé, and the recruiter stacks the résumé in a database, so other recruiter can pick up it up by searchable keywords. Nav.no does provide a full list of employment portals.[5]

The actual process from an applicant's perspective from start to finish investigated in this thesis, can look like this:

- Job found via a recruitment portal or company website.
- To apply for it, the applicant must register a new user profile at a job-application company, or use an existing profile.
- When registering a profile at the job-application webpage, all relevant information for the application can be filled in.
- When saved, it can be used to apply for the relevant job.

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[1] finn.no
[2] jobreg.no
[3] jucan.no
[4] karriereportalen.no
[5] Websider and portals from Nav.no

- If another job uses the same job-application webpage, the same profile and information can be used over (or modified). If different job-application webpage is used, a new profile must be created.

3.2.3 Who are the employment seekers?

The employment seekers are either first time users of job-application webpage or a recurring one. The different between the groups could possibly have something to say for the time commitment of the process; however, both are equally interesting to look into. Employees, who previously have used the application webpage, will likely use less time to modify the résumé, as the existing one already is in the system. However, the modification or update of an existing résumé is something as interesting to investigate in the observation of users, as the ones new to the system.

Therefor one possible investigation could be to update an existing profile, where the other would be to fill in the information for the first time. Why this is different, is because of the two separate actions needed. One may only have to update a few numbers of key points in their résumé, on contrary to the other starting from scratch.

3.2.4 The focus group

As mentioned earlier, the focus group for the interviews and observation in this thesis will be seniors in the age group of 55-74. This requires certain requirements from the web page, and Johnson and Kent (2007), highlights that an even greater amount of consideration is required. Many elderly users do not understand ICT-terminology, like "browse", "click", "scroll" etc. There are varying degrees of vision degradation to take into account, including many users that will rely on a screen reader. Components like drop down boxes and icons may not be understood. Research suggests going well beyond guidelines, and by de-facto argues application of common sense along with a potential need to be creative to address some problems. Choosing this target audience means that many problems are magnified even greater (Johnson & Kent, 2007; Becker, 2004).

The ideal focus group for this project would be elders/seniors in the age group of 55-74. While age 55 might not be regarded as a senior citizen by the general public,

according to Statistisk sentralbyrå (SSB), seniors in Norway are the group of people from age 50 and above. It is also valuable to include that age group because of the steady rise of unemployment. Therefore, when talking about seniors or elders in this thesis, the age group is starting at 55+, and together with the rapid increase in desire to work in the age of 62 and up to an age over 70 (Regjeringen, 2014). Norway is reaching a number of over 8000 unemployed in the age group 55-74 (Statistisk sentralbyrå, 2015). Figure 3.1 is showing how the seniors are trending towards a higher likelihood of working even after hitting the age of pension (age 67). For the 68 years, old, the proportion of working people rose with 7,1% for women and 6,5% for men (Statistisk sentralbyrå, 2011).

While the focus group can vary in age, it would also be interesting to get a random selection of computer knowledge for the elders in the group. It is as interesting to see how the applications are in terms of intuitive set up, as to color combination, plain text or button shapes.
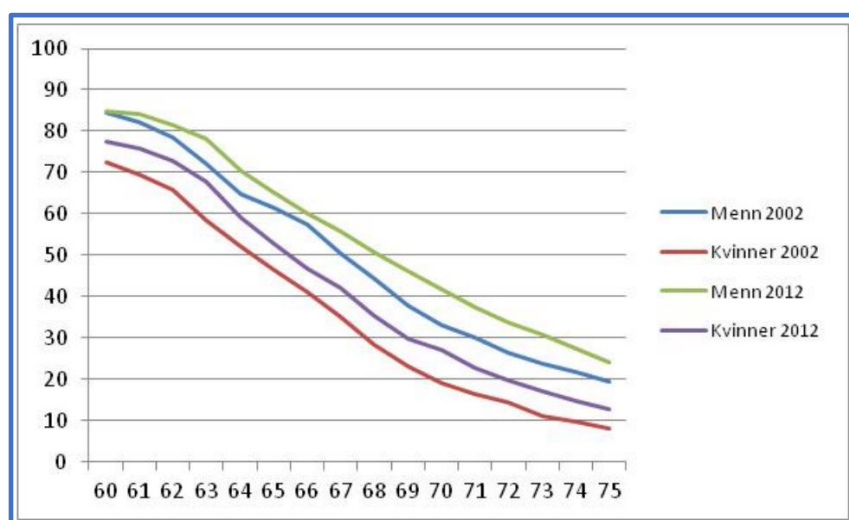
Figure 3.1 Increase of pensioners in work over a ten-year period (Statistisk sentralbyrå, 2015).

3.3 Problem statement

While only 1.5% of the number of unemployed are between the age of 55-74 (as of outcome of 2015), we are still looking at a vast number of people (8000) who are actively applying and competing for a job. It is important to have equal opportunities, when the recruitment process is solely channeled through the internet (Statistisk sentralbyrå, 2015).

The purpose of this thesis is to discover how well the job-application webpage are suited for the diversity in the population, with different levels of computer knowledge in mind, particularly the senior citizens. Also, a heuristic evaluation will be conducted, trying to discover any web accessibility barriers.

The thesis also wants to discover the integration of mobile/smartphone usage into job applications, whether it is being used by the job-seekers to apply for jobs, or merely for browsing for vacancies.

3.4 Research questions

1. How is the job-application webpage from a senior's perspective in terms of accessibility and usability?
2. What accessibility barriers can be discovered, when investigating the three job-application webpages, with the WCAG-standard?
3. Are there differences in usage of universal design in public and private job-application clients?
4. How is mobile technology used by job-seekers? Is it equal to the non-handheld platforms in terms of numbers of applications sent?

4 Literature Review

Here the key concepts of the thesis will be discussed. Some of the most commonly used job-application webpages will be listed. Accessibility (Section 4.2 and 4.3) and usability (Section 4.4) will be further explained, both in relation to the legal status in Norway (Section 4.5) and towards online forms (Section 4.7) which job-application webpages can be classified as.

4.1 Selected Job-application webpages

Following are the selected webpages intended to be investigated in this thesis. All of the job-recruitment agencies are established in the Norwegian market, although some branch out to Scandinavia or other continents. To narrow down the selection, but maintain a representative selection, a soft cap of 300 clients, or 2000 users where used. There is also included a part of whether or not LinkedIn is supported in each of the job-application company sections, and a description about LinkedIn at the end of this section.

Some of the companies also have employment portals, where advertising is sold as one of the services. This is mentioned because it is part of the product sold by the companies, where others might use advertisement portals like Finn.no or nav.no.

WebCruiter

WebCruiter offers job-application webpage tailored for their clients, and is collaborating with providers of HR (Human Resources) and administrative solutions, to maximize the recruitment process. They also run the employment portal jucan.no. Over 1400 clients and more than 65 000 users, divided in 50 countries use WebCruiter. WebCruiter offers the option to upload your LinkedIn profile into the application (WebCruiter, "Om oss," n.d.).

Jobbnorge

Offers a recruitment page, where companies can publish jobs and handle applications. All the applicants create their own profile through Jobbnorge's own job-application webpage. Jobbnorge also offers advertising for companies. Jobbnorge does not offer uploading of LinkedIn (Jobbnorge, "About us," n.d.).

ReachMee

ReachMee offers a solution to recruit and employ, and is used by over 450 clients in Scandinavia. They value their product to make the recruitment process easy for their clients and its applicants, through a seamless process. ReachMee offers the option to upload your LinkedIn profile into the application (ReachMee, "Om oss," n.d.).

HR Manager

HR Manager is a specialist in HR and recruitment, with over 500 clients in Scandinavia. HR Manager offers the option to upload your LinkedIn profile into the application (HR Manager, "Om oss," n.d.).

Recruitment Manager

Offers several functions in a seamless, cloud based recruitment system. They aim towards recruitment-, consultant- and employments agencies. On a daily basis over 2000 professional users and 7000 applicants are using Recruitment Manager. They collaborate with www.Jobreg.no for headhunting and employment advertising. Recruitment Manager offers the option to upload your LinkedIn profile into the application (Recruitment Manager, "Om oss," n.d.).

The professional network LinkedIn

LinkedIn is mentioned because of the recurring theme of job-application webpage offering to associate the user's profile with a LinkedIn-profile. While this could be used in several occasions, it does not remove the usage of job-application webpage, and is therefore mentioned, but not investigated as one of the webpages.

LinkedIn started up as way of connecting professionals all over the world, they are now the world's largest professional network, with over 400 million members. LinkedIn solid position in the professional market makes them highly regarded to tie the user's biographies to an application. LinkedIn's employment portal contains approximately 300 000 available jobs world over. While possible to submit the application with a LinkedIn profile, it most of the time runs through a third-party job-application webpage (such as WebCruiter, ReachMee etc.). However, applying to a job with LinkedIn directly is possible (LinkedIn, "Om LinkedIn," n.d.).

4.2 Web Accessibility

As mentioned earlier, the thesis took large influence from the findings by Lazar et al. (2010) suggesting that there are already several unique problems identified with job-application webpage. The same study found that the core usability problems often are the same for both people with or without disabilities. This is underlining the importance of usability testing, as it in most cases will affect more than just the "test group". Some of the suggested improvements included, accessible feedback, improved hyperlink text, a more structured layout, and clear labeling of data format and form fields.

While a number of previous studies and evaluation of accessibility of job-application webpage found possibilities for improvement, they never included users, but based themselves on automatic tools and expert inspections. The drawback of this is that you might leave out valuable insight of what the problems are from a user-perspective (Lazar et al., 2011). An additional upside of usability testing with persons with disability, is that they are the true experts of their own disability, and can with the right environment and tasks, detect otherwise hard-to-find flaws of the system.

However, the outcome of the automatic and manual testing can initiate a good building for future research. Bruyere, Erickson, & VanLooy (2005) showed in their accessibility evaluation of online recruitment web pages and job portals, using an automatic evaluation tool (Bobby v3.2) and with manual testing using a screen reader, that a majority of the web pages were impassable. And only 3 out of 12 of the tested web pages were accessible enough for the evaluation tool to go through. This form of testing is particularly good if the tested web sites have a vast number of sub-pages (Lazar et al., 2012).

For many people that use the internet on a daily basis, it is hard to imagine life without it, as it has become indispensable (Hoffman, Novak, & Venkatesh, 2004). However, a large segment of the population does not use the internet, on average, 13% of the population in Norway did not use internet in 2015 (Statistisk sentralbyrå, 2016). For many this is a deliberate choice, and they feel no need to use the internet.

As cellphone usage became mainstream, the elderly population overcame their tech aversions, most likely due to a perceived benefit, or that they would get something in return for their money in the form of increased convenience and safety (Eastman & Iyer, 2004). This technological advance was likely perceived as an upgrade to the common household phone for obvious reasons.

One study even asserts that the evidence supporting that internet is beneficial is inaccurate and based on perceptions of "perceived well-being." They noted that many elderlies could not retain information and will require constant assistance indefinitely. They also suggest that higher social activity may be a predictor of computer usage, in contrast to the assertions made in many studies. They found that an overwhelming majority of elderly in one training session had not desire to own or use a pc after taking a training course (Dickinson & Gregor, 2006). The research by Eastman and Iyer (2004), could not show any correlation between elders who used internet and the likeliness of being more innovative.

In one large survey, seniors indicated that they would rather have conversations in person, which was more preferable than the problems associated with typing (Lee, Chen, & Hewitt, 2011). And the previously mentioned study that suggested that there were minimum or no benefits mentioned that there are sometimes negative effects with social interactions in general when elderly users would be reminded of their separation from their family (Dickinson & Gregor, 2006).

4.2.1 Benefits of computer use

The previous findings show some challenges toward attitude, and the ability to adapt to new technology. However, in contrast to the reasons why some elderly chooses not to or are uninterested in using the internet, there are many studies that suggest potential benefits to using the internet. One such study, attributed a small increase in "life satisfaction" to several internet activities. They also suggest, although again unsupported, that this increase may be due to the satisfaction of gaining computer literacy (Karavidas, Lim, & Katsikas, 2005).

Some of the positive impacts that they observed were benefits that stemmed from social contact. Seniors polled also asserted that they enjoyed the internet as a good

source of information for news and queries about health. Internet use also offered the ability to follow investments or pursue hobbies. Notably however, those polled were members of computer clubs or in other words seniors that already used the internet (Karavidas et al., 2005).

Admittedly, the process of job searching is not meant as a hobby or a source of information for news. But that is just underlining the importance of the process to be intuitive and accessible. If the computer training, usage or interest is at a very low level, but the desire to get a job is strong, barriers may occur when internet is the only channel for where jobs are announced and advertised. And a well-structured web page for elderly is beneficial for everyone (World Wide Web Consortium, 1999).

Following this past paragraph, research question number 1 presents itself:

"How are the job-application webpage from a senior's perspective in terms of accessibility and usability?"

4.3 Key concepts in web accessibility

Here there will be explained accessibility concepts important for this thesis, both on a general basis, and for seniors and web.

4.3.1 ISO/IEC 40500:2012 – WCAG 2.0

ISO/IEC 40500:2012 is an international standard consisting of W3C's Web Content Accessibility Guidelines (WCAG 2.0). The international standard addresses challenges that people with disability may face. The standard also covers technical and education material supporting implementation of WCAG 2.0. For the remainder of the thesis, WCAG 2.0 will be used when referring to this ISO (ISO, 2012).

"The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect." Berners-Lee, (1997), W3C Director and inventor of the World Wide Web. The World Wide Web Consortium (W3C) are the people behind the WCAG 2.0, which is a part of the Web Accessibility Initiative (WAI).

When designing web sites that specifically target an elderly audience, there can be a need to do more than "just" follow the WCAG 2.0 guidelines. The W3C also offers "Developing Websites for Older People," which although partially incomplete, explains how the guidelines apply when trying to improve inclusion for elderly users. Many of these are explanations are good arguments as to why many of the AAA-success criteria should be applied when considering seniors (World Wide Web Consortium, 2010).

The three conformance levels A, AA and AAA, are indicating levels of how a web-page is designed or visual presented. The higher the level, the higher the requirements are for the designing of a web page. The levels are building on its predecessor.

One study that tested universally designed sites found that sites were designed for elderly/disabled users in mind, the efficiency over all age groups increased, and less entry errors were made (Johnson & Kent, 2007).

4.3.2 User experiences
But what about seniors with good computer knowledge, but is facing other disabling factors in their life?

By looking at an example like "Links". The W3C "Web Accessibility for Older Users: A Literature Review" references a study that noted that underlined text was more difficult to read because the line obfuscates the descending portions of letters (Campbell, 2015). This problem is easily corrected by removing the underlining; however, this may confuse the large population of experienced users who expect that a hyperlink will be underlined.

Another study aimed at improving web use for seniors found that seniors preferred buttons or descriptive links versus ordinary links (Johnson & Kent, 2007). These two ideas combined do not conclude in one harmonious solution. It is possible that elderly users may not comprehend that descriptive text is in fact a link.

The same study mentioned above also noted a tendency amongst seniors to return to the home page for each connection to a new subsection of a website versus using built in navigation on the page such as top or side-navigation bars (Johnson & Kent, 2007). This however would most likely indicate a preference for users that are at least somewhat experienced because this requires use of the browser's toolbar. It is likely that inexperienced users may desire to use the same method, but considerations should be made for new elderly users that are unfamiliar with the browser toolbar.

An improvement could be to ensure that text is delivered to elderly users in a larger font, and that the font can be zoomed or scaled. Success criteria 1.4.4 of the WCAG offers a plethora of recommendations regarding this. A summary of the section is that they suggest that text should be "large" and scalable or zoomable (World Wide Web Consortium, 2008).

An article in Smashing Magazine suggests using a no less than a 16-point font (Campbell, 2015). The American NIH suggests a large, left-justified, sans serif font on their website with recommendations for designing for seniors (NIH, 2003).

This particular site offers many other recommendations, such as breaking lengthy items into shorter sections. One should make sure all "clickables" require only a single click and that "targets" to be clicked should be large. They also recommend that designers try to keep navigation simple and use a consistent layout. And finally, designers should avoid using drop down boxes when possible (NIH, 2003).

4.4 Key concepts in web usability

There are several standards and guidelines available to make a system universally designed. The standards are made to ultimately closing the increasing gap between product complexity and user specialization as seen in Figure 4.1. The figure is showing that over time, the complexity and availability of products have steadily increased. The consequence is that the users require less specialization to operate the highly complex products, thus widening the «Usability Gap».
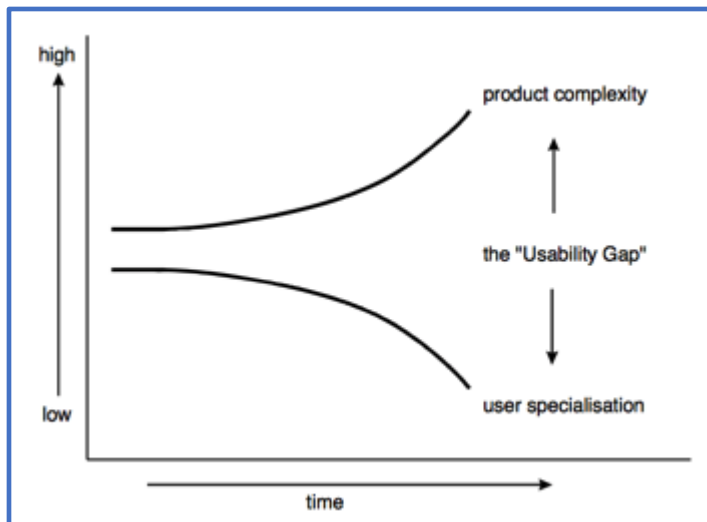
Figure 4.1 Usability Gap. ETSI, 2009.

> *The challenge then, for Human Factors in the product design process, is to reduce the usability gap and keep the user interface in line with the increasing complexity of products and decreased specialization, while at the same time increasing the flexibility of the user interface. (ETSI, 2009, p. 18)*

The quote is from the European Telecommunications Standards Institute (ETSI). They are officially recognized by the European Union as a European Standards Organization, and have more than 750 members working to produce globally-applicable standards for ICT. This underlines the importance of usability testing, as pointed out by Lazar et al. (2012). When the complexity is increasing, there is a need to close the usability gap, so that specialization rarely will be needed.

The same can be viewed in Figure 4.2, with the "Gap model", that the challenges regarding individual conditions and the demands of society needs to narrow.

Figure 4.2 Gap model. Lie (1996).

This translate to the work in this thesis, the society is demanding efficiency, therefore companies use job-application webpage to be able to filter out the ideal candidate for interviews. In order to fill these requirements, the same programs need to make the employment seekers fill in the correct information in their application, creating a template. The many individual conditions that need to be taken account for when making a program or application aimed for the general public could therefore be forgotten.

4.5 Legal status and regulations in Norway

In 2009, the Norwegian government made an action plan for Norway to become more universally designed and increased availability for the time span 2009-2013. The eventual long term goal is to make Norway fully universally designed by 2025.

Section 3.4 in the regulation, are for ICT solutions to become more accessible. As one of the byproducts of the increased focus on digital solutions, is the unfortunate consequence of possibly being left out. The regulation is especially worried about the elderly and the disabled.

One of the direct actions of this regulation became two deadlines:
- All new ICT solutions aimed towards the general public should be universally designed from 2014

- All existing ICT solutions aimed towards the general public should be universally designed by the end of 2021

To fulfill these regulations, a governmental directorate called DIFI (directorate for public management and ICT) are used to perform the supervision of web pages and terminals. DIFI are conducting evaluation and quality assurance of public web pages with respect of availability and quality. As a direct consequence of the 2009 regulation, approximately 700 public web pages are annually evaluated based on 36 criteria's, where 25 are about accessibility, availability and content (Regjeringen, 2009).

More than a governmental directorate, it became a legislative proposal for universally design and accessibility of ICT. It was passed in 2008. A number of paragraphs in the legislation are relevant for this thesis.

§ 9 is covering "Duty for general (word) adaptation (Universal design)." this paragraph is ruling that the work conditions of public companies to become universally designed. The same is to be said for the private companies aiming for the general public.

§ 11 are covering "Duty to universally design ICT". With this ruling, it is covering all applicable technology.

Paragraph §14 the law of discrimination and accessibility, is referring to a duty for universally designed ICT-solutions. The ruling is demanding online-based solutions and self-helping machines to be universally designed. The online based solutions should follow the international WCAG 2.0 guidelines. The paragraph is pointing out that other online based guidelines could be necessary, further on in the review, the thesis will propose some other guidelines with focus on valuable universally designed principals.

Already in this paragraph, there is a demand for universal design for all online ICT-solutions. However, it is difficult to determine what and who falls under this law. But what is the case for mobile technology?

The government recently (29.01.2016) posted a document about universal design, called "Regjeringens handlingsplan for universell utforming" (Regjeringen, 2016). One of the initiatives in the document, "TEK3", is covering mobile technology. It is stating that many new products and digital solutions, like applications, smartphones and tablets may fall under the current laws of universal design of ICT, given that this is technology that could cover needs such as safety and an enhanced life. Many of the modern mobile applications should be regarded as welfare technology. The government is working on covering products and fields of use, which falls under this category. The information should be available by 2017. (TEK3) While the government is working on covering who and which applications should fall under this regulation, it is fair to believe that job-application webpage is a part of the welfare technology and the webpages are necessary for people who want to apply for a job. It can be easy to discriminate people when some may have to make alternative approaches to apply for the same job. When the solutions are available for mobile and tablet technology, it should be treated as an online technology, and therefore universally designed (Regjeringen, 2016).

TEK3 is therefore important in research question number 4:

"How are mobile technology used by job-seekers? Is it equal to the non-handheld platforms in terms of numbers of applications sent?"

Furthermore, the next initiative "TEK4" is covering aspects about the same everyday technology, its products and systems, and how it is desirable to establish open and unanimous standards. This should help products to communicate with each other, and enhance cross-platform usage. This specific "TEK" is writing about logistic and web architecture from the health-department, but the joint understanding should be used in several other fields/sectors. Here they also are stressing the fact that the work should include universally designed principals (Regjeringen, 2016).

For my research area and thesis, this is important in regard of the cross-platform usage (different browser, operating system or platform), and the fact that there are several different job-application webpage in use by the public. The private sector, is

not always affected by the legislation, but since some private and public companies are using the same webpage (such as WebCruiter), and the fact that job-application webpage is in many occasions something aimed towards the general public, the notion is affecting both private and public. This leads to research question number 3:

"Are there differences in usage of universal design in public and private job-application clients? "

4.5.1 Applying WCAG 2.0 in Norway

With WCAG 2.0, under the name of ISO/IEC 40500:2012, being recognized as an international standard, Norway adapted it and are using it in the regulation for universal design of ICT solutions. The regulation is required that all public webpages are fulfilling 35 of the 61 success criteria from the WCAG 2.0. Other than public webpages, the regulation is applying for private webpages of public interest. Aimed towards the general public and used to inform or offer a service as the main solution, are two of the three criteria for the businesses that needs to follow the regulations. It could be reasonable to believe that job-application webpages can be viewed as webpages for the public interest. The final criteria are that a new or significant upgrade has been made after 1. July 2014 (Difi, 2016). If the business is under these descriptions, they should have a universally designed ICT-solution.

Relevant for this question is a report published by Difi.no in 2014 regarding the status of universal design for websites in public and private sectors (Difi, 2015). While this report looks into universal design for websites, it does not specific look at any job-application webpages.

Difi.no also have a section about the regulation of universal design on websites. Two of the paragraphs relevant for job-application webpage are:

"Login and registration" and "Limited target group or B2B"

What these regulations are saying is that a web page (even in the disguise of an application) is directed towards the general public, even if it is necessary for login or registration to use the page. And even if the business is aimed towards a target

group of customers, it will be regarded as general public as long as it is a large group of unspecified persons. This also applies if the customers are other companies/businesses. Why this is important for this thesis is because of the possibility to interpret that job-application webpage is aiming toward a very specific target group and specific persons (especially when headhunting is involved in the process). However as previously mentioned, even if aimed towards a specific group, it reaches out to the general public, theoretically open for everyone with a computer to make an application (Difi, 2016).

Therefore, with what we know from the regulations in Norway and appliance of WCAG 2.0, and as many vacant job-positions has these job-application webpages as the only channel to get applications, this is where research question number 2 will be important:

"What accessibility barriers can be discovered, when investigating the three job-application webpages, with the WCAG-standard?"

4.6 Usability, accessibility and regulations of forms

The previous paragraphs about accessibility, usability and legal status in Norway are all important to answer different research questions, and they have some common concepts. One of the shared challenges is the development of online forms. All the chosen job-applications contain forms of a sort.

The subject of online, or rather electronic forms have already been investigated and developed in Norway for some time. A master thesis written by Yoga (2005) investigated the Norwegian internet portal for public reporting, named Altinn. The thesis was written to look into possible improvements for usability and accessibility, after Altinn endured a lot of criticism for its frustrating user experience. Some of the findings suggested improvement of consistency in navigation, including informative text with the forms and logical placement of questions and forms. These findings are also among the success criteria's from WCAG 2.0 (World Wide Web Consortium, 2010) and are present on Difi's suggested solution page (Difi, 2016). Based on the

heuristic evaluation, Yoga (2005) found that the system failed, on several occasions, to even meet the single A rating from WCAG 2.0.

Even knowing it is an over ten-year-old study, the findings and experience obtained in Yoga's study, could among other findings, contribute in the heuristic evaluation done in this thesis.

4.7 Online Forms

A Dutch research from 2009 on digital skills on public information and services, pointed out that there were two groups that experienced problems when faced public forms, the low educated and the seniors. A public form has many similarities to a job-application website both can contain text input fields, dropdown menus, text fields, labels, validations of input or user notifications.

4.7.1 What is an online form?

According to the W3C, online forms are giving the user a possibility to interact with websites and web applications. (World Wide Web Consortium, 2014). This can be used when websites require logins, commenting, registering or purchasing. In the case of job-application websites, both commenting and registering are common, and most of the websites requires the user to login as well.

An online form, is built up with different textual input fields, radio buttons or drop-down menus often referred to as "Form controls". With many different types of form controls, it is possible to programmatically group them together. However, this is not always practiced.

While most people are familiar with the interaction technique of forms, it is not always intuitive and straightforward (Firmenich, Gaits, Gordillo, Rossi & Winckler, 2012). An online form can be visually, cognitively complex and difficult to use, and some user might need assistance to understand the format required to insert data into the fields or understanding the labels, which both can vary from online forms, even when requesting the same data as different job-application websites might do (Firmenich et al., 2012). It is suggested that extensive and complex forms are divided into several

pages, adding breadcrumbs to the page so the users can understand what page is completed (Tuzun, Lee, Graham, & Sluder, 2001).

By creating accessible forms, not only do it help users who have cognitive challenges, who are visually impaired, limited dexterity or use assistive technology (Rowlett, & Wright, 2005), it also makes it easier for everyone to use (World Wide Web Consortium, 2014).

4.7.2 Form concepts

The W3C page labeled "Form Concepts", writes about important concepts from a technical consideration that can apply to all forms and form controls (World Wide Web Consortium, 2014). The technical considerations listed on the W3C page, builds on the WCAG 2.0 guidelines, which is under the ISO standard (ISO, 2012).

W3C lists the following concepts for creating accessible forms:

Labelling: Used for identifying each form (text field, radio buttons drop-down menu etc.), as well as describing the purpose of the form. Allows the web browsers to divide the content into larger clickable fields. Helpful when using assistive technology as screen reader.

Grouping: What the grouping achieves, is that it encourages to divide content by grouping it into smaller sections and relation. It should help to make the forms more understandable for every user, as well as easier for the users to focus when the content is grouped into a more manageable information pool, contrary to when all information has to be processed at once.

Form Instructions: It provides instructions to help the user complete the task, as well as what is required and what is optional. It should also indicate what type of data formats is required.

Validating Input: "Validation" is an extension on "Instructions". Validation is used to prevent the users from making mistakes.

User Notifications: Which is bringing up "User notification". Users should be notified when they have submitted their form, if it was a success, or if something needs to be changed. If something needs to be changed by the user (in the case of wrong or missing input), it should be noted what field that needs attention, also it should be clear what needs to be changed in the particular form field. All of the abovementioned concepts are in line with what Firmenich et al. (2012) is writing.

Multi-Page Forms: Long forms should be divided into multiple smaller forms. This can help less experienced users, or people with cognitive disabilities to easier understand the forms. Also, progress should in compliance with what Tuzun et al. (2001) research found, it should be tracked if there are multiple pages. Tracked progress, means that the user will have a visual que to understand which pages are completed, currently undertaking or yet to complete.

Persons that are using screen reader or speech input, will greatly benefit from the use of Labelling, as this will make it possible for the user to navigate directly to a group via its label. Users who are navigating with screen reader, usually navigate with the **tab** key from form control to form control. Associating each control with a label, makes it easier for the screen reader users to skip content, but still navigating to a new group in the form (WebAIM, 2013a).

In the HTML code, one way to label a text input could be seen in Code 1.

```
<label for="name">Name:</label>
<input id="name" type="text" name="textfield">
```

Code 1. Associating an Input control with a label.

The screen reader can jump from label to label, without reading the text in each form control, making navigation easier, if the user want to go back or ahead. The "for" of the label is matched by the "id" of the input, thus associating it with the form control.

People who have limited dexterity will benefit from accessible forms that have large clickable controls or fields, such as checkboxes or radio buttons. More than larger buttons, another benefit from using labels is that the user can focus on a form

element by clicking on the label. By clicking the label, the text field will be highlighted, and ready to type (WebAIM, 2013b).

Users with cognitive disabilities can benefit from accessible forms as it can make the experience more understandable and easier to complete. This can be achieved as accessible forms improves the structure on the layout trough the "Grouping", while the "Instructions" and "Feedback" can help with understandability.

Additionally, to the technical considerations, the Web Accessibility Initiative, writes about time limits. They recommend to remove time limits on forms, to allow the user to complete their task in their own pace. Should there be a timeout, it is recommended for the user to have the option to turn it off or extend the time (World Wide Web Consortium, 2014). WCAG 2.0 have guideline 2.2 "Enough time", to cover the best practice of providing enough for the user to read and use the content on a webpage (World Wide Web Consortium, 2008).

One step further, would be to see what types of success criteria the WCAG 2.0 can offer on web forms. When looking at what each section of the "Form Concepts" can offer, four criteria are highlighted:

4.7.3 Principle 1 – Perceivable, Guideline 1.3 - Adaptable

Under principle 1 of the WCAG 2.0, Perceivable, guideline 1.3 about adaptable is located. This is saying: "Create content that can be presented in different ways (for example simpler layout) without losing information or structure" (World Wide Web Consortium, 2008). This does fit with "Multi-page-forms" and "Grouping" of the "Form concepts". More detailed, the level A success criterion 1.3.1 "Info and Relationships" is related as it exists for helping audio and visual formatting to be preserved when the presentation format is changed.

Examples of how this relates to forms:
Required fields can be marked by a red label, with an asterisk character at the end (*). Further on, the required fields should have an instruction indicating what the color and asterisk (*) means, supplemented by an example.

Another example is for the labels on checkboxes or drop-down menus can be separated and recognized by assistive technology.

4.7.4 Principle 2 – Operable, Guideline 2.4 - Navigable

The second success criteria can be found under guideline 2.4 which should: "Provide ways to help users navigate, find content, and determine where they are." (World Wide Web Consortium, 2008). The level AA success criteria 2.4.6 "Headings and Labels" is important for the "labelling" concepts for accessible forms. It also helps with users that are using assistive technology like screen readers or switch control to find meaningful headings and to reduce the number of keystrokes.

Examples of how this relates to forms:
If a form is asking for the name of the user, this success criterion can help specify what input field is for "First name" and what is for "Last Name".

Success criterion 2.4.6 requires 1.3.1 to be fulfilled as well if a label is being used.

4.7.5 Principle 3 – Understandable, Guideline 3.3 – Input Assistance

Third of the success criteria are located under guideline 3.3 that should: "Help users avoid and correct mistakes" (World Wide Web Consortium, 2008). Success criterion 3.3.2 "Labels or Instructions" is level AA, and will ensure instructions or labels that can identify the controls in the form. It is important to fulfill the "Labelling" and the "Form Instructions" concepts for forms. While enough information should be provided, the users of this guideline should be aware to keep the page with an information overload.

Examples of how this relates to forms:
If the user is asked to insert a from-to-date, there should be an example for the correct format for the date.

4.7.6 Principle 4 – Robust, Guideline 4.1 - Compatible

Fourth and last of the success criteria recommended with forms, is located under guideline 4.1 –Compatible stating: "Maximize compatibility with current and future

agents, including assistive technologies" (World Wide Web Consortium, 2008). Success criteria 4.1.2 "Name, Role, Value" is Level A, and will enable compatibility with assistive technology such as screen readers or screen magnifiers. This success criteria relates to all the form concepts except "Multi-Page Forms".

Examples of how this relates to forms:
When programmed, every form control can be labeled, given a role and value. This is what the assistive technologies are looking for when used. And will give the users the correct and understandable feedback to where and what the form is asking for.

All of these four success criteria are a part of the 35 selected for the regulation in Norway, and should therefore be fulfilled when aimed towards the general public.

5 Methods

According to Lazar et al. (2012), one should pay extra attention on how the employment application webpages are being developed and designed. In all cases of development, user centered design techniques should be used for the sake of accessibility. The techniques involve usability testing persons with disabilities, heuristic evaluation, and automatic accessibility testing. This thesis did not develop or design a new job-application webpage, but investigated the existing. The outcome of the investigation ends in proposing improvements.

For this research, the research was done in an iterative matter, where each round of investigation laid another brick into the overall picture for the job-application webpages. Starting with the automatic checker, learning the results from these, reading literature about the focus group, and forms, merge the knowledge into the observation and interviews. Analyze the new results, and start another round of manual investigation, further building on the results and knowledge gained over the previous investigations, to ultimately get the desired results.

The study started by creating a baseline for some of the interview-questions and observation. A manual investigation was performed on the three job-application webpages WebCruiter, Jobbnorge and ReachMee, with no restrictions on any possible barriers found. The investigation was done with the automatic tool (Powermapper) and by using the features offered as off-the shelf tools in the computer (Macintosh). These was to navigating and explore the webpages, checking the possibility to zoom in different browsers and to navigate through keyboard. The results and findings was then used in developing the questions for the interviews, and what to look for in the observations.

Following the manually investigation, observation and interviews of a focus group had taken place on one of the job-application webpage (WebCruiter). This part of the research was qualitative. For the observation, the participants were asked to fill in a mock job-application, with several pre-made tasks to follow. After the observation, a follow up interview was set up, to clarify any uncertainties that came up during the mock job-application session. The results of both the observation and the interviews

was then analyzed, seeking themes and patterns to evaluate if there were any barriers found, leading to suggested improvements.

Based on the results of the observation/interviews, a new manual investigation was initiated. The new investigation was done by conducting a comparative study, by manually investigating (heuristic evaluation) the three job-application webpages (WebCruiter, Jobbnorge, ReachMee). The evaluation consisted of a selected number of requirements, aimed to aid the general public. Wanting to check for both accessibility and usability, the criteria used for usability was Nielsen's 10 Usability steps (Nielsen, 1994). For accessibility, the criteria were selected from W3C's web accessibility initiative (WCAG 2.0). The results of the heuristic evaluation were then analyzed and used to propose possible improvements. This is to back up the outcome of the observation/interviews.

Summarizing the four research questions:

Research question number 1, will be answered by the outcome of the interview and observation sessions of the senior citizens. Results from the manual investigation will be used as criteria to what to look for, and questions asked.

Research question number 2, will be answered by conducting a heuristic evaluation on the three job-application webpages. Both manual investigation using the WCAG-standard, and automatic tools will be used. The WCAG-principles and guidelines used will are the same as explained in Section 4.7.

Research question number 3, will be answered by looking into a number of clients from the three job-application webpages in the thesis, and compare private up against private for some universal design principles. The specific principles will be defined later in the process.

Research question number 4, will be answered by investigating for any statistics that the job-application webpage may possess regarding handheld technology usage. When interviewing participants, questions will be about usage of handheld technology.

5.1 Usability testing with interviews

To deliver the research results that universal design requires, turning towards a qualitative method is often applied (Cairns & Cox, 2008). What a qualitative research is doing, is that it is focusing on understanding the usage and the user's feelings towards a particular technology (Cairns & Cox, 2008). On the opposite side, is the quantitative research focusing more on producing numbers, tables and statistics.

This being a universal design thesis, the discussion for making a theoretical or practical approach came into mind. According to Lazar, Feng & Hochheiser (2010), when following researches methods for universal design, it tends to not have a major focus on theory. The research needs to be relevant for people, organizations and design. With emphasis on the research being able to influence interface design or public policies. To create a research of this caliber, a profound research method should be chosen. Aligned with the same values, this research is focusing on a practical research approach. No algorithms are used to explain the data collection.

Ideally, everyone regardless of disabilities or background should be able to apply for a job online without assistance (Lazar et al., 2010). With that in mind, the approach is that the participants of this study should figure out by practice, if there are any barriers preventing them from fulfilling the job-application process. To learn as much as possible about the barriers, for the observation, a usability study with some modifications is used. The nature of the usability study is to create a scenario for the participant, in a realistic environment where the observer is watching and taking notes (Lazar et al., 2010). The modifications were used because the researcher wanted to be able to offer assistance to the participant if they struggled to move past the initial login screen. Obviously, the struggle, or barrier, is very important to monitor and document, but it is desired that the participants try all the features of the page. Given the qualitative nature of the method it gave the researcher more flexibility to be involved in the observations.

The utilization of "participant observation" also backs up the qualitative nature of this research. It includes interviews, direct observation and analysis of the material

produced by the participants. One common method in usability testing is the "think aloud" method, which is heavily encouraged in this research. All the participants in the focus group was asked to think aloud and reflect when they were performing the tasks at hand.

When the researcher is talking about focus group, it is not meant as the more traditional qualitative research method, where the participants are free to work or discuss among them self or in groups (Lazar et al., 2010). However, elements from focus groups the methodology is applied, as the researcher is taking notes and recording on-screen action (Krueger & Casey, 2014). Also, the selection of participants is selected based on criteria (in this case, age), which also is the same with focus group the methodology. Nevertheless, the usage of the word focus group, is meant to simply define the group of participants, in this case, people in the age group 55-74.

5.1.1 Selecting participants

In selecting participants, this study followed principles of research methods (Lazar et al., 2010) with emphasis on choosing people with attributes or goals relevant for the study. The observation study wanted persons of a certain age range (55-74) as the sole criteria. However, professional background, education level and computer knowledge where noted and asked for pre-observation.

Motivation of the participants is something to be aware of. With a pretty general category, open for a lot of different people, each individual's background and motivation could easily become a subject of discussion, whether or not they would contribute constructively to the research. To try to ensure the participants had something to offer to the research, motivation was taken into concern. In some cases, (Lazar et al., 2010) both motivated and unmotivated participants could offer value to the research. In this research, however, there seems to be only one of two, that had something to offer. There could arguably be three main types of people in the age group of 55-74; People looking for a job, people with a job and people who are not looking for a job. Of these three, people looking for a job, seems the most motivated to ask for participation on a study of job-application webpage. People with a job also could contribute as they at one point in time had received the job they were

engaged in, and/or they also could be interested in looking for a new job. On top of the motivational aspect, there where knowledge of computers, internet and internet-forms considered.

5.1.2 Recruiting participants

Unless one possesses a large network or work for a corporation that frequently performs user studies, the researcher would have to do the recruitment on their own. In the start of the recruitment process, the desired participants had to match the requirements for the study. In the case of this research that would mean to fit into the age span of 55-74. In other words, a wide pool of people to choose from. However, as mentioned in the section about motivation, there are other factors that are desired to match the research. Therefore, the idea of contacting NAV (Norwegian Labour and Welfare Administration), and recruiting job-seeking persons in the age of 55-74 appeared as a valid alternative. Yet another option materialized itself from the connections at campus in HiOA. HiOA, sometimes has guest lectures from other universities, companies or organizations. One of the guest lectures came from the non-profit organization Seniornett, and matched the desired requirements for participants.

Seniornett were contacted and a meeting was set up for a brief presentation of the master thesis and information about the research. It resulted in volunteers from Seniornett for the interviews and observations. Contact with the participants was set up through e-mail. The reason for the agreement of a non-compensation participation, was stated as "a part of the work that Seniornett does". Contacting NAV will also be done to diversify the participants, as it could be that the participants from Seniornett had an over average knowledge of computers and internet.

5.1.3 Seniornett

Seniornett has the goal to make seniors in Norway active users of internet. In 2016, the recon to instruct 24 000 seniors in the usage of computers and internet. They are stating that around 400 000 of the seniors in Norway used PC or the internet. Seniornett provided participants who were in the correct age-group, they had all previous work experience, some of them had applied for several jobs before

Seniornett. And most important, they had daily interaction with other seniors who had little or no experience with computers, and by teaching them, they could gain a lot of valuable insight in what troubles occurs more frequently than others. As Lazar et al. (2010) are explaining, that unmotivated users also could gain useful value to a study, as they could help understand the reluctance to adopt to new technology.

So, to conclude, a group of people with good computer knowledge, but with the appropriate awareness of occurring troubles and barriers were contacted to engage in the observation study.

5.1.4 The number of subjects

To determine the number of participants in a usability study can be difficult and a debatable subject (Macefield, 2009). Study is showing that there are no "one size fit all" solution. Although, when dealing with studies related to problem discovery, numbers from 3-20 participants is valid (Macefield, 2009). And while this is not a one hundred percent problem discovery study, it has similarity as any problem discovered in this is welcomed, and if none are found, that would also be an adequate result.

Macefield (2009) concludes further, that 5-10 participants are the sensible baseline range, where complexity if the study should determine if increased participation is required. Figure 5.1 is showing the comparison between the number of participants in a problem discovery study and a comparative study.
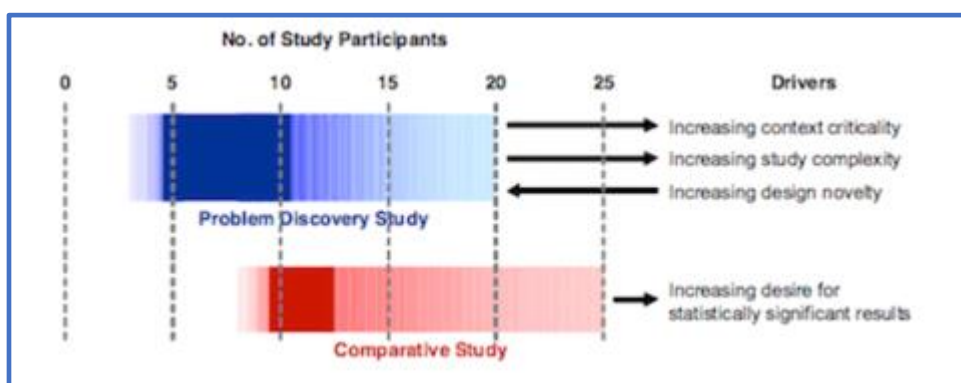
Figure 5.1 Numbers of study participants for problem-discovery and comparative studies

The nature of the study also factors into the number of participants. It could have been possible to send out questionnaires to a larger audience to get some general feedback. But it is desired to get hands-on experience and feedback from the users. As this corresponds to the methodology chosen.

According to (Lazar et al., 2010), determining the number of participants in a research is a compromise of cost and volume of information. In the case of this research, the cost could also be determined as time, as there would be no compensation for the participants and it is time consuming to recruit participants. On top, when working with deadlines the observations and interviews could not go on forever, as this is one-on-one sessions.

Ultimately, the research strived to reach a participant number between 5-10, with the adequate background, and motivation.

5.2 The interview and observation session

When participants had accepted and the schedule were ready, the interviews and observations could begin. The sessions consisted of two interviews, one pre-and one post, along with the observation. The observation then let the participants explore a fictional application in WebCruiter, one of the job-application webpages examined in the manual evaluation.

For the whole session, the approach was a semi-structured one. With pre-specified questions that would serve as starting point for the participant to talk and possibly create a discussion. According to (Lazar et al., 2010), this approach has room for digressions as well, where the more structured interview would not support to much digression. The participants were handed freedom to go beyond the premade script, as long as it would not violate the participants' privacy.

After the observation, the post-interview session started immediately. The participant was asked open-ended question to invite discussion or elaboration on the session and tackling one question at the time, trying to avoid compound questions (Lazar et al., 2010). Along with the questions and discussions, the participant was asked to show specific in the job-application webpage where the possible problems or barriers

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occurred. This process was also used by the researcher to make the participant shed more light on certain points noted from the observation.

Based on the literature and methodology, an observation protocol was created to help with the flow of the sessions.

5.2.1 Interview protocol

Before the observation, the observer wanted to ask the participants some questions. Age was asked for, along with some basic background, like level of education.

- Have you applied to any jobs in recent time (last 15 years)?
  - This question is based on the study that in 2001 approximately 90% of large companies have and use recruitment pages (Cappelli, 2001). So, it should be possible that even as long as 15 years ago, there were used a job-application webpage in the application process.

- If so via what channels did you apply?
  - Follow up on the previous question. Established what channels were used, and familiarity with different systems. It should be noted that the researcher is aware that, if any application were used in previous years, it is a high possibility that the system is changed. However, the process could be similar.

- Have you ever used WebCruiter before?
  - To see if previous knowledge and usage of the system affects the flow of the tasks.

- Before the observation, do you have any opinion about job-application webpage?
  - To see what mindset the user has towards the applications. Have they any stories from the past to share. Do they feel anything positive or negativity before exploring the tasks?

- How would you rate your computer knowledge and internet usage?

- ○ This is to gather some comparative data. Also, does computer knowledge affect much of the flow and the fulfilling of the task? Or is the system intuitive and self-explanatory?

- If internet is used, what does an ideal web-site look like, name example?
  - ○ To see if they have a preferred webpage that appeal, and are familiar. They are also asked to elaborate on pages that are troublesome, or less appealing.

- What is a vital requirement for a webpages functionality?
  - ○ Again, a follow up question regarding the participants' internet usage. Is it important for a webpage to be absolutely scalable? To be translated into different languages?

- Do you use smartphones or tablets?
  - ○ Linked to one of the research questions. Does the small sample of participants in the age group use handheld technology? Follow up question after observation.

5.2.2 Observation protocol

The observation protocol is based on chapter 8 in "Research Methods" (Lazar et al., 2010). With the semi-structured interview approach as a baseline.

- Involvement of the participant and observer
  - ○ As this is a two-step observation, intervening might occur after a given time to tackle the login obstacle etc.
  - ○ Apart from that, they should try to navigate naturally without lead, while the observer notes.
  - ○ Ask the participants to think aloud and speak in their natural language.
  - ○ Feel free to ask them open questions during the observation as well, to get insight into how they experience the pages and forms.

As discussed in "ethics and considerations", different actions are required to make the participants feel comfortable. Again, it is heavily based on "Research Methods" (Lazar et al., 2010) The following takeaways are used in the protocol.

- What actions should be taken by who, what equipment is needed and what are the user's needs?
    - If users need assistive technologies, they will be asked to use their own equipment, as they should be most familiar and comfortable with that.
    - The observer will take notes during the pre-and post-interview as well as during the observation
    - The observer will have prepared a pre-filled note, that could replicate a dummy CV for the participants to fill inn.

- When, how long and where will the test be conducted
    - The participants might prefer testing at their own house, at their workplace or at a neutral location. It will be up to the participants to choose what they are most comfortable with.

After the observation, the post interview did take place, to pinpoint why certain actions and reactions during the session occurred. If something looked troubling or took longer time than expected, it seemed valuable to follow up the subject to get a more detailed explanation on the barrier. During the observation, the observer would have to be extremely caution not to ask leading questions, to get impartial answers (Lazar et al., 2010).

The post interview questions are as follows:

- Did something stand out as a challenge/barrier to the flow or completion of the tasks? (Think about the button sizes, colors, text size and font!)
    - During the observation, hopefully any complications have been noted by the researcher, but this is a chance to go back and look at the challenges again to pinpoint what it could be.
- Would you favor to use a tablet over a computer?

- ○ In relation to the pre-observation question. If they have handheld devices, is this an approach they could use?
- How relevant is a job-application to you?
  - ○ This question is asked because of motivation. It might not have any affection on the session, but highly motivated users could perhaps give different results than user that perhaps not care as much.
- How did the job-application webpage compare to the ideal webpage stated earlier?
  - ○ A follow-up on the pre-interview questions regarding preferred webpage. There might be no notable or even logical comparison to make between WebCruiter's application and the "ideal" pages, as they could be very different. So, this will be a question where the researcher need to filter out positive and negative feedback based on relevance.

Finally, there would be some questions asked based on the observation (as the abovementioned questioned would be asked to all), what they said or what they did. The questions were asked to clarify if the system validated with the 10 steps in J. Nielsen's book Usability Engineering about heuristic evaluation (Nielsen, 1994). This would also work as an indicator if the system had a high usability. So, questions were asked about:

System status - did the user feel informed about what was going on. Was the feedback appropriate?

Plain language - did the user understand the language in the system? Where there any phrases or concepts that were, unclear or misunderstood?

User control - If mistakes, or unintentional steps occurred, was it clear how the user could leave the unwanted state?

Consistency - Were the system consistent in terms, actions and situations?

Error prevention - If the possibility of an error were present, is the system designed so that the error never should be met in the first place?

Minimize recall - Are all the options, objects and actions visible by default? Or is some information hidden or up to the user to remember?

Flexibility - Is the system flexible so that frequent actions could be tailored for both experienced and novice users?

Minimal design - Are there unnecessary text, objects or information in the system?

Recover from errors - Are the error messages expressed in plain language? Is the feedback on point and helpful?

Documentation - Are there any "help" functions for explaining parts of the system?

(Nielsen, 1994)

All the results were analyzed after the test, and not during, while still understanding the importance of analyzing the data while it was fresh. The analysis wanted to try to categorizing the issues and describe how they were triggered.

5.2.3 Pilot testing

Before the usability testing and interviews were initiated, a pilot testing was conducted to test the routine and questions. This was also an indicator for the estimated timeframe of the sessions. As the interview would be semi-structured, it was hard to get exact results during the pilot-testing, but it ensured practice and confidence for the researcher. It was an option to use the first session as the pilot test, as this would give real exposure and feedback to the test, and if it did not go according to plan, it could have been revised and removed from the results.

5.3 Observation environment

The participants were handed a premade template with instructions on how to fill out information for a job-application (see the template in the Appendix, 11.2 The Observation Manual). The observation was done in a test environment, with

permission and access given by WebCruiter, and this section will go through the same route as the participants were asked to do.

They had a "vacant" position as "HR-manager" for Norwegian. The observation start-point was inside the vacant job "about-page". In this case an empty content-page apart from a single picture. The right side of the page had some general information along with the "apply for position" button, white text on green background. Left of the text was a white checkmark. (Figure 5.2)
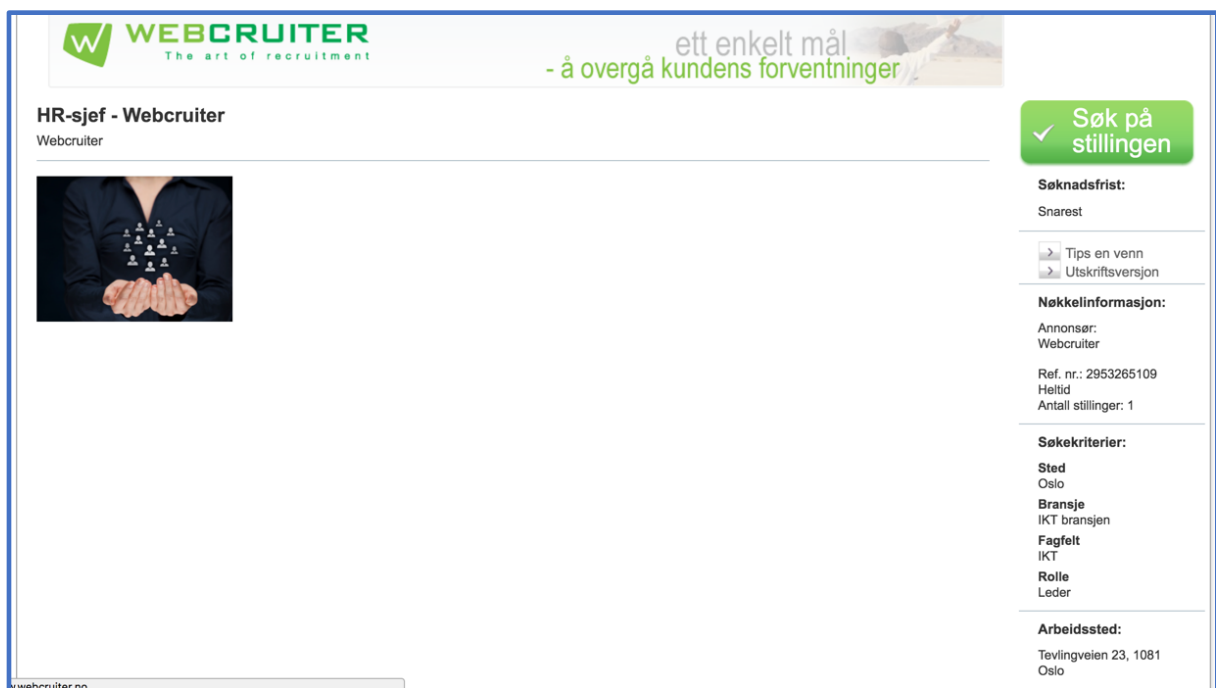
Figure 5.2 Main start page for the observation

When the "apply for position" button is pushed, the page loads, moving the user to the next step of the task, the "login sequence". The first step is to insert an email into the text-field. When no text or an invalid email is used, a friendly red reminder-box appears under the text-field, saying either that email is mandatory (Figure 5.3) or that the email is invalid. When a proper recognizable email is inserted, the "next" button makes a "password" field appear. The user has the option to hide the password, where the default option is to make letters appear instead of asterisk. The user also has the option to be remembered, ask for help if password is forgotten or apply with a different email (Figure 5.4).

Figure 5.3 Email input

Figure 5.4 Password input

With correct password, the "login" button takes the user to a general information form. The top of the page is showing the progress of the application, in this case the "breadcrumb" is set of step number 1 of 4. The form is consisting of email, name, cell phone number, address, postal number and place, and at the bottom a dropdown menu for choosing country (Figure 5.5).

Figure 5.5 Personal information page

The next page is a short "question" page, with two "Yes" or "No" questions, possible to answer by hitting a radiobutton. The questions are pre-made by WebCruiter. When the radiobuttons are ticket off, the answer field is filled with a shade of blue. At the top of the page, one can note that the "breadcrumb" is showing where the user has progressed to, and a green field to indicate that general information page is completed (Figure 5.6).

Figure 5.6 Question page

Finally, the main application page is presented labeled "application text". The application text is also the next open text-field the user is met with. The structure of the page is built with dropdown menus, where the application text field is visible. One of the other dropdown menus is "CV", it further consists of sub-dropdown menus. Giving the option to "add work experience", "add education" or to import an already existing CV.

The "import CV" function gives the user the option to upload a CV from their personal device. Then WebCruiter tries to read the CV, and import work experience into one section and education history into another.

Figure 5.7 shows how the add work experience is functioning. It consists of a "from date" and a "ending date" to write when the work was conducted. Otherwise it consists of more forms. The page to add work, is the same as the page to add education history. The user can add more work experiences or education, by using the button labeled "legg til arbeidserfaring" or "legg til utdanning" (Figure 5.8).

Figure 5.7 Date picker

Figure 5.8 Add work experience and education history

The final option used in the observation sequence, is to add a language. The layout of the page looks like the other, this one containing a dropdown menu for language-nation, and two questions regarding language skills, orally and written. Each option with four alternatives, "none", "some", "good" and "very good" (Figure 5.9).

Figure 5.9 Add language

It should be noted that WebCruiter's layout changed from the first observations to the last. As WebCruiter is making new modifications, new releases to their product occasionally is published. This is visible as the top "breadcrumb" is new from the first observations. The images in the document are of newest date (November 2016).

5.4 Ethical

For the interviews and observations, there was the question of whether or not to ask the participants about sensitive information. If they had any disabilities or if they used assistive technology. The questions could have been relevant to map the users, and look at specific troubles or barriers combined with certain assistive technology etc. (Lazar et al., 2010). Ultimately, it felt unnecessary to know if there were a disability of usage of assistive technology present, as it is the findings of barriers that is relevant. If some barriers occur, the problem will be assessed, and analyzed for how it could be improved regardless of background knowledge.

Screen recordings is useful to track movement or missclick, but could cause some ethical difficulties (Lazar et al., 2010). When the user was to fill in sensitive CV information the sensitive information would be recorded as well. Therefore, it was vital that the participants used a premade manuscript to fill in the CV information and not use their own name or birthdate. The username and password for the login section would also be premade by the observer.

The reason for the usage of a premade manuscript was to save time for the user to come up with a fake name and information "on the spot" (Lazar et al., 2010), along with securing the privacy of the participant.

For the observer, the only form of logging what was said and done would be too transcribe it by hand. No audio or video of the sessions would be used. The transcriptions would never include name or any personal related traits that could identify the participants.

With these considerations, there was also the part whether this had to be submitted to NSD for an evaluation if it was possible or not to do the observations. The choices mentioned above, of excluding any form of sensitive information, and only keeping screen recordings without audio, no submission for NSD is required.

For the observations and interviews the observer would be both flexible to meet the participants at their preferred location, and open to use equipment of the participants' desire. That being said, there is a preferred use of equipment (a Macbook Pro), as it has a built-in screen recorder very favorable for the usage.

As some of the participants represented the organization Seniornett, and they had an office located in Oslo, it was ideal for both the researcher and the participants to conduct the observations and interviews at Seniornett. Differences in work hours and schedule, the sessions were scattered around on different weekdays. Other sessions were arranged to be either at campus or at the participants chosen location.

5.4.1 Protecting participants

As the researcher, have decided not to report the project to NSD, there are some guidelines that are required to follow to ensure the anonymity of the participants. For a project to not be subject to notification for the NSD, the data gathered in the entire research must be anonymous. No sensitive data can be linked up with identifiable personal data, not even by using reference numbers as identifiers (NSD, "Meld prosjekt," n.d.).

To further ensure that no privacy violation is broken, NSD have some examples for methods that can be followed:

- Data from interviews and observation is recorded by taking notes.
- No names are mentioned
- No identifiable background information is registered. A person can be identified by social security number or unique personal characteristics.
- To prevent indirectly identifiable cases, no information about current occupation are combined with age, gender, education or diagnosis
- To de-identify data, categories are made broad, an example are the use of intervals for age, which in the case of this study would be fully 55-74.

(NSD, "Meld prosjekt," n.d.)

For protecting the participants, the researcher had to communicate very clearly what terms the participant joined in under, and what would happen with the collected data. A consent form was created for agreement and information. On top of this, an orally explanation of the project was given to each participant to ensure that they knew the conditions of participation.

The consent form was created on a template from NSD (Norwegian Social Science Data Services), but tailored to fit this research. The form, included; "background and purpose", "What participation in the research would mean", "what would happen to the collected data", "ensuring that the participation is voluntary", "contact information about researcher and supervisor" and finally the "signature". The consent form can be viewed in its entirety in the Appendix (11.1 Consent form (Norwegian)).

The interview, pre-observation, were committed orally by the researcher asking the participant questions, while transcribing the answers. All questions were translated into Norwegian, to avoid language barriers, and to get most out of the questions.

The observation part of the research would most likely (Lazar et al., 2010) not endanger the participant, but fatigue from mouse movements or eye strain could occur. However, the sessions were scheduled not to take too long time, making the risk even slimmer. This was something to be aware of. Another point was to try to meet the participant with an equipment as familiar as possible, along with always

trying to make the participant as comfortable as possible. This would mean to have external mouse available or enlarge the mouse pointer if desired. All to create an observation environment that would let the participant focus solely on the task at hand, and no other factors.

6 Results

The result section will cover all the results from each of the iterative step in this research. The first manual investigation helped the research in pursue the use of assistive technology. The observations and interviews (Section 6.2) helped with adding foundation for the results from usability testing (Section 6.3). And the final manual investigation added accessibility testing to the research (Section 6.4), and helped create the whole picture for the situation of the investigated job-application webpages.

6.1 First manual investigation

Due to the difficulty in making automatic accessibility checkers access login demanding pages, it causes a lot of restrictions. However, some of the pages can be accessed as to the login page. When this was possible, the automatic tool PowerMapper[6] was used to get results.

When not utilizing the automatic testing tool, the testing is consisting of manual investigations. To do this, navigating and exploring the webpages, checking the possibility to zoom in different browsers and navigate through keyboard was used. The testing is trying to navigate from the login page (if available) to where the uploading or inserting of the CV is done. This navigation is done by using trackpad and keyboard, using both together and each of them one by one. Zooming was conducted in Chrome and in Safari, looking for the content and text size to scale and rearranging itself.

The manual testing did cover the login/register page of selected webpages, additionally the testing will be on the "CV" page.

6.1.1 Automatic tool Powermapper

Powermapper returned feedback on both accessibility and usability. WebCruiter, Jobbnorge and ReachMee was the job-application webpages selected.

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[6] http://www.powermapper.com/

6.1.1.1 WebCruiter accessiblity findings

When using the accessibility checker on the login/registration page of WebCruiter, it returns the following accessibility issues:

Level A issues

WCAG 2.0 A 2.4.1 The footer iframe for social media has no descriptive title.

WCAG 2.0 A F70 Due to missing end tags in the html, it may cause screen readers to miss important content.

Level AA issues

WCAG 2.0 AA 1.4.3 The foreground/background contrast ratio is just slightly off the AA requirement, with the light gray text on the white background (4.4. AA requirement is 4.5).

6.1.1.2 WebCruiter usability findings

W3C Best Practices - No issues found

Readability - No issues found

6.1.1.3 Jobbnorge accessibility findings

Jobbnorge has a login page visible for accessibility checking. The following accessibility issues were found:

Level A issues

WCAG 2.0 A F68 Although the form fields have text, it should have been labeled to describe what action is required for what form field (Form control).

6.1.1.4 Jobbnorge usability findings

W3C Best Practices - Some pages violate these guidelines. Priority 2, could keep URL shorter than 78 characters.

Readability - No issues found.

6.1.1.5 ReachMee accessibility findings

Unlike the other pages tested, ReachMee does not have a login page. The solution consists of an CV uploader, different text fields and other possibilities for uploading content. This makes it easier for automatic checking.

Also, it should be noted that this can be helpful for some people, where the login page can be a barrier itself. However, it forces the job applicant to input the same information, and same steps in all the different job applications the job applicant want to apply for. Unless the user has an up to date LinkedIn profile, then lesser steps are required.

Level A issues

WCAG 2.0 A F65 and

WCAG 2.0 A F89 The screen readers are mentioning the image name (Figure 6.1), which make no sense (LinkedIn_16) No alternative text is inserted.
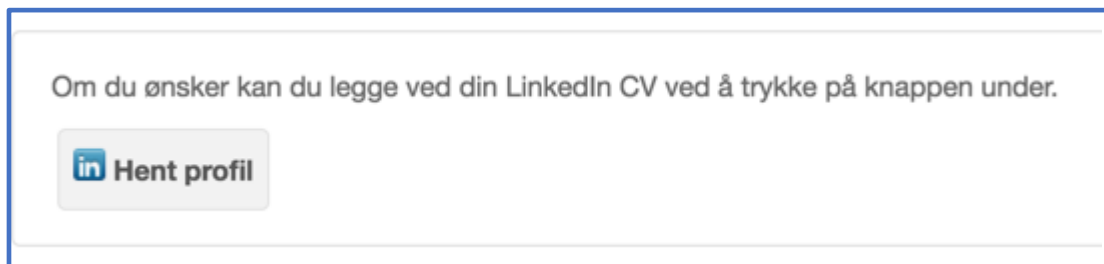
Figure 6.1 LinkedIn button.

WCAG 2.0 A F70 and

WCAG 2.0 A F77 Duplicated ID, makes screen readers to miss content.

All in all, the solution to integrate the application into the webpage without any form of login, has its pros and cons. First of all, the pro is that it prevents the users to register and login, and if the applicants have a LinkedIn profile it should ease the workload of the application process some. Unfortunately, the LinkedIn button along with other links are lacking text describing their function or where they take the user.

Level AA issues

WCAG 2.0 AA 1.4.3 The foreground/background contrast ratio is off the AAA requirement.

<u>6.1.1.6 ReachMee usability findings:</u>

Readability - No issues found.

W3C Best Practices - No issues found.

<u>6.1.1.7 Findings from zooming</u>

-WebCruiter is zooming on both Chrome and Safari, and the content is rearranging itself.

-Inside the CV input page zooming works as it should.

-Jobbnorge is zooming on both Chrome and Safari, and the content is rearranging itself.

-Inside the CV input page zooming is working, however the hoover menu is overflowing the bottom content when scrolling to the bottom of the page (Figure 6.2).
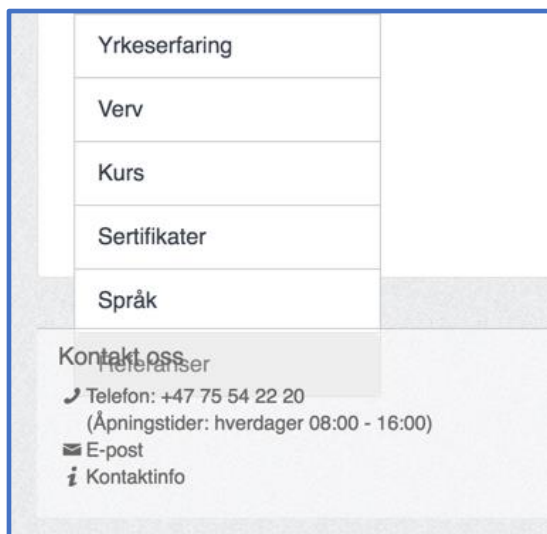
Figure 6.2 Screenshot of overflowing hoover content (Chrome).

ReachMee has no problem zooming in with different browsers. Content and structure resize and arrange nicely.

<u>6.1.1.8 Other findings</u>

One major error found in the WebCruiter page when going through it manually, is the "import CV" function (Figure 6.3).
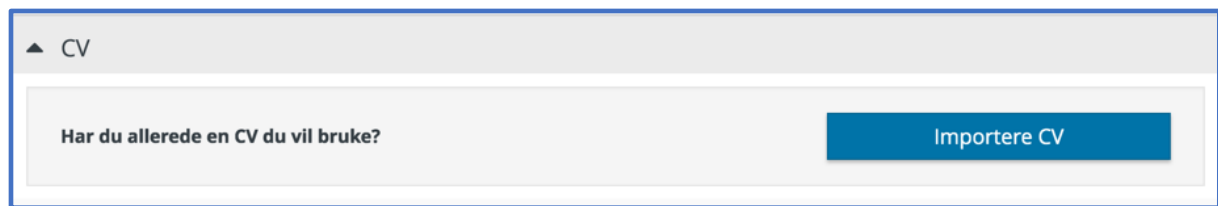
Figure 6.3 The import CV function

This function is supposed to make a user uploaded content-file from their personal computer fit into WebCruiter's form. If the user has written down education, work experience, language skills and other personal information, this is supposed to fit into the correct sections in the application. Problem is, it fails to recognize different headings in the file (docx-file used), so each section is overflowing. This is frustrating as everything has to be manually edited afterwards. Another drawback, is if the user uses the "import CV" function over some existing data and saves the draft, there is no way of restoring to the previous draft. It feels unnecessary to keep the button/function at the application, when it has flaws.

Keyboard navigation was found to be difficult or impossible to use in two of the job-application webpages (WebCruiter and ReachMee). More on these findings will be elaborated in the results for the accessibility investigation, Section 6.4.

Although, the three job-application webpages checked were found to uphold a decent standard for accessibility and usability when using the automatic tool, there is still much that was not investigated. As it was only possible for the automatic testing to check the login/register page in two of the pages (WebCruiter and Jobbnorge), there was much that needed further investigation.

However, some results from the first session showed some findings that could be built on. Labelling in form fields and buttons without meaningful name was further investigated in the final session of manual investigation. The indication that screen readers could miss content also highlighted the importance to get a more in-depth understanding of the status of the different job-application webpage, by using the assistive technology VoiceOver.

First of however, the observation and interviews was conducted to get more results.

6.2 Observation and interview results

Six sessions were completed, over the span of two months. Four of the interviews was done in in the span of two weeks, and the remaining two interviews in one week the following month. The participants have different background, but are all in the age group of 55-74. Again, the guidelines, mentioned in the ethics section, by NSD is used to ensure the anonymity of the participants (NSD, "Meld prosjekt," n.d.).

The participants completed the observation on a MacBook Pro (Retina, 13-inch, late 2013), with macOS Sierra 10.12.3 installed. Additional to the standard keyboard and trackpad the MacBook is delivered with, the users had the option of using external keyboard and mouse. The browser used was Google Chrome.

As the observations took place over the span of two months, there was changes on the WebCruiter page during this time. Some of the changes will be reflected in the results (Section 6.2.3), but the full extent of the changes will be covered in Section 6.3.1.1, because there where collaboration between WebCruiter and the researcher in this period, and some of the changes could be reflected upon this.

6.2.1 Who are the user?

Starting by looking at the age of the participants, all six were in the age group 55-74. The participants had various background, some with higher education and some with secondary education, but they all rated their internet and computer skills to be adequate and above average. None of the users used assistive technology. Three of the participants used an external mouse, while the remaining three used the trackpad. No one wanted the option of an external keyboard.

When it came to previous experience with job-application webpage, and the application process, there is different exposure. Four had numerous encounters with different webpages, online recruitment pages, LinkedIn and email. Two only had experience with post-mail in the previous 15 years as well as networking. And the last one had WebCruiter experiences. The one with WebCruiter experience said it was "streamlined" in terms of layout and user experience.

Participant ID	Duration of observation	Average observation time
#1	11:22	
#2	13:15	
#3	12:17	
#4	10:14	
#5	06:45	
#6	05:36	

Table 6.1 The first four observations were done pre-the WebCruiter changes.

The time the participants spent on completing the tasks for the observation was between 5 minutes and 13 minutes (Table 6.1). The first four was fairly consistent, with 3 minutes separating, while the last two observations took considerably faster time to complete. The changes made by WebCruiter could have been an impact on the time, however, the last two participants considered themselves above average with computers, and had previous experience with job-application websites, suggesting it could be a combination of the two.

6.2.2 Preliminary feelings towards job-application systems

The opinion of job-application webpage and recruitment pages, were somewhat neutral. Those with experience had an "Ok" opinion. Stating that "the functionality had been ok", or "generally fine". The two that had little or no experience with the webpage in recent time had a divided impression. One said it "seems necessary and valuable for both applicant and the recruiter". Where the other were less keen on the webpage, as second hand experience had been troublesome. Some of the trouble had been with being timed out on the page, causing confusion and frustration to the user. The participant also mentioned that the copy/paste function had been absent, making it a time-consuming session. But as mentioned, the participant had no personal experience with this particular case, it was knowledge picked up by another user and passed on.

A very recurring theme, mentioned several times by multiple of the participants, were the desire for standardization. As mentioned, one of the participants had experience with different webpages and recruitment pages, and one of the drawbacks were "the time-consuming process of it all". Another participant, the one with WebCruiter

experience, mentioned that it was "difficult to remember where one was registered" and wondered if "the different systems worked or talked together?". One of the participants without hands on experience, wondered if "it was possible to standardize the application process for the job-seekers?".

This have been mentioned several times during the interviews, that it would be easier with one interface or system. They on more than one occasion drew parallels to other systems, like online banking or insurance pages. Stating that "Sure it might have been easy to switch to a new bank, but it was a whole other story to learn the new interface of the online banking page. So (seniors) preferred not to switch because of new interface." So, based on the perception before the actual observation and exposure to the system, there were some concern regarding learning new interfaces and systems. Another concern stated, was for the systems to have a too technical jargon, or not to have a plain language. Also, one had previous experience with systems not returning feedback if something went wrong, or some actions should have been changed.

A reappearing feature, were the importance of a personal network in the application process. Although, four of the participants used some sort of job-application webpage, all six stated that they benefitted from a personal and professional network. Two of the participants previously were offered a job via their network.

6.2.2.1 Ideal pages

One online bank page was mentioned as a page with "good and intuitive interface". Other ideal pages that were mentioned by all the participants were typical portal-pages, pages that works as forwarding page to other services. These were explained as "easy to use" and "time saving". One mentioned the desire for job-application webpage to work in the same way "to start at the same position, to minimize other logins and usernames/passwords". Other pages thought of as good, was encyclopedia pages, like "Store norske leksikon", as it had "great contrast, large letters, black on white. There was some contradiction regarding travel pages, as it for a couple of the users it was thought of as "good and familiar to use". While another thought of it as "Way too much information, and difficult to understand all the icons and letters". One of the participant mentioned changing of online banking pages to

potentially be confusing. "…we get familiar with a system, and if we change (to a new bank), it becomes discouraging to use the new system if it is not familiar". A final concern noted about the webpages is that they should be "fast to load" and "it is very discouraging when pages link to something that does not exist (dead links)".

6.2.3 The observation

The tasks for the observation was to apply for an open position as "HR-Manager" in WebCruiter, a fictional position with a fictional user. The participants had a premade template, and steps to do. The screen was recorded during the whole session. The participant started logged out as default and followed the same steps as shown in "Observation environment".

The first task, to find the "apply to position" was found by five of the participants right away, the sixth needed a little guidance on which button to hit. All six of the participants found the form to insert the email, inserted it correctly and found the "next" button. No one had problems with the password either, and no one mentioned that the password had default as "shown", where the hide or "skjul"-button would give the traditional asterisk (Figure 6.4). When asked after the observation, there were no particular reactions to the system not having asterisk as default. It was "fine as it is".
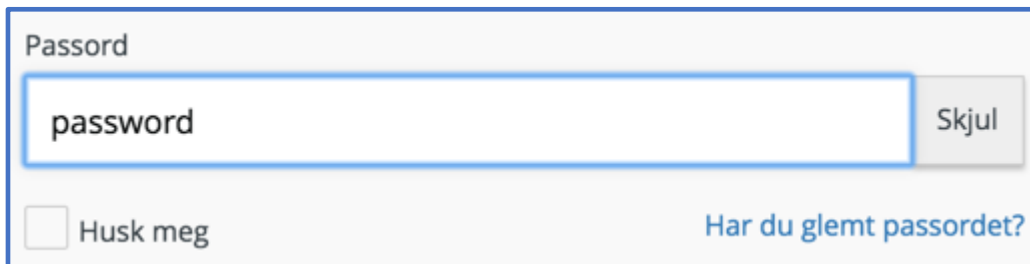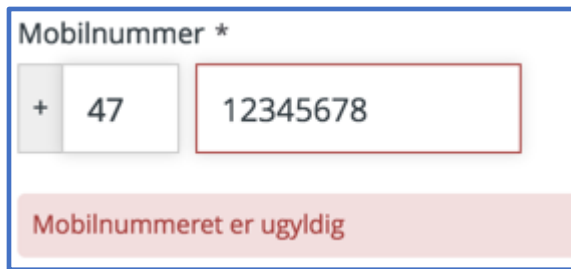
Figure 6.4 Password without asterisk.

The next page, was the personal information page. Here the template had some intentional errors, to force feedback for the participants. Name and address (standard form fields) was not a problem for any of the participants. The intentional error in the template was an incorrect mobile number. All of the participants inserted it, got feedback that the number was wrong and understood the feedback (Figure 6.5).

Figure 6.5 Red feedback box from wrong number.

The final challenge in the personal page was the drop-down list, to find country. The drop-down list could also work as a text field, to write in the information. And this was reflected in the different practices by the participants. Two used the drop-down list and found the country. One erased the existing text in the field, and typed in the correct country with the keyboard. Another participant that used the keyboard when maneuvering on the different pages (only used the mouse for changing page, as keyboard was the preferred option to navigate) had "tabbed" down to the country-field. Here the participant tried to continue using the arrows to scroll for the correct country, but found it to take too long time, and instead used the letters. At this point "Zambia" had already unintentional been selected, and when the participant tried to spell the correct country, it became wrong. It caused some frustration over the system for the wrong country, but the participant understood it was possible to erase all the letters with the keyboard and re-write the correct.

None of the participants had any problem with the question section. The text was clear, and it was "fine that the chosen answer was highlighted".

The next task was to find the option to be "removed from public" under "Special consideration" and to tick it to "Yes". Three of the participants spent some time finding where the "removed from public" option could be found. One returned to the "personal information" page to search for it there. When the option was found, there was some confusion regarding what to do. This is a question that default is set to "No", but the slide bar had caused some confusion (Figure 6.6). One participant thought all the options already were set to "Yes", and that the slider in fact was a check off field, so that if you hit it "a X would appear, and it would be ticket off as

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"No"". Also, mentioned as "not very intuitive". The others clicked the slider and commented no more in the subject.
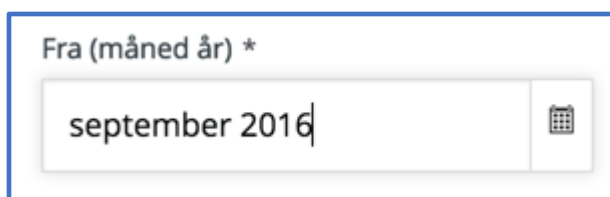
Figure 6.6 Slide bar default set as "No".

After finding the slider, the next task is to insert work experience. Everyone finds the button that takes the user to the work experience page. The first task is to select the date of when the work occurred. This is section that receives a lot of positive feedback. "It was clever, and easy to use". "It looked familiar". The participants fulfill the requirements, but there are however some small details to note. Two participant tried immediately to use the keyboard to write in the date manually. One of them, after a few seconds, when no feedback was returned, the participant used the date selector. Another comment was that "the date picker-icon could have been larger" (Figure 6.7). A final desire is "to have the picker as "scrolling". As this is the most familiar function".

Figure 6.7 Date picker icon located on the right side.

The other participant that chose to write from/to date by using the keyboard, was of the group of interviews done in the last session. WebCruiter had made some changes to their datepicker page at this point. The user noticed there is an example over the input field to guide the user so the input is correctly written (previously not present). This was later revisited by the observer to see if all formats were acceptable. If the wrong input is written, a notification materializes to further guide with the correct format (Figure 6.8).

Figure 6.8 Date picker with notification

Next up as a task, was to set language skills. The main issue with this task, was to find where to "add language". It is placed under "Add CV elements", which default has its content hidden (Figure 6.9). So, when the information in the manual only had "add language" as the task, it caused some confusion. "To me, it was not intuitive. It could have been a stand alone feature, or at least the content in the CV-element should have been visible as default." one of the participants' states. Others had trouble locating it, and had to ask the observer. The main language input works without any problems or noteworthy comments.

Figure 6.9 A hidden "add CV-elements" indicated with a small arrow pointing down

Lastly, in the observation session, there was the task to add a pre-uploaded PDF. There was a couple of missclicks on the "upload new file" button, where the other correctly selected the wanted PDF, and hit the "Save" button (Figure 6.10). One comment here, was that the wording on "upload new file" could have been "more descriptive."

Figure 6.10 Add PDF, both with upload button and Save button.

One of the participant pointed out that, after years with education and work, there could be a lot of work-references, certificates, experience notes, generally lot of paperwork. So, the option to upload papers that was scanned (and bypass the mandatory fields (marked with asterisk (*)), saved the user a lot of time versus writing every description into the job-application website by hand. Moreover, a lot of dates get lost or not so precise over decades of work, so it definitely was a plus that the from/to date skipped days, and kept it to months and years.

6.2.4 Post observation discussion

After the session was completed, the participants were asked about the session and the job-application. The feedback was generally very good. "Clean and consistent page", "Clear and straightforward page", "Easy language to understand, both on the page, and in the feedback boxes", and "Ok colors, icons, text size and font-type" were some of the positive feedback. The constructive feedback was as follows:

- Preview function of the complete application was missing
- Print button
- More descriptive icons (Figure 6.11). "Not logical to everyone what they do"
- The icons could have written descriptions under
- The text field to add application text was for one of the participant more logical to have at the bottom of the page instead of first. As "on had more of an overview when everything is filled in, to write the personal letter. Also, it could prevent the applicant from repeating himself"

Figure 6.11 Icons without description. What does the pencil do?

The user experience received generally good feedback. There was some confusion on where to find certain elements. Especially the "add CV elements" seems that it could have benefitted from being default as "shown" and not "hidden". The point that got the most negative feedback, were the icons. Either because of size, or because of unfamiliarity or the desire of (more) describing text. Also, the reappearing slider made some confusion, and alternatives here could have made it more intuitive. Lastly, one of the participants wondered who could see the application when it was sent and saved into the system, if there were any place to easily find information and the possibility to decide on privacy matters like these. Also, the participant, wondered what it meant that a CV was searchable.

The desire for a standardized solution when working with job-application webpage seems a difficult challenge to complete. Much because there are many private stakeholders competing for market share, all striving to release new and "better" solutions. It can be compared to the many online banking solutions and actors.

6.2.5 Handheld devices

Apart from asking about the observation session. The post interview asked about whether or not the participants owned and used handheld devices. All six of the participants had both smartphones and a tablet, which they frequently used. However, if they could choose, none of them would want to use a handheld device to apply for a job. "Generally, I use the tablet for email, online newspapers and games. For tasks like this I prefer mouse and keyboard." Another said, "I am not using machines (PC/Mac) as much as before, but for online banking machine is the preferred choice". The last point could further back up that not many seniors would use handheld devices to apply for a job. Online banking has similar traits as many of the job-application webpage, with a login page, forms to fill inn, and perhaps most important, a lot of text to write.

6.3 Results compared to Nielsen's ten steps of usability

When stacked up against the ten steps of Nielsen's Usability criteria, the results from the observation was set into a table. The steps were mentioned previously in Section 5.2.2. The table used **Appropriate** and **Some shortcomings**, as the two categories for meeting with Nielsen's ten usability steps. The categories used, is purely based on findings from the observation session, and the researcher own manual investigation. If any shortcomings are located, they will be elaborated to clarify which step could have been addressed.

6.3.1 WebCruiter compared to Nielsen's ten steps of usability

For the first set of observation, the following answers was received and observed (Table 6.2).

Usability step	Appropriate	Some shortcomings
System status		X
Plain language	X	
User control		X
Consistency	X	
Error prevention		X
Minimize recall		X
Flexibility	X	
Minimal design	X	
Recover from errors	X	
Documentation	X	

Table 6.2 Usability results from first investigation of WebCruiter

The **system status** had some shortcomings, the system had a loading symbol when a new page was loaded, showing that the webpage was handling a task (Figure 6.12). However, there was no progress bar, or breadcrumbs to show the user which step in the application they had completed, was undertaking and had yet to complete.
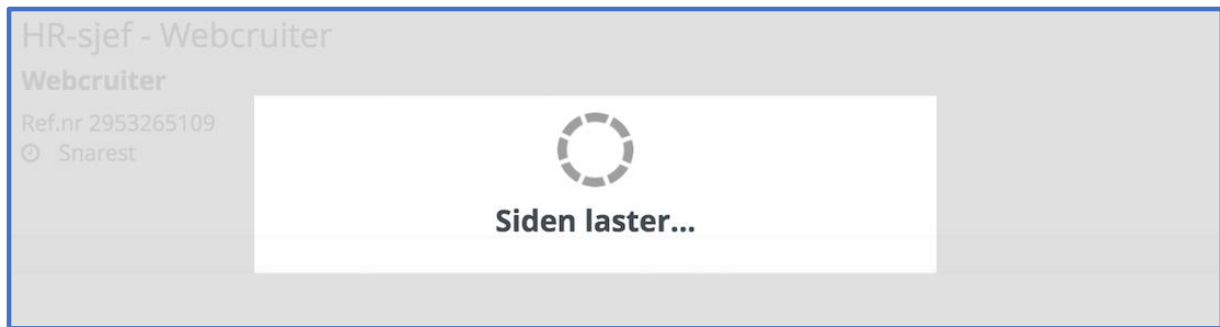
Figure 6.12 Loading symbol

All the participants said the webpage had easy to understand language, and no internet-jargon that was unclear, hence, the appropriate **plain language.**

The **user control** for the most part was not a problem. The user had to click a button labeled "continue later" to exit the page, and all the internal pages was labeled in an understandable manner. The two shortcomings were because some felt the "upload new file" to be confusing in that manner that they linked it with an execute button, when it in reality asked the user to browse and upload something from the computer. The second shortcoming is if the user accidently hits the "X" in the browser window forcing it to close, the user will not be given a warning. If the user navigated out of a CV-element, by hitting the "Back" button on the webpage, a warning message was displayed. (Figure 6.13)
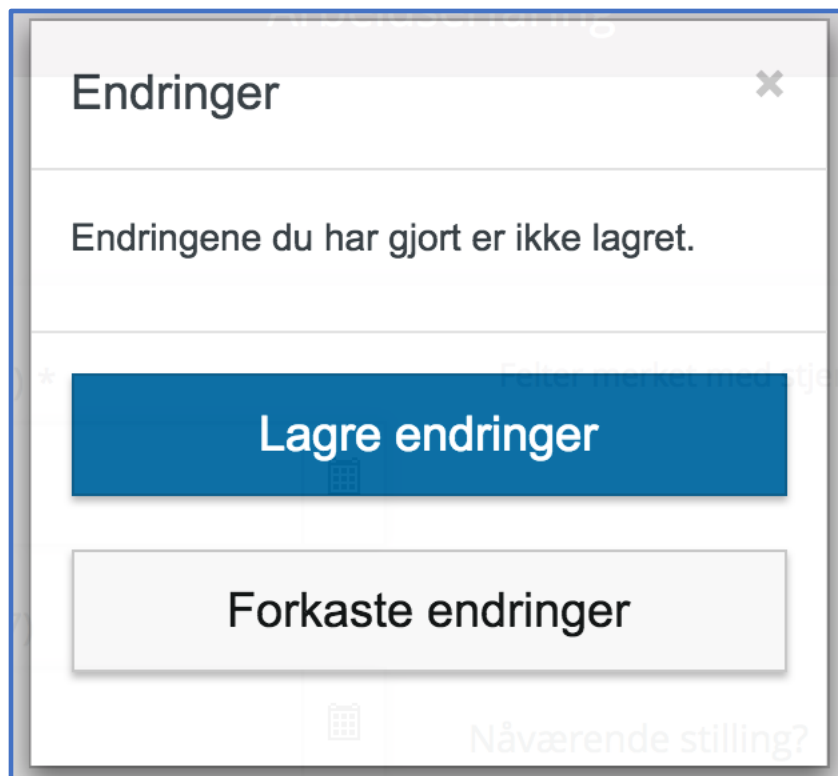
Figure 6.13 Warning message.

Every one of the users felt the pages was **consistent** in the design and user interaction.

At the point of the first observations, there was some missing **error prevention** text in the date format, failing to suggest what type of format the date should be written in, if not using the datepicker. The text fields had a descriptive label for what type of input was asked for.

Minimize recall caused some frustration for the participants. Some of the fields (like adding language) was hidden by default, and had to be found under "CV-elements".

Flexibility was found from the datepicker and using tabulator on the keyboard. However, no hot-keys was provided. Hot-keys could have been used to add work experience or education history. Admittedly, not more than a few seconds is spared by this action.

Several of the participants commented on the design being "clean and with ok colors". When asked after the observation, they felt it held up with the **minimal design**, with no unnecessary objects or text. If something it could have been some more text under some of the icons.

The webpage had error messages in a language that was understandable for the participants. The text was also helpful and on point helping with the **recover from error** step.

Lastly, the **documentation** was extensive and could have answered some of the questions the participants had, like "what a searchable CV meant" or "finding information on privacy issues". While the documentation is extensive, the "help" icon is rather small, and might be overlooked (Figure 6.14).
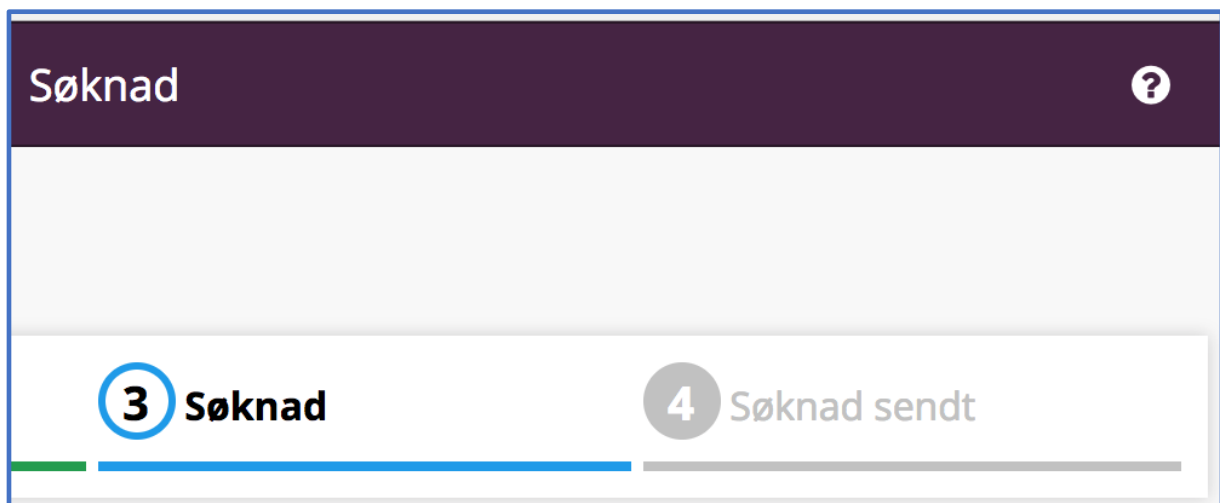
Figure 6.14 A question mark-icon is used as the "Help" button

Usability step	Appropriate	Some shortcomings
System status	X	
Plain language	X	
User control		X
Consistency	X	
Error prevention	X	
Minimize recall		X

Flexibility	**X**	
Minimal design	**X**	
Recover from errors	**X**	
Documentation	**X**	

Table 6.3 Usability results from second investigation of WebCruiter

6.3.1.1 Summing up the usability results for WebCruiter

As mentioned earlier, the second set of interviews was conducted after an update meeting with WebCruiter. It is not given that changes were made based on the feedback, but WebCruiter changed their page in alignment with some of the findings during the first set of interviews.

The updated table (Table 6.3), has changed **system status** to "appropriate" along with **error prevention**. The changes with **system status** is the supplement of the "progress bar", helping keeping track of which steps the user have finished, conducting and yet to do. The **error prevention** added more help-text as of what type of format the date should be written in, if chosen to write manually.

6.3.2 Jobbnorge compared to Nielsen's ten steps of usability

Investigating Jobbnorge, was done using a MacBook Pro (Retina, 13-inch, late 2013), with macOS Sierra 10.12.3 installed, in the Google Chrome internet browser. For the investigation three different open positions was used. They were found browsing Jobbnorge's own vacant position database. The job-applications looked into, was one for the University in Oslo, one for Ministry of Foreign Affairs, and one for Vinmonopolet. Jobbnorge requires to register and login to use their solutions.

Jobbnorge does have multiple pages when an application is written. Two of the investigated applications had six pages, and the last one had five. For the six-page application, "question", "application text", "information", "CV", "attachments" and "send application" was the different page headings (Figure 6.15). The one with five pages did not have the "question" page. This arrangement allows the webpages to have a mix of unique and standardized form controls. The first three pages had tailored question according to what the employer wanted to ask. The last three pages was alike, where the "CV" page retrieved information already stored when registered

at Jobbnorge. This means that the whole configuration of the user's CV actually only needed to be completed once. It nevertheless gives the user the option to change any information in the CV.
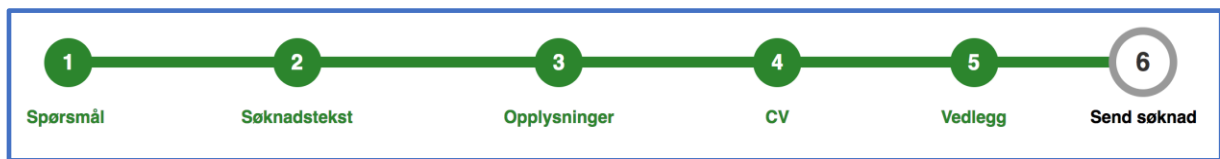
Figure 6.15 Progress bar for Jobbnorge. Each completed step is green, white and grey is yet to complete. The numbers also work as links.

For **system status** in Jobbnorge, the heading on top of the application-pages also served as breadcrumbs for the user (or the breadcrumbs served as heading). The different pages were represented by a number inside a circle, with a label placed under the circle. The page the user was filling out was highlighted as the circle became larger, and the core of the circle changed color (figure 6.15). To track progress, each completed step turned the circle and the label into the color green, along with a horizontal bar connecting the headings. Any pages unanswered was represented by a grey color. The headings also work as links, so the user can change between the application pages.

The **system status** is also appropriate as the webpages are returning feedback to the user when pages are loading, so they can understand their action is handled. The feedback is visualized by a loading ring (figure 6.16). This loading ring is used for multiple actions on the webpage (when buttons are clicked, or other actions that needs loading is performed).
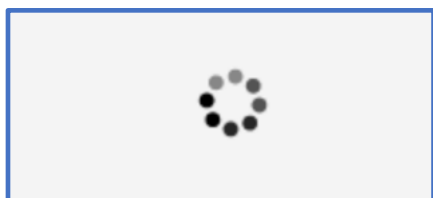
Figure 6.16 Loading symbol. Informing the user that something is happening.

For attachments, the system allows the user to rename their file, or to change what type of file it is classified as. It also offers the option to remove the attachment from the application. Both is visualized as a button, and has text and an icon (Figure 6.17).

Figure 6.17 An uploaded attachment can be edited or deleted by the user.

Jobbnorge does in the researchers view have an appropriate **plain language**. The jargon used in the form controls and the feedback is the understandable and is very similar to WebCruiters webpage. The user has the possibility to change language to English, Sami or Nynorsk. There are a few places where the translation is missing (Figure 6.18 and figure 6.19). However, if the user should fail to answer the question properly, the feedback text does inform about the mistakes and the missed translation is answered. However, the translation can make unnecessary difficulties for a user with VoiceOver. There are cases where the VoiceOver reads required information (figure 6.18), and if this information is missed (because of missing translation), the process and time-spent on filling in information might be prolonged unnecessary. Jobbnorge do have a large portion of Norwegian clients (Jobbnorge, "About us," n.d.), but nevertheless, the translation has shortcomings.

Figure 6.18 Translation is missing for the informative text about required fields.


Figure 6.19 Translation is missing on the help text.

Mentioned above, the user has good **user control**, and can in Jobbnorge's system choose to remove attachments uploaded (Figure 6.17). It is possible to edit or delete

any CV-elements already written, or started (figure 6.20). The user stands freely to start and complete any form control under the CV-heading. The one place where the user does not have full control is if they would want to jump to a different application-page via the heading. The first time the user start the application, each step must be viewed consecutively, as long as a heading is grey, it cannot be view until the ongoing step is answered. This should not be a problem for the user, and can be manipulated and bypassed by answering short, and then be revisited later on.
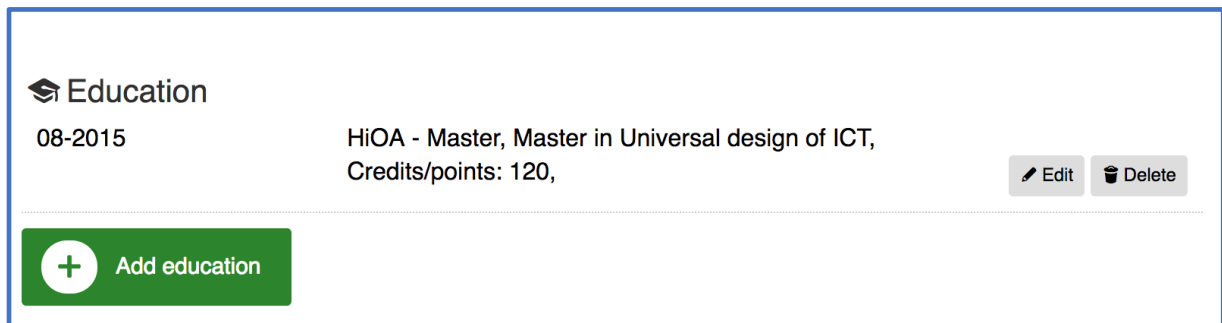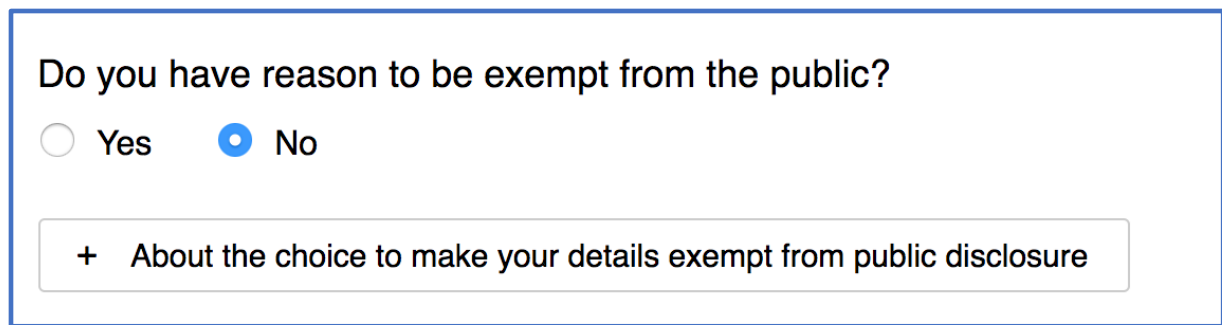

Figure 6.20 It is possible to edit or delete any CV-elements already made. As well as adding more.

For **consistency** Jobbnorge are using the same layout for all of their client's applications, the only difference being in the number of application-pages used by the employers. Throughout the pages, known symbols are used:

- "+" for adding elements
- Pencil for editing
- Trash can for deleting
- Matching symbols for different CV-elements

The only small confusion could be seen under the "information" page, where "+" is used as a symbol for showing hidden text (Figure 6.21). "A user's understanding of an icon is based on previous experience" says Aurora Harley (2014), when the "+" symbol is used for adding elements, it is a possibility that it's function can be mistaken in Figure 6.21. It can be difficult to use icons in the absent of a standardized usage. However, a text label should make up for the icon choice (Harley, 2014).
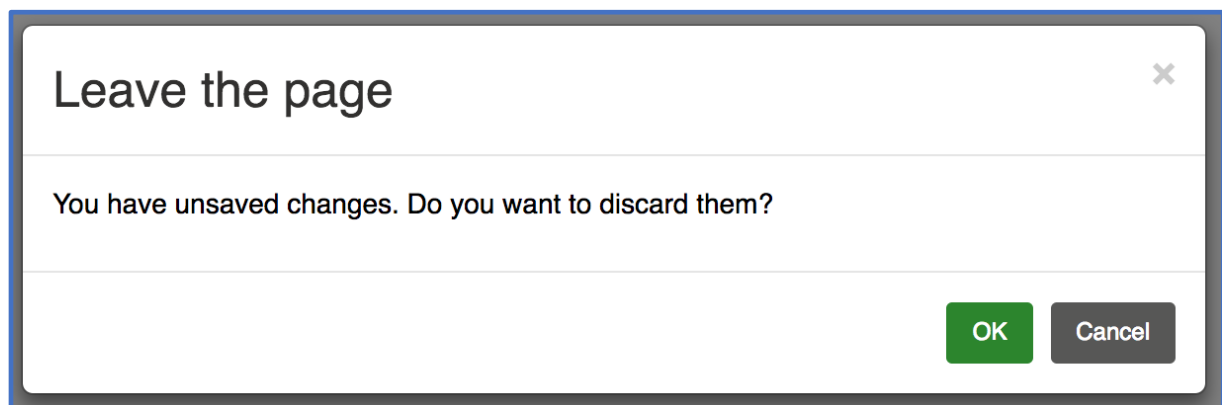
Figure 6.21 The "+" is a button for showing hidden text.

There are few errors the researcher found when investigating the three different applications. As far as **error prevention** goes, it notifies the user if they try to cancel or exit the system before new changes are saved (Figure 6.22). This only applies for the "application text" page. If the user browse between the other pages in the application, all changes are automatically saved.

Figure 6.22 Notification text pops up, and prompts the user if they want to leave.

The few hidden content is the before mentioned hidden text under "information" that needs to be clicked before it can be read. And this is not a necessary step or information for other actions, so it only applies for the "information" page. As well as the hidden text, there is text field for some questions that becomes visible if the user change their answer from "no" to "yes". The same is the case with this text field, it is only linked to the question the user is answering, and further only becomes a factor if they want to change answer. To have it default hidden therefore seems logical and a way of keeping the unnecessary information to a minimum. It is not necessary for the user to remember information from one page to another. Plus, any actions have a descriptive text that explains the actions needed.

All three of Jobbnorge applications are fully accessible by keyboard. It is possible to navigate, push buttons and write text, making it very **flexible**. There are no hot-keys here either, as with WebCruiter. When the three different applications were assessed, they all worked seamlessly. If one change was made in the "CV" or "Attachments" pages, they applied for any unfinished applications as well, updating them automatically. This can save time for the user, by building one "master CV" to use over and over. But the user needs to remember that if they want to tailor one CV for an application, any unfinished application also changes.

Jobbnorge does have a lot of content on several of their pages, so it is crucial to apply **minimal design** to prevent the user from fatigue and frustration. The fact that they utilize several pages, does help to spread the information. As previously mentioned, Jobbnorge does have some content hidden by default. This helps the content on each page to appear minimal, when it still can be expanded to answer the necessary questions or to read information regarding some of the questions.

The system offers feedback and error messages if something is wrong or missing. The error is displayed in red color over the form control that needs attention (Figure 6.23). The feedback indicates what is wrong, but does not give an example of a correct way to insert the input. This seems like a minor flaw, but could help some user to **recover from errors**.

Figure 6.23 All error messages or missing input fields are marked with red color.

For **documentation** Jobbnorge does have a frequently asked question (FAQ) page for their webpage (Figure 6.24). The system seems intuitive to operate as it is, but the FAQ can help the user with some step by step instructions on how to go through certain steps on the webpage. It also explains what happens if the user "publish your CV", or who can read a submitted application.
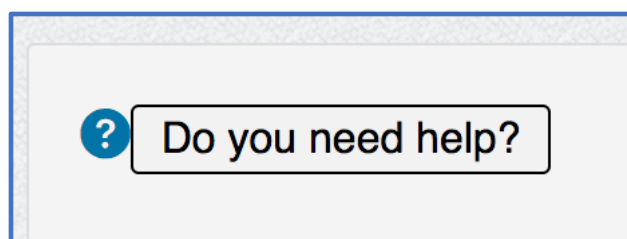

Figure 6.24 The "help" page can be accessed via the question mark or the button.

Usability step	Appropriate	Some shortcomings
System status	X	

Plain language		**X**
User control	**X**	
Consistency		**X**
Error prevention	**X**	
Minimize recall	**X**	
Flexibility	**X**	
Minimal design	**X**	
Recover from errors		**X**
Documentation	**X**	

Table 6.4 Usability results for Jobbnorge

6.3.2.1 Summing up the usability results for Jobbnorge

Being a larger and more complex webpage than ReachMee, it has a more in common with WebCruiter. The results can be viewed in Table 6.4 Jobbnorge seems straightforwardly, and the user can at all time see where they are in the application process. The use of plain language and an intuitive design seems appropriate. The only shortcomings are minor, but changing them could prevent confusion for the user, or to guide them further if errors occur. The reuse of the "master CV" is great for time saving, and Jobbnorge also offers the option to have an application template made by the user to save more time. The option to preview the application is a solution sought after in the interviews done on WebCruiter's webpage.

6.3.3 ReachMee compared to Nielsen's ten steps of usability

Investigating ReachMee was done using a MacBook Pro (Retina, 13-inch, late 2013), with macOS Sierra 10.12.3 installed, in the Google Chrome internet browser. For the investigation three different open positions using ReachMee was used. The job-applications looked into, was one of ReachMee's own open positions, one for Sweco and one for Acando.

ReachMee does benefit from being a one page application as far as **system status** goes. There is very few places loading is necessary, and in lack of more pages, progress is not tracked. When an object is uploaded (like an image), it shows up with the file name, and the possibility to remove the file (Figure 6.25).
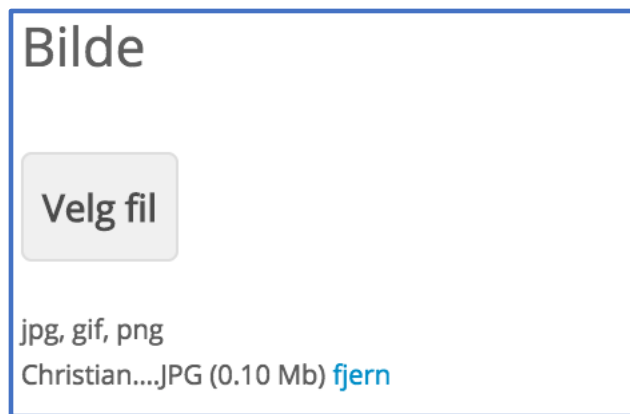
Figure 6.25 The filename of the image is too long, and only parts is viewed. It is possible to remove it by pushing the "fjern" letters.

For **plain language**, both the form controls and feedback is labeled in the same matter as WebCruiters webpage. The jargon is understandable. The one place the jargon seemed a little to technical and hard to understand was in the text-editor ReachMee offers its users to write text in. It is not given for the researcher what "div" or "pre" could mean and does in the text-editor (Figure 6.26).

Figure 6.26 "Div" and "Pre" could be confusing without any further explanation.

As far as **user control** goes, the user can choose which tasks they want to undertake, and when a file or object is uploaded, it can be removed before submitting (Figure 6.25).

ReachMee uses the same design features for their clients, where the differences are tailored into each of the clients existing design. So, each client merges ReachMee's job-application solution into their recruitment webpages, so the fonts, colors and theme is matching with their existing design. This leads to some s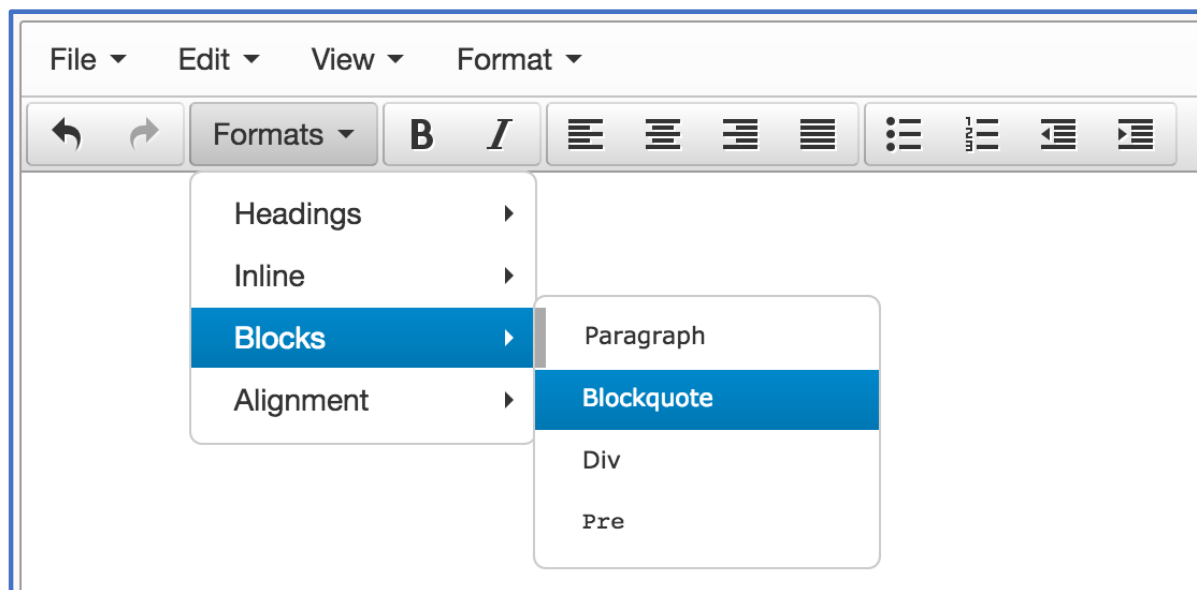mall differences in **consistency** between the webpages using ReachMee, but the core of the solution is the same, with the single page application, and the same feedback and keyboard navigation. The one shortcoming found in **consistency** is when files are uploaded. "CV" and "Søknad" has their file uploaded over the button to choose file, while "Bilde" and "Øvrige dokumenter" is presented under the buttons (Figure 6.27). Following the logic first presented to the user, it might cause confusion to where the upload was located and errors if the user is to remove files.

Figure 6.27 The uploaded files are placed both over and under the "choose file" buttons, which could create confusion when they are so close to each other.

ReachMee offers the possibility to both upload a CV document, or to write the CV-text directly into the website. When the latter option is selected, a warning message appears (Figure 6.28) to inform the user that any uploaded CV-files will be overwritten if the user chose to proceed. This is one of the few places **error prevention** is needed. The other place is if the user want to upload an application text. It has the exact same design as the CV-text function, a button and the option to write the text directly into the website. However, it does not overwrite the file the user already has uploaded. Related to this warning message, is the one shortcoming found regarding **error prevention**. Admittedly, it might be logical that only a single CV and a single application text should be uploaded, but if the user tries to upload a second, no warning is presented, and the existing file will be overwritten. Another warning message that could have been implemented is in the use of the text editor used. If a "New document" is selected, any existing work is overwritten without warning (Figure 6.29).
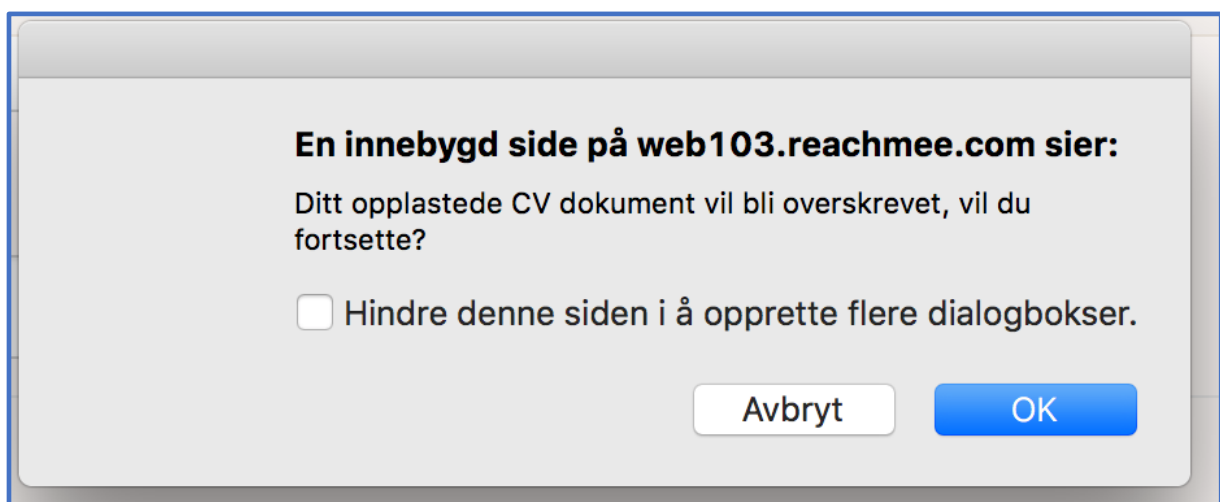
Figure 6.28 Warning message. The heading has unnecessary elements.
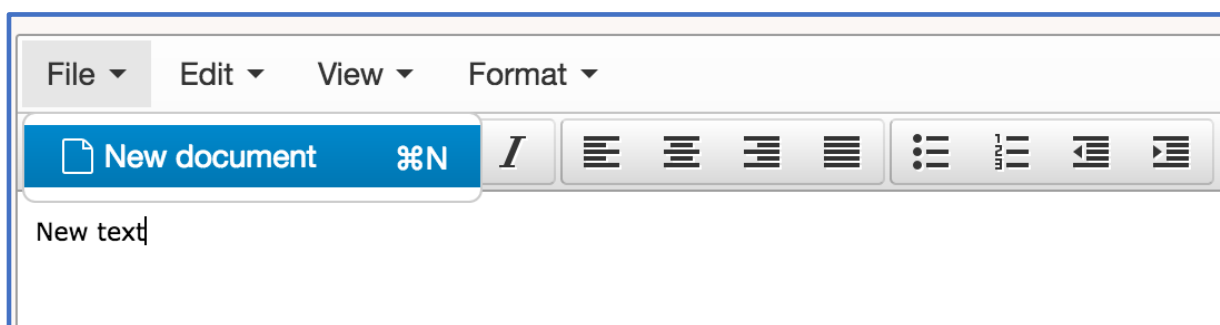
Figure 6.29 When "New document" is chosen, all content is deleted without warning message.

ReachMee has few elements that is different from most webpages using forms. It is text fields, buttons or dropdown menus. The label of each form control helps the user to **minimize recall**, and the only hidden elements is the text field used for writing the application text or CV (Figure 6.30). This text field allows the user to use a text editor very similar to existing text editors (Figure 6.31). It has few options, but in the researcher's opinion the buttons seemed intuitive, and have descriptive text on buttons and options, apart from the ones mentioned in the **plain language** part.
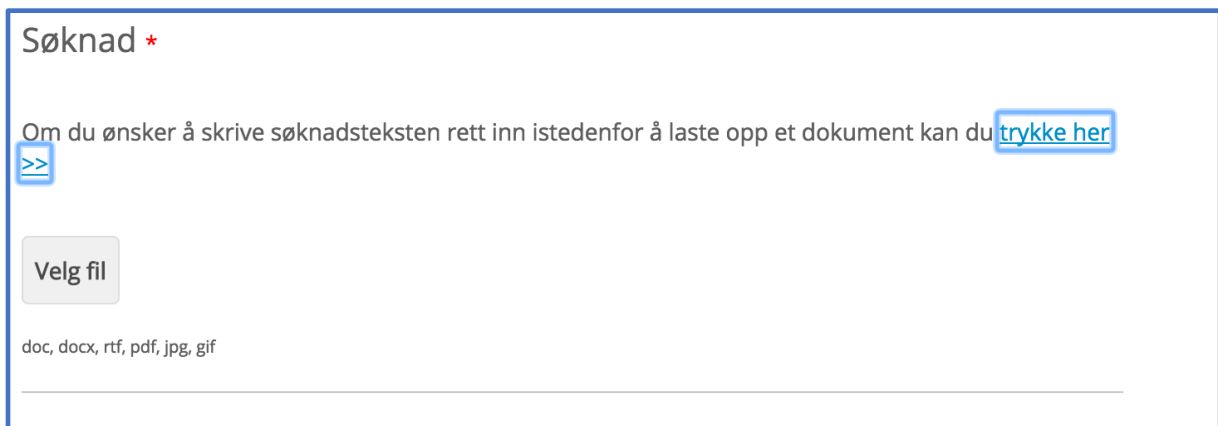
Figure 6.30 The text editor is hidden, and can be viewed by pushing the "trykke her" letters.
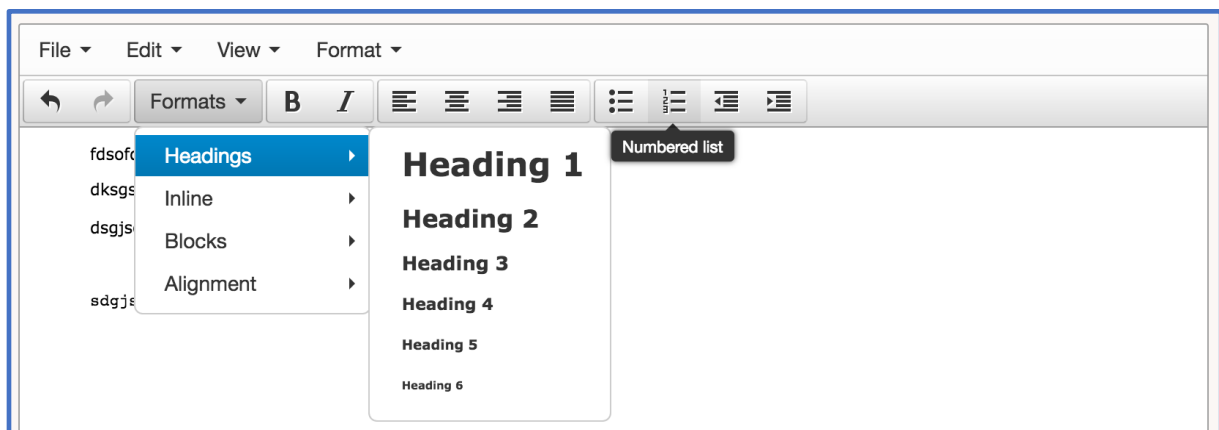
Figure 6.31 The text editor is using familiar icons and symbols for the most part.

There are some shortcomings on **flexibility**. It is possible to use keyboard and navigate the vertical webpage, and any dropdown menu's is accessible with keyboards. However, when tabbed downwards, it is not possible to access or activate all the buttons and hidden text fields. The hidden text fields are highlighted

when tabbed onto, but when hitting "space" or "enter" it is not responding, forcing the user to use a mouse or trackpad click to access it (Figure 6.31). The same was the case with the different buttons (some do respond to the "space" key). Also, the text editor does not have full keyboard accessibility.

ReachMee is utilizing **minimal design**. It is very few elements and form controls in the job-application webpage, but those that is present is minimalistic precise. The text editor does not have the overload of functions other editors might have. It actually is so stripped down, that there is no "save" button for the work in the text editor. This seems like a very minor issue as the text is saved once the user hits the "send application" button.

The ability for ReachMee to help the user **recover from error** is appropriate. If mistakes are done, the webpage returns feedback on which field is required to be changed. The feedback is marked with red text (Figure 6.32). ReachMee also returns an error message that explains specifically what needs to be addressed, if the e-mail does not exist or if it is not matching. If letters are used in the telephone number or other mistakes that needs to be corrected. ReachMee validates the information the user is writing with automatically, so feedback is received immediately for the user to correct them.

Figure 6.32 Feedback is showed in red colors directly under the form controls.

Even though most of the elements on ReachMee seemed intuitive, and there was help regarding which file type to use in the file-upload, there was no **documentation** to be found on the webpages. One area where documentation or a help-text could have been useful, was on the text editor. As mentioned earlier, the text-editor buttons seemed intuitive for the researcher, however, this might not be the case for everyone, and a helping text (or examples) would have been welcomed. Also, as previously mentioned, some of the jargon could have been explained, along with what the function does (Figure 6.26).

Usability step	Appropriate	Some shortcomings
System status	X	
Plain language		X
User control	X	
Consistency		X
Error prevention		X
Minimize recall	X	

Flexibility		**X**
Minimal design	**X**	
Recover from errors	**X**	
Documentation		**X**

Table 6.5 Usability results for ReachMee

6.3.3.1 Summing up the usability results for ReachMee

The results for ReachMee can be viewed in Table 6.5. ReachMee does benefit from being a one page application when it removes loading time and letting the users be in control which steps they want to complete. The webpage is intuitive with a plain design, and is helping the user to recover from errors in a satisfying matter.

The downside of a one-page application is that it could end up being a very long vertical page, causing the user to lose the overview (however, none of the webpages investigated was very long). Also, ReachMee does not require the user to register and login to use their website solution. This will be a time skip for the first-time users, but when the second or third time using the website comes, the user still must do all steps all over, as nothing is saved (by example the CV written in the text-editor). This challenge is however, tackled by relaying and encouraging on uploading premade files (CV, application letter, references etc.) or applying the users LinkedIn profile. This is a factor for the shortcomings, as they are minor, and most of them are linked to the text-editor. Be that as it may, the shortcomings found in **flexibility** is critical for users that relies on keyboard, or other input when navigating. This will also be a subject of exploration in the section of the assistive technology testing.

6.4 Accessibility checking

6.4.1 Tools and background for accessibility checking

To check for accessibility, the aforementioned four success criteria from WCAG 2.0 for accessible forms was used. Additionally, success criteria 2.2.1 "Timing Adjustable" under guideline 2.2 "Enough time" was selected for investigation. The intention was to use the different success criteria as a measurement for the three job-application websites, to check for any shortcomings, or if they fulfilled the conformance level.

The investigation was manually investigated by exploiting the different "how to meet…" and "understanding…" sections in WCAG 2.0. The content of these sections explains the intentions of the success criteria, specific benefits, examples of the success criteria in practice and techniques to fulfill requirements (World Wide Web Consortium, 2008). The results are displayed using a table with the Guidelines, success criteria, conformance level and the results. The results are judged based on if the webpage are fulfilling the conformance level or not (Table 6.6).

Guideline	Success criteria	Conformance level	Results
1.3 Adaptable	1.3.1 "Info and Relationships"	A	
2.2 Enough Time	2.2.1 "Timing Adjustable"	A	
2.4 Navigable	2.4.6 "Headings and Labels"	AA	
3.3 Input Assistance	3.3.2 "Labels or Instructions"	AA	
4.1 Compatible	4.1.2 "Name, Role, Value"	A	

Table 6.6 The table for posting the results is used for all three webpages.

The three job-application websites were checked using a MacBook Pro (Retina, 13-inch, late 2013), with macOS Sierra 10.12.3 installed, in the Google Chrome internet browser. The webpages were tested using both Norwegian and English as a language.

When investigating with these four success criteria, it makes for a much fuller result when assistive technology is used. The assistive technology makes full use of the ability for the user agents to adapt content to needs. In the case of a screen reader this means that information that have visual meanings for the user, can be understood or interpreted as something more than just text. For users that are

counting on braille-devices, they may have problems accessing information that is relying on color.

6.4.2 VoiceOver

Before this study started, the researcher had limited experience with screen readers as a tool for desktop computers. But to check some of the success criteria and to further understand the accessibility, it was desired to learn, and get hands-on experience on how to use a tool, and roam job-application webpages using screen reader.

For the task, Mac's VoiceOver was chosen to use. This is a built-in feature on almost every new Apple device, and was first launched in 2005 (Apple VoiceOver, 2016). Several guides and help-pages from Apple and expert users was read to understand how to use the VoiceOver tool (Apple VoiceOver, 2016; Ingber, 2013). But most of all, hours of usage were put in to learn to use the screen reader tool.

6.4.3 Notes on Time Adjustable

For the job-application webpages that requires login to submit an application, there are two types of timing. One for the session the webpage allows the user to remain on the webpage without any new actions. And there is the deadline of the application. The deadline of the application does not affect success criteria 2.2.1, as it per W3C falls under the "essential exception" (World Wide Web Consortium, 2008).

6.4.4 Accessibility checking for WebCruiter

6.4.4.1 WebCruiter 1.3.1 "Info and Relationships"

WebCruiter has, as the other two job-application webpages, their fair share of required fields. The required fields are marked with an asterisk (*) at the end of the heading. At the top of each page that have these required fields, there is a short information sentence, stating that there will be required fields in the following form, and that they are marked with a star (Figure 6.33). This is in accordance with what the success criteria is suggesting. The assistive technology, VoiceOver, does recognize the information sentence, with the asterisk as "star". The "star" is used with every form control that is required. Even though the informative text always is close

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to a new set of form controls, and is marked with an asterisk (read as "star"), it according to W3C should also include the word "required" in a parenthesis. (World Wide Web Consortium, 2008).

Figure 6.33 Date-input fields, with an instruction text about required fields close by.

The forms are both containing required and optional fields for the user to fill in. If some of the required fields are left blank, or the information is invalid, the webpage is notifying the user with a new red text box directly under the form control (Figure 6.34). If the user tries to move "back" from any unfinished content, a confirmation box appears to notify the user. This box is preserved when using VoiceOver, although, it is stacked at the end of all the other content, and needs a lot of navigation to read out.

Figure 6.34 Red notification text box is placed directly under each of the wrongfully handled form controls.

WebCruiter is using heading H1 to H4 on their application pages. The breadcrumb, or progress bar at the top of the page (Figure 6.35), seems to have little importance for users that apply VoiceOver technology. The "check" mark that indicates that a

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task is completed, is not picked up by VoiceOver, but requires an extra step to move through. Each of the headings was read out by VoiceOver, but when they miss to function as links to the related pages, plus the user does not receive any indication whether or not the task is completed, it loses its purpose. This study is suggesting that the user receives some sort of feedback that the task is completed or is pending further action. This seems better than removing it, as the progress bar, according to the observations, is a valuable asset for users that does not rely on VoiceOver.
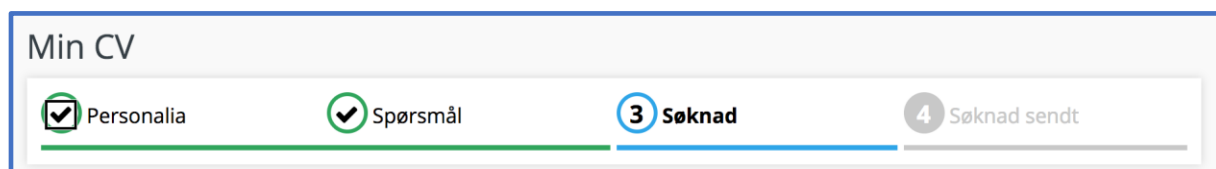
Figure 6.35 The WebCruiter progress bar can be accessed by VoiceOver, but the audio-feedback does not match the visual representation.

In relation to the findings done with success criteria 1.3.1 "Info and Relationships", WebCruiter does have some shortcomings and fail it.

6.4.4.2 WebCruiter 2.2.1 "Timing Adjustable"
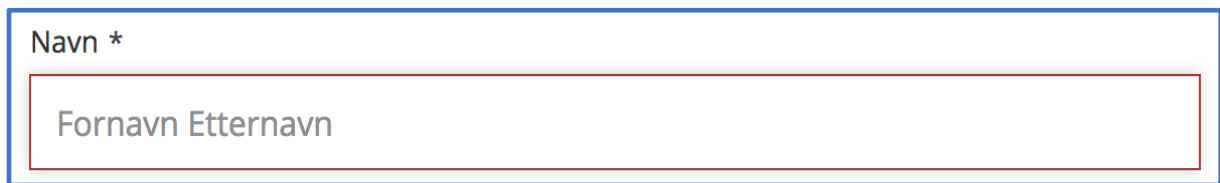
As WebCruiter is requiring login to use, it does require the user to login from time to time. But when tested, it does not force the user to be logged out in the timespan of a 20-hour period. When leaving the job-application webpage, by closing the browser, it is possible to restore to the last task undertaken, however, any unfinished content, will not be restored. WebCruiter does log the user out after an unknown number of hours, or with the absent of internet connection. This does however, not influence the "passing" of this success criteria. W3C mentions that this success criteria only applies if it does not affect any security concerns (World Wide Web Consortium, 2008). With no time limitations on any of the CV-element tasks, and 20 hour of response time before the user is timed out, this study suggests it to be passable.

This was tested by having several of the job-applications via WebCruiter open for over 20 hours, as well as opening the same pages the following day. This was to pass the 20-hour exception criteria from WCAG 2.0 (World Wide Web Consortium, 2008). The test was done in Google Chrome.

6.4.4.3 WebCruiter 2.4.6 "Headings and Labels"

WebCruiter have meaningful and informative headings for the different form controls. In addition, they use placeholder text in some of the text fields to further clarify the heading. This can be seen as an example in Figure 6.36. The heading is "Name", but to further specify that they are asking for the full name, they have placeholder text that says first name and last name.

Figure 6.36 The initial text indicates that both first name and last name is asked for.

As mentioned in success criteria 1.3.1, there are symbols and icons that VoiceOver does not recognize, and simply does not give any feedback to the user (Figure 6.37). Even if this is a VoiceOver only problem, or if it is something that many assistive technologies pick up on, it is something that should be addressed, as a lot of information simply can be overlooked for several users.
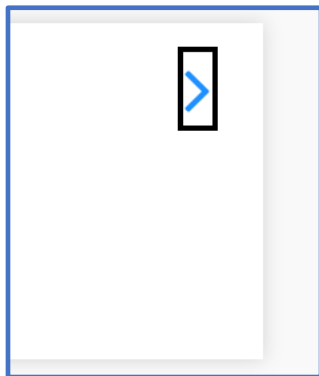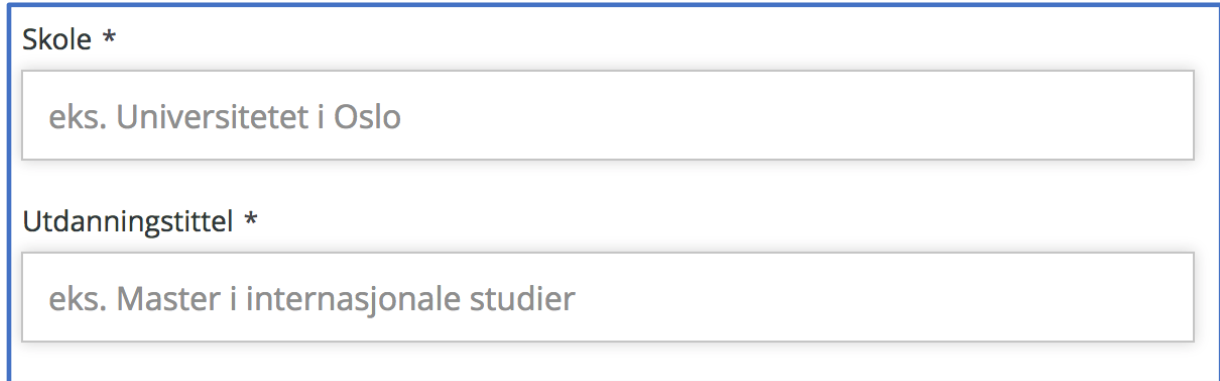
Figure 6.37 Icon represented for the user to navigate for further information.

Unfortunately, the links that are missing name when using VoiceOver does fail success criteria 2.4.6 "Headings and Labels". It does not have to have any other visual explanation, but a hidden name should have been exposed when using assistive technology on the link (World Wide Web Consortium, 2008).

6.4.4.4 WebCruiter 3.3.2 "Labels or Instructions"

WebCruiter does use the option to include initial text in several of their text fields (Figure 6.36 and Figure 6.38). In Figure 6.38, it can be seen as way of further clarify and instruct which varieties of school, or title they are typically asking for.
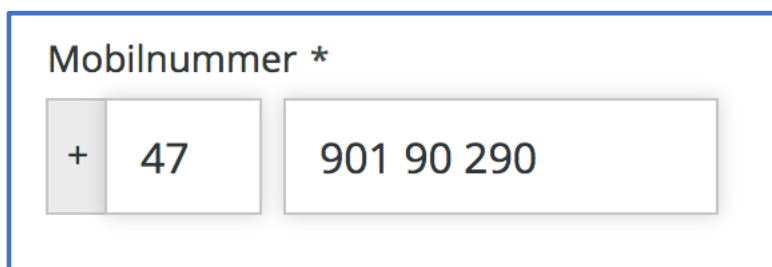
Figure 6.38 Initial text is used as placeholder for the input fields.

One place where the placeholder is not used, is with the fields for entering date. This is recommended from W3C (World Wide Web Consortium, 2008). However, WebCruiter are using instructions for correct forma in their heading, and thus it should be sufficient.

Another place where the instructions are clear and according to the success criteria, is for the input fields of cellphone number (Figure 6.39). The heading is explaining that they are asking or the cellphone number of the user, and the input is split into two boxes, one for "area code" and one for "number".
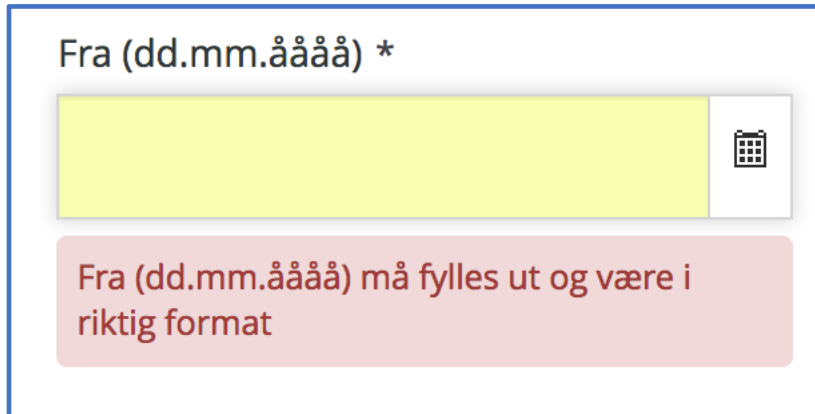
Figure 6.39 The input fields for cellphone number is divided into area code and number.

WebCruiter are using larger clickable fields to help out with navigation, as the labels are associated with the input elements, meaning both the heading and the form control will activate the control.

As previously mentioned in success criteria 1.3.1, WebCruiter is alerting the user when wrongfully or missing information is entered into the form. The red text field is saying what needs to be addressed in the form control in order to complete the input, and also comes up with an example (Figure 6.34). If there are specific data formats, the instruction text is the same as the rules for correct input of the data (Figure 6.40). The red text field does however, only repeat what the heading already are displaying.

Figure 6.40 The notification text for wrong/missing input, is the same as the instructions above the date-input.

All in all, WebCruiter does fulfill success criteria 3.3.2 in a passable matter.

6.4.4.5 WebCruiter 4.1.2 "Name, Role, Value"

WebCruiter is fulfilling every need for users when it comes to the slider-bar where the user can answer between "Yes" and "No" (Figure 6.41). The VoiceOver is reading out what the current state of the slider is, if it changes it says what it changes to, and if the user want to navigate back to the slider it once again reads out what the current state is.
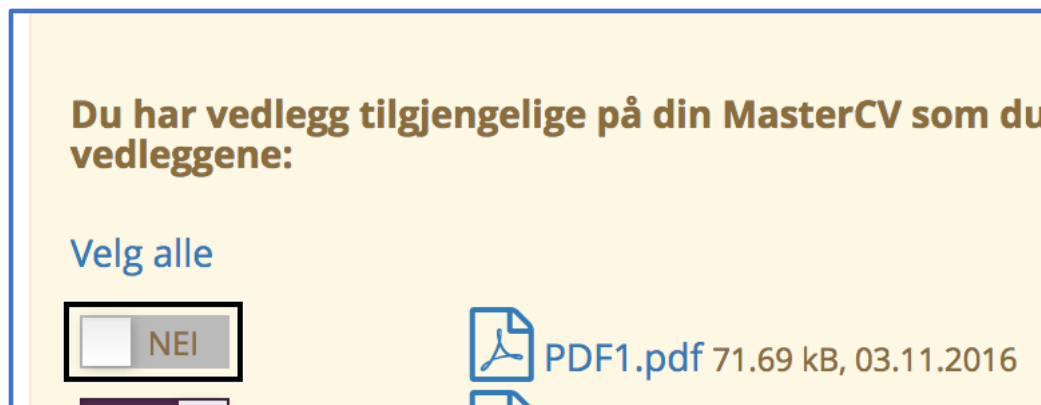
Figure 6.41 The slide-bar in WebCruiter is highlighted by VoiceOver, and can be ticked between "Yes" and "No" with the keyboard.

Unfortunately, the major drawback with WebCruiter, is the inability for users to use keyboard navigation to fulfill the applications.

It is continually updating, but at the moment the keyboard navigation is flawed. It is a violation of the Level A success criteria 2.1.1 "Keyboard", as it is not possible to use any of the standard keys to move around the page (tab, arrows, space, enter etc.). It is suggested, based on these findings, that changes are made so that users that rely on keyboard access can maneuver the WebCruiter job-application webpage as well.

This is further reflected with the use of VoiceOver, as the same buttons and form controls that should have been accessed using keyboard, also is impossible to reach using VoiceOver. All of the main headings, are accessible, but the headings themselves only offers to open or close a hidden menu (Figure 6.42 and Figure 6.43).

Figure 6.42 The light blue header indicates that it is active from the keyboard.

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Figure 6.43 When enter or space is entered, it open/close the elements for viewing.

The navigational elements seen in Figure 6.42, is not possible to access from keyboard or VoiceOver. This is the only way the user can add CV-elements by custom.

Although it is impossible to move to add any new CV-elements with VoiceOver, the CV-elements pages are tested with VoiceOver. The layout of each of the CV-element pages are the same, with the only differences being in the form controls. The "Education" page was looked into for layout. The first finding here, is that VoiceOver does navigate through all of the content and the different form controls in the page. This is not the case with keyboard navigation, as the "back" button (among other) is skipped when using the keyboard (Figure 6.44).
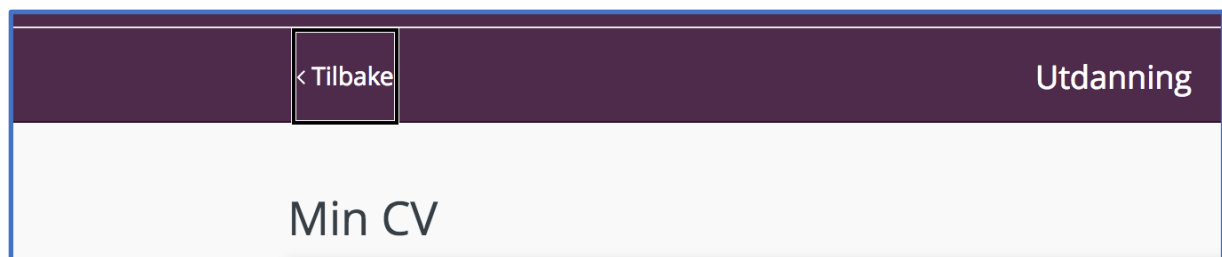
Figure 6.44 The button for taking the user back to the previous page is highlighted with VoiceOver and can be executed.

Other than the "back" button, the slide-bar (figure 6.45) and the "Save", "Delete" and "Abort" buttons and links cannot be reached via keyboard.
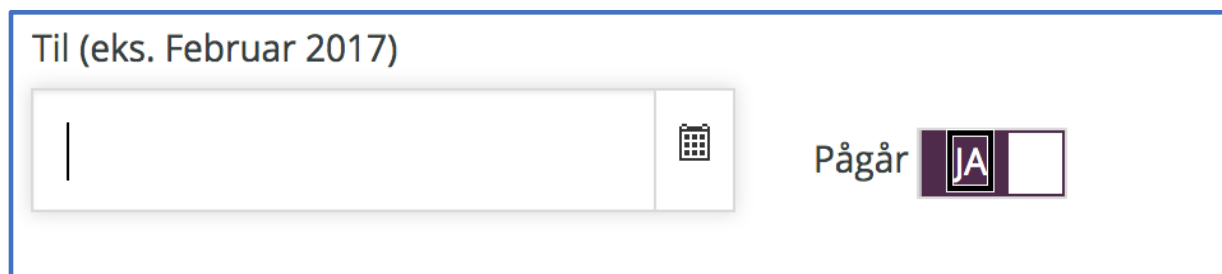
Figure 6.45 The slide-bar in education can be accessed with VoiceOver

WebCruiter does meet the requirements of a closely connected information text on how a required field look like. When VoiceOver is active on an input field it also reads out a placeholder text that has examples on how an appropriate input can be.

As mentioned in the findings, when using VoiceOver, WebCruiter show that they have both satisfying content and shortcomings for success criteria 4.1.2 "Name, Role and Value". The buttons that are accessible have descriptive titles or descriptions. There are labels for the different form controls, which are grouped together where it is possible. A minor shortcoming in this success criteria, is that there are missing descriptions in some of the icons, and links, which can cause confusion for the user. The glaring fault however, is the absent of role and value for all of the intended user interface components. This is causing a large portion of the application to be impossible to navigate and fulfill without the support of a pointing device. WebCruiter does fail success criteria 4.1.2 "Name, Role and Value".

The results therefore are as viewed in Table 6.7.

Guideline	Success criteria	Conformance level	Results
1.3 Adaptable	1.3.1 "Info and Relationships"	A	Failed
2.2 Enough Time	2.2.1 "Timing Adjustable"	A	Passed
2.4 Navigable	2.4.6 "Headings and Labels"	AA	Failed
3.3 Input Assistance	3.3.2 "Labels or Instructions"	AA	Passed
4.1 Compatible	4.1.2 "Name, Role, Value"	A	Failed
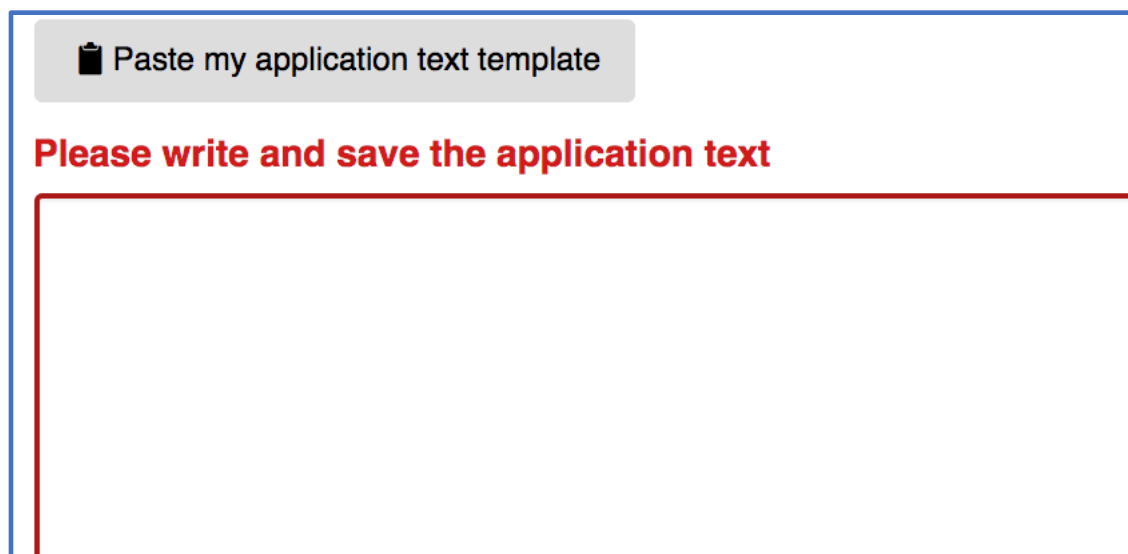
Table 6.7 The Accessibility table for WebCruiter

6.4.5 Accessibility checking Jobbnorge

6.4.5.1 Jobbnorge 1.3.1 "Info and Relationships"

Jobbnorge have proper use of headings (H1-H6) in their pages. The content is aligned and arranged as it should, without using any white space characters to arrange the content. It will therefore be read in correct order with assistive technology as a VoiceOver. All of the links and buttons investigated, can be reached by keyboard, while tabbing and using arrows, and an action happens when "enter" or "space" is used on the keyboard. Or the it can be reached by using VoiceOver own commands, to navigate between groups in the webpage.

When using VoiceOver in the required fields, the VoiceOver is reading the text that appears if the user input has shortcomings. This new text appears in red color (from black color) if the user tries to move on when some of the requirements for the field is not met (Figure 6.46). The color in itself has no use of being read out by the VoiceOver, it is the message that it is a required field that is important, and the user has to become aware of. Jobbnorge are succeeding in conveying this to the user.

Figure 6.46 If something is wrong/missing with the user input, there is a new red notification-text displayed.

When the VoiceOver tool is used on the "CV" page, there are some findings that can suggest improvements. When one of the options under "CV" is activated for input, in this case the "Reference", the VoiceOver starts by reading the first heading of the form controls (Figure 6.47). In this case that is "Navn". What this means is that it is

missing the text over the first header, which is stating that all required fields are marked with a star (VoiceOver and text use star instead of asterisk).

Note: It is possible to read all written content on the webpage with VoiceOver. But, as explained, if the VoiceOver is used, "Navn" is the first content read, and the user has to navigate backwards to read the previous content.

Figure 6.47 The initial heading in each of the CV-categories is missed by VoiceOver.

When the first heading, "Navn" is read, it is marked with an asterisk for visual users (Figure 6.47). When read in context with the first sentence under "Referanser", the user can understand this is a required field, that need input for the form to be complete, and the action of the user to succeed. With VoiceOver, however, it reads "Navn stjerne" (translated to "Name star"), which in this case might not make much sense, as no background information necessarily is read regarding what the star means. The VoiceOver follow up with "Required Invalid Data" without any comma or breaks, which are suggesting something contradictory, and could possibly be misinterpreted by the user.

If the user insert wrong or incomplete data, the heading changes color and text (Figure 6.48). Unless the user backtracks in the form, this information can only first be heard after the user try to save their content. However, if it is the case that the first text field needs attention ("Navn må fylles ut" in Figure 6.48), then the webpage automatically send the VoiceOver to the first text field without reading the heading. In this case, the user does not receive any information automatically what needs to be addressed. For all the other required fields, if there are any wrong or missing input,

the VoiceOver reads out the new heading that fits the text field. In other words, only the first text field in each of the form groups have this shortcoming.

Figure 6.48 Both input field and notification text is changed to red if something is missing/wrong. However, VoiceOver is not immediately notified.

When investigated, it was found out that there are no validation (RegEx) checking for wrong input information in the "Phone" bracket. This is a required field, but if mistakes are made, like letters in the text field or to many/few numbers, no error message is returned to the user.

If we look at the actual code for this form, it is a paragraph item, and not something assigned to be read if not going through the whole page manually (Code 2).

```
<p class="cv-section-help-text" data-jn-localize="Obligatoriske felt er merket med stjerne *">obligatoriske felt er merket med stjerne *
</p>
```

Code 2. The text containing information about the required text is paragraph item.

To sum up, Jobbnorge has a couple of minor shortcomings that prevent them from pass this success criteria. There are fields that are not preserved when using VoiceOver (the information text about required fields and placement of feedback sentance). Also, the "Required Invalid Data" can possibly be confusing for a user. To

use the word "required" is encouraged by W3C (World Wide Web Consortium, 2008), and is good practice by Jobbnorge, but the combination of "invalid data" is excessive. All in all, Jobbnorge does fail 1.3.1 "Info and Relationships".

6.4.5.2 Jobbnorge 2.2.1 "Timing Adjustable"

As Jobbnorge is requiring login to use, it does require the user to login from time to time. But when tested, it does not force the user to be logged out in the timespan of a 20-hour period. When leaving the job-application webpage, by closing the browser, it is possible to restore to the last task undertaken, however, any unfinished content, will not be restored. Jobbnorge does log the user out after an unknown number of hours, or with the absent of internet connection. This does however, not influence the "passing" of this success criteria. W3C mentions that this success criteria only applies if it does not affect any security concerns (World Wide Web Consortium, 2008). With no time limitations on any of the CV-element tasks, and over 8 hour of response time before the user is timed out, this study suggests it to be passable.

This was tested by having several of the job-applications via Jobbnorge open for over 20 hours, as well as opening the same pages the following day. This was to pass the 20-hour exception criteria from WCAG 2.0 (World Wide Web Consortium, 2008). The test was done in Google Chrome.

6.4.5.3 Jobbnorge 2.4.6 "Headings and Labels"

According to the WCAG 2.0, if a form has required fields, it is sufficient that an information text regarding how the required fields stands out (in this case in the form of an asterisk (*)) is near the information it is describing (World Wide Web Consortium, 2008). With this in mind, the headings that are marked with an asterisk in Jobbnorge do meet the 2.4.6 "Headings and Labels" success criteria, as it is stated in each of the different form groups what the asterisk mean (Figure 6.47). Elsewhere in the job-application webpage, the headings and labels are descriptive and meaningful.

This success criteria are closely related to 1.3.1 "Info and Relationships", and where the latter one fail, 2.4.6 actually has descriptive labels in the code for all of its

headings (Code 3). It is something else that causes the VoiceOver to miss the information text about required fields (see discussion in Section 7.2 for more). Therefore, along with descriptive headings Jobbnorge passes success criteria 2.4.6.

```
<label for="cv-property-name" …

 </label>
```
Code 3. The form control "Name" has an appropriate label.

6.4.5.4 Jobbnorge 3.3.2 "Labels or Instructions"

At several of the "CV" form controls, there are from/to dates to interact with. The intended interaction method is to use a dropdown menu for months, and a stepper for the years (Figure 6.49). It is possible to manually write in the month and year as well. For the latter, it has an initial text asking the user to "choose a year".
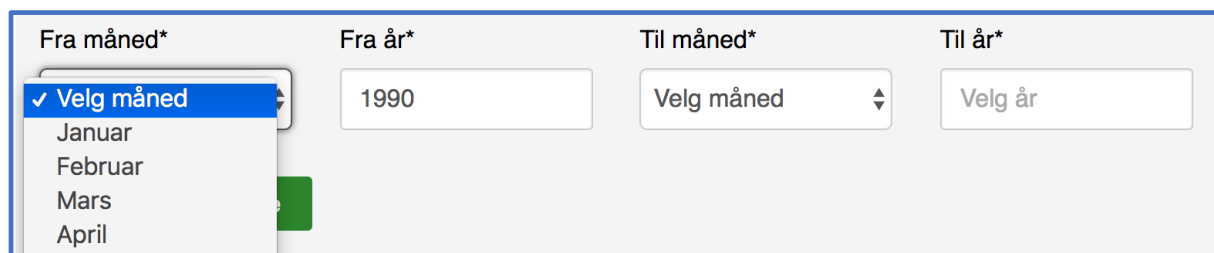
Figure 6.49 From/to months are chosen with a stepper and input fields for years.

Clicking on the form controls or close to the heading, activates the form control. This can help users with motor control impairment, with a larger clickable field.

The form fields are located close to each other, which is helpful for users that use screen magnifiers or enlarge the browser window.

If an error is made or the data is invalid, the layout of the form changes immediately, and guides the user to find the error with a change of color to red, and help them out with an updated text in the heading, suggesting what needs attention (Figure 6.46 and Figure 6.48).

Again, these success criteria are closely related to each other, as are they to forms. Therefor success criteria 3.3.2 "Labels or Instructions" can take previous findings in the other success criteria into account when validating. The results are passable for this success criteria, but it is suggested that a placeholder/initial text is placed on the text forms, to further enhance input assistance.

6.4.5.5 Jobbnorge 4.1.2 "Name, Role, Value"

For images and links, it is appropriate alternative text provided for the user when using VoiceOver. The buttons have meaningful on-the-point descriptions. Jobbnorge does have labels in place for their form controls. So, when roaming one of Jobbnorge's job-application webpages with VoiceOver, every action was understandable, and as a consequence, executable. Extensively discussed in 1.3.1 "Info and Relationships", the only cause for minor confusion was for the form controls that were required. It may cause the user to go over the form control once more, but for success criteria 4.1.2 the names, values and roles are present and passable.

Results for the manual investigation for Jobbnorge located in Table 6.8.

Guideline	Success criteria	Conformance level	Results
1.3 Adaptable	1.3.1 "Info and Relationships"	A	Failed
2.2 Enough Time	2.2.1 "Timing Adjustable"	A	Passed
2.4 Navigable	2.4.6 "Headings and Labels"	AA	Passed
3.3 Input Assistance	3.3.2 "Labels or Instructions"	AA	Passed
4.1 Compatible	4.1.2 "Name, Role, Value"	A	Passed

Table 6.8 Manual accessibility results for Jobbnorge.

6.4.6 Accessibility checking ReachMee

RechMee was investigated using an actual job-application (Acando and Sweco). This is different from the other two as they have login possibility to investigate the webpages. The screenshots are taken from one of the webpages investigated, but the findings are the same for everyone.

6.4.6.1 ReachMee 1.3.1 "Info and Relationships"

ReacMee has several required fields, which are marked with an asterisk (*) at the end of the heading. The asterisk stands out with its red color (Figure 6.50). ReachMee does apply different headings. Primarily from the testing with assistive technology H1 and H3 are used.

The required fields are read by the VoiceOver as "star". With no previous text explaining that there are required fields, the webpage does not inform anything for the user that use VoiceOver. Therefore, the reading of "star" could be to short and uninformative for the VoiceOver users. A short pre-text explaining and exemplifying what a required field looks like, could prevent any confusion.

Based on the absent of information of what a required field is, ReachMee **Fail** 1.3.1 "Info and Relationships". W3C suggest that a form, in addition to being identified, all the required fields should include the word "required" in a parenthesis (World Wide Web Consortium, 2008).

6.4.6.2 ReachMee 2.2.1 "Timing Adjustable"

As there is no login needed to apply with ReachMee, it is up to the different clients ReachMee has, or the user. It is possible to leave the job-application webpages open for a day, close the machine and open it up again without losing content. Even if the browser is closed during input, and opened again it is possible to continue the application with the unfinished content restored. In contrast to WebCruiter and Jobbnorge there are no server that forces the user to "logout", but after a while the content is not possible to be restored from a reboot. It does however, seem sensible to ReachMee to pass on "Timing Adjustable".

This was tested by having several of the job-applications via ReachMee open for over 20 hours, as well as opening the same pages the following day. This was to pass the 20-hour exception criteria from WCAG 2.0 (World Wide Web Consortium, 2008). The test was done in Google Chrome.
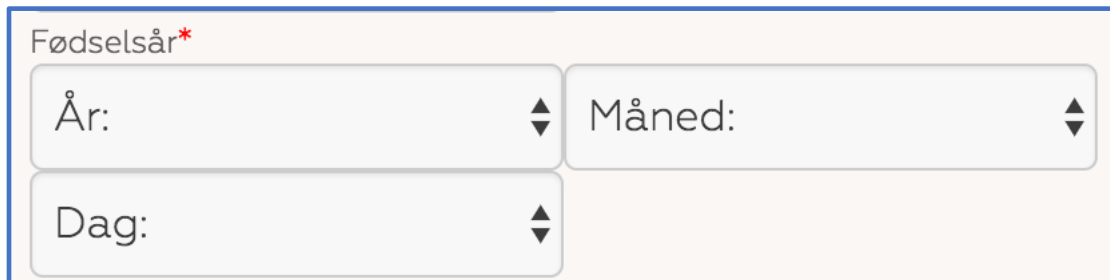
6.4.6.3 ReachMee 2.4.6 "Headings and Labels"
The headings in the form are informative, and are put into groups. For instance, there is a main category labeled "personal information", with sub-form fields and their own headings, for instance "E-mail". Also, when the forms are asking for name, they have to separate text-fields, one for "first name" and one for "last name".

When the pages were combined with VoiceOver, they still communicated meaningful and informative headings, however, as ReachMee already has failed on notifying the user on what a required field is, they also **Fail** 2.4.6 "Headings and Labels".

6.4.6.4 ReachMee 3.3.2 "Labels or Instructions"
One of the webpages investigated that used ReachMee, had dropdown menus as the only option to insert date format (Figure 6.50). This prevented the need of any instructions on how the format needed to be inserted.

Figure 6.50 Form controls, year, month and days provided through a dropdown menu.

When previously mentioned that ReachMee had required fields marked with an asterisk, there was however no example or instructions for what the asterisk mean, or if there are required fields in the form. But, when the user has missing or incomplete fields that are marked with the asterisk, the webpage does return feedback that something required is missing, or that the information is wrongfully inputted (Figure 6.51).

Figure 6.51 An alert sentence at the bottom of the page.

There is no initial text, or immediate instructions on how to complete the actions, but if the actions are wrongfully inserted the feedback is either a standard message stating that the "task is required" (Figure 6.51), or it has instructions for how to complete the unfinished tasks (Figure 6.52). This is good practice according to the WCAG 2.0 (World Wide Web Consortium, 2008). There is not too much information, or instructions that might be given for certain users, while if some information is missing or wrongfully inserted helping information is provided.

Figure 6.52 Specific feedback, that some of the input is wrong or needs to be changed to match requirement.

For users that could benefit from larger clickable fields, ReachMee do have the extra clickable area in the headings for each text field and drop down menu. However, for buttons, the user has to hit inside it, as the clicking the heading or around the button does nothing.

Most of the intentions with success criteria 3.2.2 is met and followed by ReachMee. But, because there is no indication on what are required fields (no explanations on what the asterisk is marking), ReachMee **Fails** success criteria 3.2.2. W3C is writing that it is important to explain that there are required fields and how they look like, so

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that users that use keyboard only, don't have to navigate the redisplayed form (World Wide Web Consortium, 2008). Implying that all users know what a red asterisk mean, might not be enough.

6.4.6.5 ReachMee 4.1.2 "Name, Role, Value"

For the first option, it is possible to connect the users LinkedIn-profile to the CV. This can be done by hitting a button with the labeling "Get profile" (Figure 6.53). The button has a small icon before the label, which the VoiceOver reads as "LinkedIn_16". The number is unnecessary for the user to hear, but apart from that, it is good that LinkedIn is mentioned again to remind the user what they can expect from clicking the button.
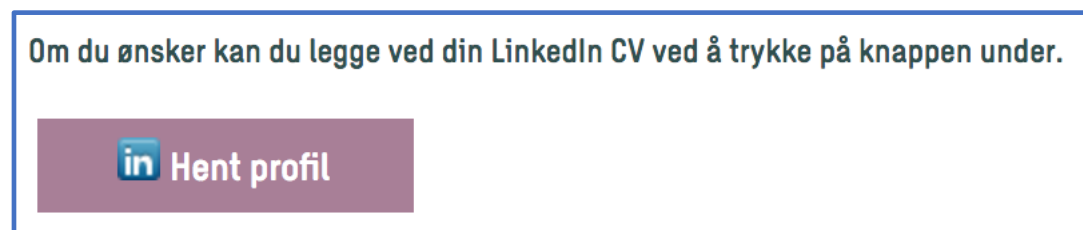
Figure 6.53 A button with a LinkedIn icon

In the primary part of the application, where the different form-controls are located, there are more buttons. Under the "CV" heading, there is a short text, informing about the possibility to write a CV directly into a text-editor, followed up by a link to the editor (Figure 6.54). The screen reader reads out the text, then stops, and the user has to navigate to the next readable object to get to the link. This is a minor complaint that is a drawback when using VoiceOver, but it can disrupt the flow of reading the document, or confusion if the user is navigating upwards. To prevent any confusion, the link could have been labeled more than just "Click here".
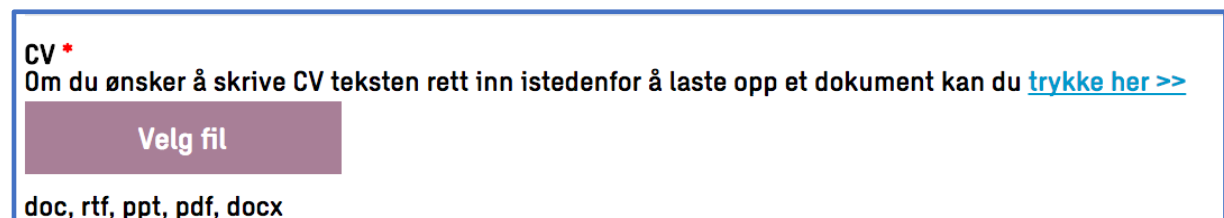
Figure 6.54 CV-upload button and link for hidden text-editor.

Navigating to the following button under "CV", it was simply a button labeled "Choose file". This might be intuitive for the average user, but without over complicating to much, the button could have been labeled differently. For example, with "Choose CV-file", following with some alternative text explaining short what type of files they could accept (instead of having it named separately on a new line).

ReachMee have shortcomings on 4.1.2 because when tested with VoiceOver, the assistive technology does not acknowledge a required field, and the buttons and links have shortcomings in their labeling, as it fails to explain what the form controls are doing, and because ReachMee are duplicating ID's on several of the form controls.

The hidden text-editor, that allows the user to compose a CV freely, unfortunately, is missing labels on its buttons (Figure 6.55). All of the menus are labeled, and the VoiceOver reads out the name given to each. However, none of the buttons does have any alternate names to their symbols, and the VoiceOver reads out "button" on each of them. This suggest that ReacMee **Fails** on 4.1.2 "Name, Role, Value"
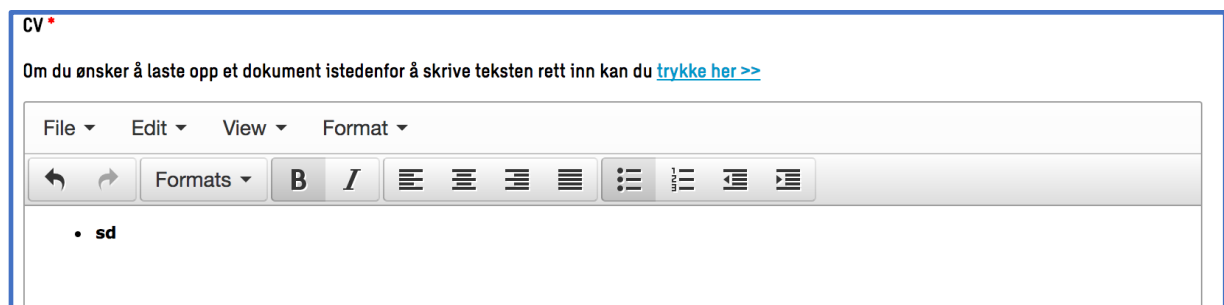
Figure 6.55 The text-editor that ReachMee provides for freewriting a CV.

The results from the accessibility caching can be viewed in Table 6.9. To sum up the investigation on ReachMee based on the selected success criteria, the same shortcoming of missing instructions and labelling of required fields, fails ReachMee on several of the chosen success criteria. Apart from that there are some general improvements to find on labelling of buttons and links.

ReachMee is a smaller job-application webpage than the two other investigated, seemingly intended to rely on premade documents or the connection to a LinkedIn account. With some shortcomings on instructions and labels, the findings suggest

that there could be difficulties in using ReachMee to apply for a job, especially if using assistive technology, screen reader, as a tested.

Guideline	Success criteria	Conformance level	Results
1.3 Adaptable	1.3.1 "Info and Relationships"	A	Failed
2.2 Enough Time	2.2.1 "Timing Adjustable"	A	Passed
2.4 Navigable	2.4.6 "Headings and Labels"	AA	Failed
3.3 Input Assistance	3.3.2 "Labels or Instructions"	AA	Failed
4.1 Compatible	4.1.2 "Name, Role, Value"	A	Failed

Table 6.9 The Accessibility table for ReachMee

6.5 Summarizing the results

6.5.1 Usability summary

Usability step	WebCruiter	Jobbnorge	ReachMee
System status			
Plain language		X	X
User control	X		
Consistency		X	X
Error prevention			X
Minimize recall	X		
Flexibility			X
Minimal design			
Recover from errors		X	
Documentation			

*Table 6.10 Comparison table for usability. **X** = Some shortcomings*

Comparing the shortcomings from the usability checking of the webpages, there are two shortcomings that occur for more than one (Table 6.10).

Jobbnorge and ReachMee does have shortcomings on Plain language. Jobbnorge have some small translation errors from Norwegian to English, and ReachMee could have elaborated some more of some features in the Text-editor that might be not be understandable.

Jobbnorge did have double usage of icons, with different meanings that could lead to inconsistency. ReachMee changed the place of where uploaded content appeared, which could be confusing.

The findings could all be viewed as small, but nevertheless indicates some shortcomings.

6.5.2 Accessibility summary

Job-application webpage	1.3.1 "Info and Relationships"	2.2.1 "Timing Adjustable"	2.4.6 "Headings and Labels"	3.3.2 "Labels or Instructions"	4.1.2 "Name, Role, Value"
WebCruiter	Failed	Passed	Failed	Passed	Failed
Jobbnorge	Failed	Passed	Passed	Passed	Passed
ReachMee	Failed	Passed	Failed	Failed	Failed

Table 6.11 Comparison table for accessibility

If the three job-application webpages are stacked up against each other (Table 6.11), the results show that success criteria 1.3.1 "Info and Relationships" is the only one where all three fail.

WebCruiter is failing to transform information that is visual to be presented when using VoiceOver (completed tasks in the progress bar), and should per success criteria 1.3.1 use the word "Required". Jobbnorge does miss out on information about required fields when using VoiceOver. ReachMee does not have any information text stating what required fields look like.

Success criteria 2.2.1 "Timing Adjustable" is ok for all the webpages.

The reasons for failure in success criteria 2.4.6 "Headings and Labels" are closely related to 1.3.1. If the heading or labels have failure in success criteria 1.3.1 they also fail in 2.4.6. ReachMee does this. WebCruiter have links and headings that the VoiceOver technology miss out on.

RechMee is the only one that fails success criteria 3.3.2 "Labels or Instructions", because of the missing information text about required fields.

Success criteria 4.1.2 "Name, Role, Value" causes WebCruiter and ReachMee to fail on the base that both VoiceOver and keyboard navigation would make it impossible

to complete an application when notifications about change of focus is failed to be sent.

The common denominator when it comes to shortcomings, seems to be preserving information from visual content to the use of assistive technology. As well as informing and conveying the present of required fields.

7 Discussion and recommendations

The discussion will revisit the results, and considering what is discovered, solutions will be proposed and discussed for each job-application webpage (Section 7.1-7.3). The end of this chapter will cover contributions, limitations and further work based on this research.

7.1 Discussing the findings and suggesting alternatives for WebCruiter

Webcruiter has received the most attention in this study, as it was the one used during the interviews and observations, plus there was a few meetings with WebCruiter for talk about their webpage and thoughts about universal design. Based on the results from the findings in this research, there are some key-points that is suggested to be addressed:

- Consider the accessibility for assistive technology
- Consider some usability steps and user involvement

The glaring shortcoming with WebCruiter found in this study, is the inability to navigate the page consistently with keyboard only, as well as access all features with the assistive technology VoiceOver. The Nielsen Norman Group is talking about the importance of allowing the users to "navigate through all interactive elements", while the user should follow where the keyboard focus is (Nielsen Norman Group, 2014). What they mean, is that the user should be able to tab through all of the form controls that WebCruiter has to offer, as well as buttons and icons that are interactive. On top of this, whenever the tab-button is used, the new element should be highlighted both by something to indicate what element is active, as well as changing the screen view to the active element. Findings in this study unveils that WebCruiter are consistent when they are highlighting fields of interactions (Figure 7.1), as well as changing the focus of the browser window to the new element. The inconsistent part is if/when the user wants to add any new "CV-elements" to their application (Figure 7.2).

Kommentar
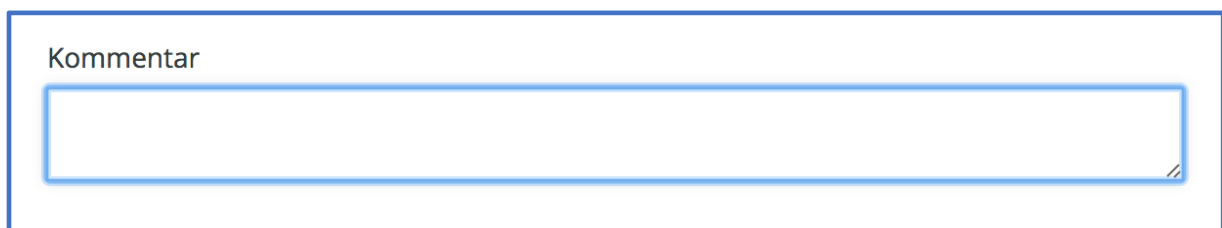
Figure 7.1 A text field in WebCruiter is highlighted when tabbed through the elements

Figure 7.2 Adding CV-elements in WebCruiter is done via a drop-down menu, through links.

7.1.1 What is causing the inability to tab through all interactive elements, or use screen reader?

Considering the code behind Figure 7.2, it is possible to see that there have been applying the use of "role = region", which Wai-Aria explains as "important enough to be included in a page summary or table of contents" (World Wide Web Consortium, 2016b). The intention of using "role" is according to Wai-Aria suggestions, but something is missing (code 1). What is important to remember when using "role" in this case is the use of "tabindex". When the default behavior of the element is missing the tab-navigation ability, and no "tabindex" is set, neither keyboard nor screen reader technology recognize the role, and it is overlooked. But by adding a "tabindex" (code 2) into the "div" it receives an order, and it is possible to tab to the different elements (Figure 7.3).

```
<a data-bind="click:createEducation" class="btn btn-default">Legg til utdanning</a>
```

Code 1. The "Add Education" button is an <a> tag inside a <div>. It is only possible to click the button, and not possible to navigate with keyboard.

```
tabindex="0"
```

Code 2. Adding a tabindex to the <a> tag with "0" as value, enables keyboard accessibility.
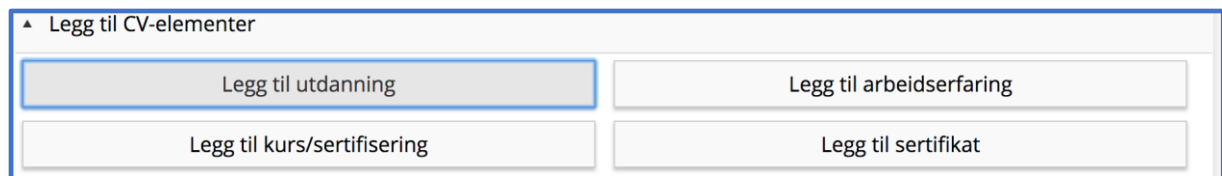
Figure 7.3 When a tabindex is added, it is possible to keyboard navigate to the different elements, and it is highlighted.

This does however, not fix the ability to use "enter" to actually add the "education element". To correct this, it is suggested to add an event in the javascript code (code 3), to add the ability to use "enter" as a function when highlighted (code 4). At the moment, only a mouse click is working to execute the "add education" function.

```
data-bind="click:createEducation"
```
Code 3. The "Add Education" button is set up to respond to a "click".

```
event: {keypress: onEnter}
```
Code 4. Changing from "click", to "keypress" enables keyboard as a working solution to navigate the button.

By ensuring keyboard navigation, and making it accessible for assistive technology usage, WebCruiter has a webpage that has scored well on usability, and that will serve all users in our population.

7.2 Discussing the findings and suggesting alternatives for Jobbnorge

The second job-application webpage that received attention was Jobbnorge. In the Usability-investigation, this research found that Jobbnorge had some shortcomings with **Plain language**, **Consistency** and **Recover from error**. The problem with the language, was the few places were the translation was missing. This was minor findings, as the feedback was in the correct translation, and it does not seem to prevent anyone from filling out the application. Still, it could contribute to prolong the application process unnecessary.

The same is the case with the consistency of the page. The finding of using the same symbol or icon in several places is only a concern for confusion or irritation, but it does not seem likely to keep anyone from fulfilling the application. A suggestion could be to use an arrow point downwards instead of the "+" symbol (Figure 7.4 and Figure 7.5). Plus, as mentioned in the results, a text label should make up for the icon choice (Harley, 2014), which Jobbnorge is doing (Figure 7.4).
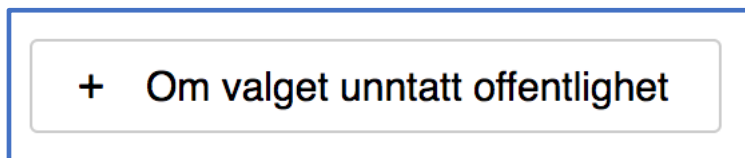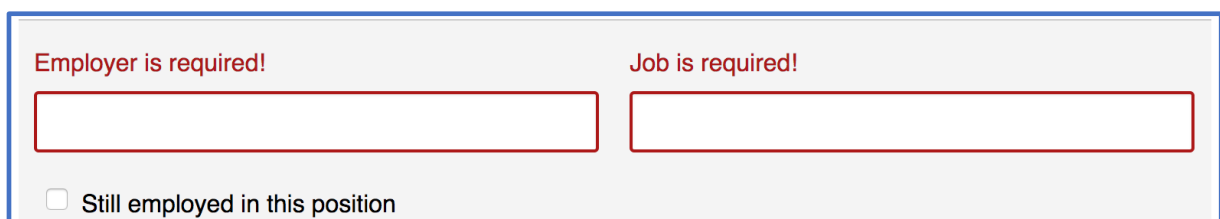
Figure 7.4 The original "show hidden element" button used by Jobbnorge

Figure 7.5 An arrow down could have been a replacement icon for "showing" hidden text.

The final finding in the Usability research was the ability for the user to recover from errors. Based on the results and the feedback-text received on the Jobbnorge's webpage, this also is a minor concern, that again could potentially cause confusion or frustration for the user. This research suggests that the use of initial text throughout the form could prevent confusion over any headings or input elements. A more descriptive feedback text would further ensure that the application is correctly inserted (Figure 7.6).

Figure 7.6 When the system has returned error, there is no example of what type of input can be inserted or initial text. Employers name? Company?

Still, the user should be able to deliver an application, which is the most important criteria looked for.

The results from investigating Jobbnorge showed some shortcomings in 1.3.1 "Info and Relationships", where when using VoiceOver, it spelled out "Required Invalid Data" without any comma or breaks. To avoid this contradiction, it was interesting to look into the code from Jobbnorge. When looking into it (code 5). The text field does not have a placeholder/initial text and is empty for the user, and for the validation ("ng-invalid" in AngularJS) to work it also has to take empty spaces into account (since this also is a wrong input for the required text field), therefor the VoiceOver reads out that it is required, but also has invalid data (which is true, but a little confusing). To correct this, a placeholder/initial text could have been provided. This would have the VoiceOver to read out "Required" only. This can be further reflected if the user has inserted input into a form field, the VoiceOver now only says "Required".

```
}
 .my-form.ng-invalid}
```

Code 5. "invalid" is reacting when the input field is blank. With placeholder text, the VoiceOver would speak out "Required" as the only word.

The results showed that there was no validation of phone numbers, as the user could enter incorrect phone numbers as well as letters without it being registered as a fault. As mentioned in the results it could have been changed by adding RegEx to the webpage. The RegEx or similar, will check the input for incorrect letters, numbers or symbols based on pre-defined rules.

The issue with the information text not being automatically read by VoiceOver, could for one be about the fact that it is a paragraph and not a heading. If it was a heading (H1-H6) it would automatically have been picked up by the assistive technology, forcing the user through the content. Alternatively, Jobbnorge could use the "label" attribute to associate the form field, with the information text that is related (World Wide Web Consortium, 2016b).

Jobbnorge could retain the paragraph but it then has to be moved inside of the grouping element that Jobbnorge is using. Remembering Jobbnorge's page, they have eight different "CV-elements" that the user can input personal information. The sections of the CV-elements are already divided into sections, and the set of sections do have descriptive tags for the VoiceOver to read out. This is all according to the

use of <fieldset> and <legend> tags, that W3C is suggesting when writing webpages containing longer forms (World Wide Web Consortium, 2008). By moving the paragraph into the same "fieldset" instead of outside it should be read out by VoiceOver.

7.3 Discussing the findings and suggesting alternatives for ReachMee

Revisiting the results from the 10 usability steps from Nielsen, there was found several smaller shortcomings. As mentioned when concluding the findings in the usability step investigation, ReachMee relies heavily on the fact that the user has existing or premade documents on their personal computer or device, ready to be uploaded. Either that, or an up to date LinkedIn-profile that can act as a CV. This results into a crucial point: All the features for uploading documents needs to be fully accessible from all user-clients.

As the results show in the usability test, ReachMee has shortcomings on the **flexibility-step**, as it is impossible to tab to the buttons in all of the ReachMee applications via keyboard. Interestingly, when using the assistive technology, VoiceOver, it was actually possible to navigate to all the buttons, hidden text fields, links etc. So, what did cause the keyboard accessibility to fault?

When looking further into the matter, it is possible to use tab on all the form controls containing input fields or drop-down boxes, but not the following section containing the buttons and links mentioned. What more is, if the cursor is used inside of the area of the buttons, it is possible to navigate the following button and link with the tab-button. (Figure 7.7).
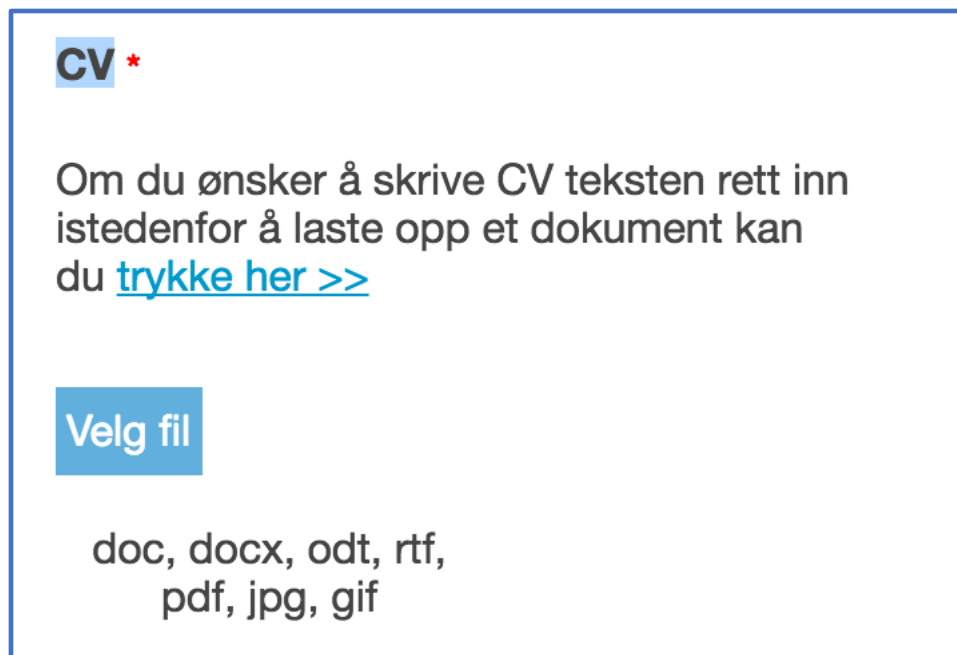
Figure 7.7 The H3-heading "CV" is highlighted, causing the tab-button to access the following drop-down menu and button.

Visiting the code, it can be found that ReachMee has divided their application box into several div-classes, which seems fine, but the interesting finding is that for the div-class that contains all the form controls, each separate form-control has been given a tab-index in rising order. The div-class that has the buttons, links and drop-down menus does all have "0" as their tab-index. When changing their tab-index to the next number in line, it is possible to navigate to this div-class as well when using the tab-button.

This does help with the possibility to navigate to the button, links and hidden menus, but it still is impossible to use the keyboard to activate the buttons. Another look into the code can reveal that they are all placed into the <a> tag with an onclick-event. There are a couple of solutions that can help in this case. It is possible to add an onkeydown-event to the <a> tag, causing the elements to respond to keyboard buttons as well (W3Schools, 2017a). The other possibility is to change the <a>, commonly used for links, to a <button> tag instead (W3Schools, 2017b). This automatically causes both keyboard and cursor click to activate the buttons, while keeping the onclick-event only. The drawback is that the buttons has to be redesigned with CSS.

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Many of the reminding shortcomings was in labelling and usage of the internal text-editor that ReachMee provided. The toolbar for the text-editor is also inaccessible with keyboard, and only the text-field can be interacted with (Figure 7.8). When it seems like ReachMee is already relying so heavily on the user coming prepared, it could benefit ReachMee to remove the toolbar altogether, only keeping a simple input-field for text.

Figure 7.8 Toolbar for the ReachMee text-editor.

The final suggestions are the addition of an explanation of the presence of required fields and how they look like, near the required fields. As well as the addition of the word "required" with the use of assistive technology. Some re-arrangement of where uploaded files are placed would cause the job-application webpage to be consistent.

7.4 Contribution and limitations of the thesis

This section will be about the contribution this master thesis can bring, with the possibility of further work. It will also cover the thesis limitations. Limitations and further work is closely related, as everything this thesis missed out on or failed to cover, could be subject for further work.

7.4.1 Contribution

The findings in this thesis has discovered different shortcomings in three of the most commonly used job-application webpages in Norway. All the shortcomings found can act as frustrating factors for the users, but most of all some of the shortcomings and violations of the WCAG 2.0 regulation will cause barriers so substantial that it will become impossible to use the webpages without assistance from other persons.

With awareness of this, and hands-on recommendations it should be possible for the investigated job-application webpages to alter their appearances and product. It seems sensible for both providers and clients of job-application webpages that their product is as accessible as possible, to reach out to most satisfied users. Moreover,

all of the three investigated webpages do state that they have public clients as well, which should more than encourage them to fulfill the legislation on universal design. Even without the public clients, it could be argued that the job-application webpages are of "general interest" themselves, and therefore should act as universally designed webpages.

7.4.2 Limitations of the thesis

It is acknowledged, that the thesis has some limitations and shortcomings. First of all, even when it was intentional to not apply for NSD for this thesis, in hindsight it looked beneficial to have applied. Both because it could opt to discuss more diverse participants, and because of the value in the application process to NSD. The sample size for the observation part of this thesis could also have been changed. It was in line with the literature and method looked into, but even more and diverse people could have been selected. No personal data was collected, but to openly be able to discuss and analyze various usage of assistive technology could have helped substantiate the results and findings, and could also add more findings to the results.

Another limitation, or awareness of the study done in this thesis, is that the observation environment could have felt fabricated, and the participants could have had the feeling of "biased" when answering.

Other than suggesting and recommending changes to the job-application webpages, there are no suggestions for how to be proactive and strive for universal design when designing applications and webpages.

7.5 Further work

To follow the close relation of limitations and further work, a study of observation of participants with a more diverse background could have pinpointed more shortcomings or needs for the job-application webpages. To observe expert users of different assistive technology, or with dexterity and cognitive background could give specific user related feedback.

A study using field-based study design could have given different and more comprehensive results. When the user can investigate the webpage in their own environment, without time-pressure, or anyone observing them, they could have journaled usability barriers by their own terms.

An area of interest for further studies, could be to find out how people who experience barriers when using job-application webpages get by/around the application process. Do they use other tools like email or regular mailing? Or do they have to rely on help from others to fulfill applications?

Another subject not checked in this thesis, but subject for further research is if the job-application webpages have follow up quiz's or ability tests. Are these accessible and usable?

8 Conclusions

8.1 Revisiting the first two research questions

This research looked into job-application webpages, and their usability and accessibility to the elderly as well as the diversity in the general population. Observation and interviews of users in the age group of 55-74 was used to gain firsthand experience and insight of the user group chosen. The results of the observation were combined with the use of Nielsen's 10 Usability principles for the three job-application webpages. Lastly a heuristic evaluation of the three job-application webpages was conducted using success criteria from WCAG 2.0, with specialty for the use in forms. Assistive technology was used to navigate the webpages as well as keyboard and pointing devices. The focus of this research was to find out:

1. How is the job-application webpage from a senior's perspective in terms of accessibility and usability?
2. What accessibility barriers can be discovered, when investigating the three job-application webpages, with the WCAG-standard?

As the increasing number of people (especially between 55-74 in this study) who actively are applying for a job was increasing, answering this seemed important to many users of job-application webpages. Findings from the observations and interviews showed that users had various experiences with the use of job-application webpages, many had used post mail, e-mail or just a network of contacts to set up interviews or get the job. Not necessarily reluctance to use internet and its application, but perhaps more the fact that the job-application webpages was less common when the interviewed users had applied for their first or second job. When applying in recent years, contacts or known associates, was the most used way of receiving interviews. The users that had experience with job-application webpages was generally pleased with the use, and when exposed to WebCruiter, they felt it to be relatively easy to handle. The main drawback with job-application webpages as a general, is the absent of any standardization. It is not an accessibility feature or a violation of any universal design laws, but the fact that if more than one application is

to be made, there is a high likelihood of the user having to use several different webpages as well.

This is something that feels extra time-consuming and frustrating for the users. They compare it to the likes of changing internet banking services: "It feels like the better option to switch, but I don't want to go over it again, the process of learning a new system" (Candidate from post interview, during observation). Job-application webpages like WebCruiter and Jobbnorge are creating an environment to help the users from this "fatigue". By creating a user profile, it is in most cases a one-time time investment to fill inn education history, work experience, references, certifications etc. The only investment needed in new applications is the unique application letter tailored for the vacant position. Plus, WebCrutier received positive feedback from the users during the interview, as "easy to understand" and a "well-formed webpage". The users still must be familiar with the user interface of these login webpages, as well as username and password, but it could potentially require less effort than in a single page application like ReachMee. The pro of using a single page application like ReachMee is that it is heavily relying on the fact that the user can connect their LinkedIn profile to the application, and minimize effort there as well.

Even with the reuse of user profiles, to different applications, or the connecting with LinkedIn profiles, the user still must go through these job-application pages when applying. Therefore, it can become even more frustrating for some users when there are findings of shortcomings in the usability and accessibility in the webpages.

This study, and these findings has no intention of being a "competition" between the three job-application webpages. But, there are findings, like keyboard and VoiceOver navigation inaccessibility, in this study that suggest there are shortcomings on a various of scales, where some have more improvements to work on than others.

8.2 Revisiting the last two research questions

Two of the research questions did perhaps not receive all the wanted answer sought after. However, there was results found that could suggest some answers to them. To recapitulate the two last research questions:

3. Are there differences in usage of universal design in public and private job-application clients?

4. How is handheld technology used by job-seekers? Is it equal to the non-handheld platforms in terms of numbers of applications sent?

Revisiting research question number 3, the findings in this research indicates that there is no difference in treatment of public or private job-application clients, based on the three job-application webpages looked at. As both WebCruiter and Jobbnorge has pages for setting up CV-elements and requires the user to use them, the users/clients are exposed to using the same interface for all applications. There were some differences found in when looking at the tailoring of personal questions, but the layout was the same for private or public.

ReachMee is different as it has all their applications via its clients' webpages. However, as all the clients are using ReachMee, the only difference is in colors, and layout of the form controls. The accessibility is found to be the same throughout all the investigated webpages. Even if the client of ReachMee has an otherwise accessible webpage with VoiceOver, the ReachMee tool has the same shortcomings on every researched webpage.

The fourth research question was divided into two related questions regarding handheld technology and job-application webpages. When searching, and reading for literature review and investigating the different homepage for the three job-application webpages, no results was found that could answer on how job-seekers used handheld technology. Therefore, this was a field of interest when interviewing the participants for the observation sessions.

Because it was a small portion of job-seekers (in term of age), and a tiny sample-size (in terms of volume), the results does not give the full answer to the research question. The results from the observation session did nevertheless, suggest that the elderly used handheld technology, but the participants preferred to use computers for tasks such as applying for jobs, or related tasks such as accessing their online banking portal. Stating that the screen size, the absent of mouse, and that job-related

documents was located on their computer as reasons for why they would not use handheld technology for tasks like this. The former part of research question is therefore partly answered, the participants in this research (people in the age-group 55-74) would **not** use handheld technology for job-applications. It remains unclear how other job-seekers might use handheld technology.

The latter part of the research question, regarding any statistic of how many applications was sent by handheld technology versus computers, was reached out to WebCruiter for any clarification. They had tracked numbers on this subject, but could not give out the answer. Therefore, this question remains unanswered. In hindsight, one can see that research question 4 could have been given a quantitative analysis, to gather information and statistic regarding how the job-seekers use handheld technology when applying for jobs. This could further have been a stepping stone for research, about the mobile design, if it was in line with the current standards and regulations for mobile technology.

8.3 Concluding the research

The purpose of this thesis was to discover how well the job-application webpage was suited for the diversity in the population, with different levels of computer knowledge in mind. Throughout the process, the iterative way of approaching the thesis, has ensured a steep but steady learning curve, where each finding has added another layer to the result.

The focus group is trending upwards in wanting to stay in work longer and more are applying for jobs. They were able to fulfill an application when standard user equipment was used, like mouse, trackpad in combination with keyboard. The research found that while they are using new handheld-technology the computer is preferred when using job-application webpages.

Lazar et al. (2012) concluded in their research that both accessibility and usability barriers would prevent and discourage certain users in the job-application process. This does match the findings from this thesis. From the interviews, frustration was a commonly phrased concern, and the difficulty in learning new systems was a concern.

While acknowledging that the companies that make the job-application webpages are relying on their product being "live", and that the webpages are continually updating, this research shows that both involving users to test the product or using different approaching when testing the webpage could have prevented to have a product with obvious usability barriers.

As previously mentioned, one of the investigated job-application webpages in this thesis (WebCruiter), had several changes to their webpages thorough the process. If the changes are so significant that it would be considered to be a new ICT-solutions, they should by default be universally designed when launched.

In conclusion, this research has found results that highlights the importance of using accessibility and usability to create universally designed webpages. The findings show several small shortcomings in both usability and accessibility. The most severe findings however, the barriers that was found when users want to use keyboard only or VoiceOver technology, shows that the full diversity of our population cannot apply for jobs without assistance from other people, which in reality is discrimination. It is recommended based on the findings in this research, that the job-application webpages utilize the tools, standards and regulations that exists for universal design when designing and developing their webpage. Problems related to accessibility and usability should be easy for the developers to correct.

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10 Appendix

10.1 Consent form (Norwegian)

Forespørsel om deltakelse i forskningsprosjektet

"ICT barriers in job-application webpages"

Bakgrunn og formål

Formålet med studiet er å studere tilgjengeligheten i dagens jobb-søkesystemer. Et typisk jobb-søkesystem ligger i dag på Internett og krever ofte at brukere må registrere seg med brukernavn og passord, samt skrive inn søknadstekst og CV inn i en nettleser. Prosjektet vil se på personer i aldersgruppen 55-74 for å kartlegge eventuelle barrierer ved jobb-søkesystemene. Prosjektet er en del av et masterstudiet i Universell Utforming av IKT ved Høgskolen i Oslo og Akershus.

Hva innebærer deltakelse i studien?

Deltakelse i studiet vil innebære en spørreundersøkelse, en observasjon hvor deltakeren vil bli bedt om å utføre noen oppgaver på et jobb-søkesystem, samt tenke høyt, og et intervjue basert på observasjonen. Hele prosessen fra start til slutt bør ikke ta mer enn to timer. Det vil ikke bli innhentet inn sensitiv informasjon som kan være med på identifisere deltakeren. Alle svar, og deltakelsen vil være anonym. Spørsmålene vil omhandle bruken av data, og bruken av Internett og jobb-søkesystemer. Intervjuet vil omhandle spørsmål fra observasjonen. Dataene registreres ved at observatør noterer svar og tankene til deltakeren. Det vil også bli benyttet skjermopptak under observasjonen. Skjermopptaket vil kun lagre aktiviteten som utspiller seg på skjermen.

Hva skjer med informasjonen fra deg?

Skjermopptaket og den transkriberte teksten vil kun bli benyttet av studenten og deltakeren vil ikke kunne bli gjenkjent i en publikasjon.

Prosjektet skal etter planen avsluttes juni 2017. Skjermopptakene og den transkriberte teksten vil da bli destruert.

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 har spørsmål til studien, ta kontakt med:

Christian Solstad Westgaard

Epost: s180360@stud.hioa.no   Telefon: 99 24 62 47

eller veileder:

Norun Christine Sanderson   Telefon: 67 23 86 73

Epost: Norun-Christine.Sanderson@hioa.no

Studien er ikke meldt til Personvernombudet for forskning, NSD - Norsk senter for forskningsdata AS, da ingen sensitive data skal bli innhentet.

Samtykke til deltakelse i studien

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

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(Signert av prosjektdeltaker, dato)

10.2 The observation manual

"HR-sjef - Webcruiter AS"

Søk på Stilling

Fyll inn følgende brukerinformasjon:

E-post: test@epost.no

Passord: sommer

Oppdater informasjon

Endre fornavn og etternavn til: Jan Johansen

Endre Mobilnummer: +47 12345678

Adresse: Kongens gate 1A

Postnummer: 0273

Poststed: Oslo

Land: Norge

Neste

Svar Nei på første spørsmål

Ja, på siste

Fortsett

Fyll inn personlig informasjon

Spesiell vurdering: "Unntatt fra offentlighet"

Arbeidserfaring: Januar 2014 - Februar 2015

Nåværende stilling: Nei

Arbeidsgiver: Oslo Kommune

Tittel: Gartner

Kommentar: Hovedoppgave med stell av blomstene på slottet

Lagre

Språk: Norsk
Muntlig: Meget godt
Skriftlig: Meget godt

Lagre

Vedlegg:
Velg "PDF 1"

Lagre og Send søknad