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## **Dos and Dont's of Web Accessibility Legislation**

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## **Abstract**

On 21 June 2013 the Norwegian government approved the regulation for the Anti-Discrimination and Accessibility Act (ADA), and new web sites that are aimed the Norwegian public were given one year to become accessible according to the standard provided in the regulation. Existing web sites have until 2021 to do the same.

This thesis looks at how Norway is dealing with this web accessibility legislation. As the regulation has so recently been approved one focus has been on how similar legislation in other countries has been dealt with. There has also been an emphasis on how web development practitioners address web accessibility, since they are among the first people who implement such legislation.

The methods that were used were interview, literature survey and web site assessment. The interviews were with the Norwegian web accessibility legislation's supervisory authority, an accessibility expert, and representatives from a public institution and a private business. The findings from the interviews showed that the supervisory authority has enforcement capabilities, but that they lack a specific plan for how they are going to supervise the legislation. The public institution and private business respondents reported that they had not heard about the legislation from the government, but had found out about it through other channels. The literature survey findings showed that critical factors for a successful implementation of web accessibility legislation were: education and training; government legislation; and, good tools. It was also found that in addition to having web accessibility legislation, it was important that the government enforced it and promoted it well.

The conclusion is that the situation for Norway has both positive and negative sides. The fact that there is a legislation concerning web accessibility, and that a supervisory authority has been provided and given enforcement capabilities, is good. However, the situation could benefit from a more intensive promotion of the legislation and regulation.

## **Preface**

This thesis concludes my Master in Information Science education at the University of Bergen. The thesis was conducted over two semesters, spring 2013 to fall 2013, at the Department of Information Science and Media Studies.

I would like to express my appreciation to the people who have helped during the course of this study. First, I would like to give special thanks to my thesis supervisor, Barbara Wasson, who has given excellent guidance during this process. Her suggestions and encouragement were instrumental to this project.

I would also like to thank the respondents that participated in the interviews for making time available in their busy schedules.

My family has also been a great support throughout the process, and I would especially like to thank my mom who, as an occupational therapist, has been a good discussion partner during this research.



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# 1.0 Introduction

In 2008 the Norwegian government introduced a new law called the Anti-Discrimination and Accessibility Act (ADA) (Anon, 2010). Section 11 of ADA is about universal access of Information and Communication Technology (ICT). It applies to ICT that is directed at, or made available to, the public. The law was effective from January 2009, and the deadline for new ICT systems to accommodate the new law was July 2011. For existing systems the deadline is 2021. The specific requirements that the law demands, however, were not approved by the government until 21 June 2013 and took affect from 1 July 2013. Therefore, the deadline for implementing the law for new systems will be 1 July 2014. The Ministry of Government Administration, Reform and Church Affairs were responsible for making the requirements. The requirements are based on the Web Content Accessibility Guidelines (WCAG) 2.0, with a few exceptions, and will in the first instantiation only apply to web sites and self service machines, (Difi, 2013).

## 1.1 Project inspiration

The inspiration and motivation for this research project came from having a brother with color vision deficiency. Watching him struggle to see the difference between team mates and enemies, who are only distinguishable by color, while gaming online showed me the need for accessible design of ICT.

## 1.2 Research Questions

This research's main goal is to study how Norway is dealing with its new web accessibility legislation, and will therefore not focus on the self service machines. To answer this, experience from other countries will be examined to see which factors are important for the implementation and reception of web accessibility legislation. There will also be a focus on web development professionals since they are the most active in the implementation process of such legislation. These three areas of study have been defined in three research questions:

1. How has web accessibility legislation been introduced and received in other countries?

2. How is Norway dealing with web accessibility legislation?

3. How are web development professionals addressing web accessibility laws?

### **1.3 Thesis contents**

This thesis is organized into 7 chapters. Chapter 2 presents a literature survey that is organized into 9 categories derived from the initial literature survey. Chapter 3 presents the methods that has been utilized in this research. Chapter 4 presents the interviews that were conducted, and chapter 5 presents a web site assessment to illustrate a few of the problems that the new Norwegian web accessibility regulation addresses. Chapter 6 discusses the findings from the research in relation to the research questions, and chapter 7 summarizes the results and suggests future research.

## 2.0 Literature survey

The literature survey is categorized into nine sections that either give an introduction to a subject or relate to different research areas in the field:

- *What is Web Accessibility*: introduces the field and points to some issues related to different terms that are used.
- *User Diversity*: explains how we define a disability now and also describes different groups of impairments.
- *Web Accessibility Legislation Around The World*: presents web accessibility legislation in several different countries.
- *Guidelines*: introduces the guidelines that the Norwegian regulation is based upon, and a few examples from those guidelines are presented.
- *Practitioners Attitudes*: describes several different studies on practitioners attitudes about web accessibility.
- *Tools for making and Assessing Accessible Websites*: introduces several tools that can help in the process of making accessible websites.
- *User Testing*: discusses the need for user testing to make a website fully accessible.
- *Education*: explains why education is important for making websites accessible and gives a few examples of educational programs that focus on this.
- *Economy*: describes the costs and gains of making the web accessible.

## 2.1 What is Web Accessibility?

There is a discussion among the research community about what web accessibility is. According to The World Wide Web Consortium (W3C) “Web accessibility means that people with disabilities can use the Web” (2005). Goldstein et al. (2011) write that accessibility “means a more flexible interaction design experience, which not only benefits people with disabilities, but also people interacting with digital information using different devices, such as smart phones.” (p. 746). For example, when using a smart phone while standing on the side of a busy street on a sunny day, the noise from the street makes it hard to hear sound coming from the smart phone and the sun makes it hard to see information on the screen. In winter the need to wear gloves can make a touch screen inaccessible, and if the day is also noisy and sunny, it will effectively make a person blind, deaf, and motorically impaired when interacting with a smart phone.

Accessibility is also a part of Usability (Krug, 2006, p169). Usability is defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” (ISO Standard 9241-11). Krug (2006) writes that if a web site is not accessible then it is not usable: “Unless you are going to make a blanket decision that people with disabilities aren't part of your audience, you really can't say your site is usable unless it's accessible.” (Krug, 2006, p169). Eika Sandnes (2011) writes that accessibility entails ensuring a user group access to a service using a specialized solution (assistive technology), and usability entails that access to the service is done as intuitively and efficient as possible.

Universal Design, a term that originally came from the field of architecture, is the process of increasing accessibility (Sandnes, 2011). In her article *Universal Design: Implications for Computing Education* Burgstahler (2011) writes about the history of universal design. The term was coined in the 1970s by Ronald Mace, an architect and educator. He defined Universal Design (UD) through the Center for Universal Design (CUD) at North Carolina University as “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (Center for Universal Design, 2008). Burgstahler writes that many instructors and institutions focus only on providing accommodations to address disability issues: an accommodation

is an adjustment or modification to make a product or environment accessible to an individual with a disability. Accommodation is grounded in the medical model of disability, in which a professional identifies an individual's functional 'deficits' and prescribes adjustments that allow him or her to participate to some degree in the 'normal' environment. (p. 3)

According to her, accommodation is a reactive approach to provide access, while universal design is a proactive approach:

UD reduces, but does not eliminate, the need for accommodations for students with disabilities. For example, if a professor posts resources for her computing class online in an accessible format, no accommodations or redevelopments would be necessary if a blind student enrolls in her class. Thus, planning ahead with UD may save time in the long run. (Burgstahler, 2011, p. 4).

There are many terms that are synonymous with Universal Design, including *Universal Access*, *Universal Usability*, *Inclusive Design*, *E-inclusion*, *Design for all* and *Accessibility*. Although they all belong in the field of Universal Design, they have slightly different meaning, with some attached to specific projects. Newell and Gregor (2000) try to determine a way to aptly describe the field. They suggest to include *Universal Usability* as an extension of the *User Centered Design* methodology to produce the best outcome, and write “User Centered Design enables developers to focus on the users as the heart of the design process, and involving disabled people as a normal part of such design gives them the dignity of being treated in the same way as any other users of products” (p. 40), and they point out a problem with the term *Design for all*, “Except for a very limited range of products, 'design for all' is a very difficult, if not often impossible task, and the use of the term has some inherent dangers.” (Newell and Gregor, 2000, p. 42). The dangers they mention can be as “sir Robert Watson-Watt, the inventor of Radar, once said that the excellent is an enemy of the good. In our context 'accessibility by all' may provide a barrier to greatly improved 'accessibility by most'.” (Newell and Gregor, 2000, p. 42). Newell and Gregor propose that the name for the new methodologies that must be developed should be *User Sensitive Inclusive Design*. Inclusivity is more achievable than universality. Sensitive replaces the word centered to underline the difficulty in producing a small representative group of users, and to design a product that is accessible by everyone in that group.

On the other hand, Shneiderman (2000) supports the term *Universal Usability*. He introduces three challenges in attaining universal usability for web based, and other services: “User diversity”; “Technology variety”; and, “Gaps in user knowledge”. The “Technology variety” challenge is about the technological resources that need to be covered, both on the low end and the high end. “Gaps in user knowledge” is about bridging the gap between what users know and what they need to know in order to operate a system or device. The “User diversity” challenge involves users with disabilities, but also users with different skills, knowledge, age, gender, literacy, culture, income, and so forth. He also writes that universal usability measures taken to accommodate disabled users can benefit all users, and uses the example of the curb-cut, designed to help wheelchair users get on and off sidewalks, but also very useful for baby carriage pushers, delivery service workers, bicyclists, and travelers with roller bags. Also, making the curb-cut after the curbs have been built is costly, but doing so in advance reduces the cost because less material is needed.

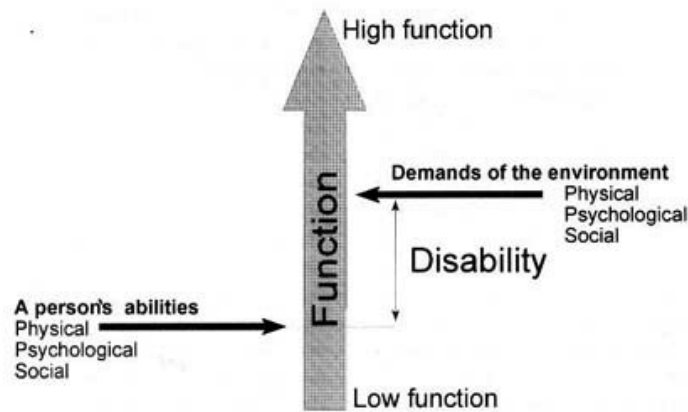
### **2.1.1 Summary**

Web accessibility is about making the web accessible for disabled people, and as a byproduct, can benefit people outside of that group as well. Accessibility is part of usability, so if a web site is not accessible, it is also not fully usable. The process of increasing accessibility is called universal design, a field that has many names. A problem that can arise with *Universal Design* or *Design for All* is that the focus on making something accessible by all can come in the way of making it accessible by most, so that the excellent becomes the enemy of the good.

## **2.2 User Diversity**

Sandnes (2011) writes that sometimes user diversity, like the fact that some people are right-handed, others are left-handed and some people are color blind, impacts the user interface. Sandnes explains how the medical understanding of the term disability has changed. Where the focus was on the individual's defects, there has now been a paradigm shift so that disability is now understood relationally through the Gap-model (Aslaksen et al., 1997), see figure 1.





*Figure 1: The Gap-Model.*

The Gap-model describes how both society's lack of available solutions and the individual's impairment is the cause of the disability. An impairment can prevent the availability of a service, but not necessarily. Only when there is a gap between society's demand of function and the individual's impairment does a disability arise. The Gap-model is a tool that identifies and tries to remove societal barriers to eliminate or reduce experienced disability. When society's demands and the individual's condition do not correspond, a gap occurs, and that gap is the disability (Eika Sandnes, 2011). This model is in accord with Burgstahler's (2011) proactive approach to accessibility as described in the previous section.

Sandnes (2011) divides impairments into three groups: Sensory; Motoric; and, Cognitive. Sensory impairments are attached to the senses: sight, hearing, touch, smell, taste and balance. Sight is the most important sense associated with using a computer, but hearing is also important there. Touch is used on some screens, and balance can be important in some games. Smell and taste are not associated with computers that are available to the public. Some people have a partly or fully impaired sense, sometimes several, therefore they rely more on their other senses. Blind people will rely more on their hearing and touch to get information from a computer, and the hearing impaired will use their sight. When several senses are impaired it becomes more complicated.

Motoric impairments can be divided into three groups: missing body parts; non-functioning body parts; or, partly functioning body parts. Not everyone in this group can operate a regular mouse or keyboard, but there are several assistive technologies that can be used instead, (Eika Sandnes, 2011).

Cognitive impairments can affect memory and learning among other things. It is normally not possible to see that a person has a cognitive impairment by looking at them. Cognitive impairments affect how the user relates to information conveyed by the user interface. Examples of cognitive impairments are Dyslexia and Dyscalculia, they affect the ability to obtain information from text or numbers. Other conditions can cause reduced memory, difficulty with perceiving time, and difficulty with planning and arranging activities. (Eika Sandnes, 2011)

Age often introduces one or several forms of reduced functionality. Sandnes (2011) writes that the aging population in Norway is going to increase from 13% (2011) to 37% by the end of this century, so taking heed of users with different forms of impairments will be more important than ever in the coming years.

### **2.2.1 Summary**

The medical understanding of disabilities has changed, so now a disability only occurs if there is a gap between societal demand of function and an individual's impairment. Disabilities can be divided into three categories: Sensory, Motoric, or Cognitive. The elderly population in Norway will increase significantly over this century, so it will be important to take heed of users with different impairments, since that is also something that comes with age.

## **2.3 Web Accessibility Legislation Around The World**

According to Lazar et al. (2005) to design user interfaces for technology is a political act. This is because by designing something you are influencing, and sometimes determining, what people can and cannot do. They use the example of HTML source code being available in web browsers, a political decision that created a more open and inclusive web.

Designing accessible user interfaces, more specifically accessible web sites, is not only a political act, but it is also often under political regulation. Goldstein et al. (2011) write that in an ideal world non-governmental organizations comprised of researchers and industry representatives would work on creating accessibility standards that governments around the world would adopt unchanged. In the case of web accessibility, a standard was produced in this way. The World Wide Consortium (W3C) created the Web Content Accessibility Guidelines (WCAG), but governments often make

changes to the standard before they adopt it. This makes it hard for software developers to use the same tools in multiple countries. There is often a time lag between when an international standard is finished, until it influences actual governmental regulations. One example is the W3C standard WCAG 1.0 that was ready in 1999, but was not adopted by the US government until 2001.

This section presents examples of countries, other than Norway, that have some form of web accessibility legislation.

### **2.3.1 The United States of America**

The US has two policies that concern web accessibility. They are Section 508 of the Rehabilitation Act and The Americans with Disabilities Act (ADA).

In 1998 the US government changed their Rehabilitation Act of 1973 to require electronic and information technology (EIT) to be accessible for people with disabilities. The United States government writes that “Section 508 was enacted to eliminate barriers in information technology, open new opportunities for people with disabilities, and encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology.” (US Government, n.d.).

The Americans with Disabilities Act (ADA) of 1990 is another law that affects people with disabilities in the US. It “prohibits discrimination and ensures equal opportunity for persons with disabilities in employment, State and local government services, public accommodations, commercial facilities, and transportation.” (Anon, n.d.). This law does not say anything directly about web accessibility, as it was signed into law in 1990 before the introduction of the web, (Lazar, 2010). During a public speech in March 2010 the Assistant Attorney General Tom Perez, head of the Civil Rights Division of the Justice Department, stated that the “Americans With Disabilities Act applies to non-governmental web sites which are considered public accommodations.”(Lazar, 2010, p. 9). Furthermore in July 2010 the Justice Department issued an advanced notice of proposed rulemaking to address the Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations (ANPRM) (Lazar, 2010).

Only Section 508 actually addresses web accessibility at this point, and it only applies to

government web sites. There are processes currently going on, however, to have the ADA apply to the web as well. That will not only require government web sites, but also other companies and organizations that fall under the category of public accommodations (The U.S. Equal Employment Opportunity Commission, 1997), to implement accessible web sites.

### **2.3.2 Brazil**

Lazar et al. (2012) report that Brazil passed an Accessibility Law in December 2004. It stated that all public administration web sites should guarantee access to all information for blind citizens by December 2006. There is, however, low compliance with the law due to little enforcement.

### **2.3.3 Portugal**

Portugal was one of the first countries in the world to put web accessibility into legislation, with directives issued as early as 1997 (Lazar et al., 2012). In 2007 studies showed that less than 70 percent of government web sites were accessible. Barriers to this were discovered to be vague goals, no suggestion about implementation and maintenance, no enforcement, and no penalties for non-compliance. These problems were addressed by the Prime Minister and specific compliance demands were required within a six month period. A task force was established to ensure coordination, training and help. An independent study showed that three years later 95 percent of government-run web sites were in compliance with the new directive (Lazar et al., 2012).

### **2.3.4 Australia**

In 2010 the Australian Government put into action the Web Accessibility National Transitioning Strategy (NTS) AGIMO, 2010 (Conway, 2011). It outlines the plan to adopt and implement WCAG 2.0 in all federal agencies web sites in two stages: Level A by December 2012; and level AA by December 2014. NTS only applies to government web sites, but Australia also has legislation that covers private businesses and organizations. They are covered by the Australian Human Rights Commission. According to Conway (2011) they now reinforce the NTS and require WCAG 2.0 level AA compliance for new web sites, existing web sites have until December 2013 to meet the standard.

### 2.3.5 Summary

Accessibility is under legislative regulation in many countries. The fact that governments usually make changes to international standards in their regulations is not ideal since it then becomes difficult for software developers to use the same tools and there also becomes a significant time lag between when new standards are completed and until they are adopted into government regulation. Some countries have had problems with low compliance, and this is sometimes due to low enforcement and poor strategy from the government.

## 2.4 Guidelines

This section will present the guidelines that make up the Norwegian ADA §11 regulations, and one that can potentially be added to it. The standard that the regulation draws upon is the Web Content Accessibility Guidelines version 2.0 (WCAG 2.0). Since there are 12 guidelines and 61 testable success criteria (SC) in WCAG 2.0, only a small selection will be presented here. The selection will focus on three of the most basic success criteria, an overview of them and their parent guideline can be seen in table 1. A document containing all of the WCAG 2.0 guidelines and success criteria will be provided in Appendix A.

*Table 1: The testable success criteria from WCAG 2.0 presented in this chapter.*

<b>ADA §11</b>
WCAG 2.0:
<b>1.1 Text Alternatives.</b> SC 1.1.1 Non-text Content.
<b>1.4 Distinguishable.</b> SC 1.4.1 Use of Color.
<b>2.1 Keyboard Accessible.</b> SC 2.1.1 Keyboard.

## 2.4.1 WCAG 2.0

According to the Norwegian Agency for Public Management and eGovernment (Difi) the standards for the Anti-Discrimination and Accessibility law §11 (ADA §11) are the WCAG 2.0 standards recommended by the W3C (World Wide Web Consortium) at a level A and AA of conformance, with a few exceptions. (Difi, 2013)

There are four overall principles in WCAG 2.0: *perceivable*; *operable*; *understandable*; and, *robust*. The four principles are properties that a web site must have, to be accessible for users with disabilities. Under the 4 principles are 12 guidelines, each with a subset of testable success criteria (SC). The principles and guidelines work as a framework for the testable success criteria, and make them easier to understand for developers. For the testable success criteria there are three levels of conformance: A, AA and AAA. A is the lowest level and AAA is the highest. For each guideline and success criteria a link is provided to a document to help with understanding the intent of the guideline or SC, and for each SC another link provides a document with techniques for how to meet them. The second document is a customizable quick reference web page where techniques can be filtered by different technologies and mark up languages, and also the priority level of SC (W3C, 2012). The techniques for the guidelines are more general and the techniques for meeting the SC are more detailed. They are also either sufficient or advisory, where sufficient is what is required and advisory goes beyond that. Where this is known, common failures are also available so that they can be learned from, (W3C, 2008b).

The four principles are explained, (W3C, 2008b):

- *Perceivable* – Information and user interface components must be presentable to users in ways they can perceive.
- *Operable* – User interface components and navigation must be operable.
- *Understandable* – Information and the operation of user interface must be understandable.
- *Robust* – Content must be robust enough so that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

The first three principles address the web interface; what the user is exposed to. They must be able to perceive the content, navigate it and understand it. The last principle is about software, to assure that the content is always accessible for assistive software and technologies.

There are 4 principles, 12 guidelines and 61 success criteria. 35 of the SC are a part of the ADA §11 regulation. This is because three SC regarding time-based media are exempt: 1.2.3 Audio Description or Media Alternative (Prerecorded content); 1.2.4 Captions (Live content); and 1.2.5 Audio Description (Prerecorded content). The remaining 23 SC are level AAA and therefore outside of the scope of the regulation.

Three examples from the guidelines will be presented in detail below.

### **2.4.1.1 Text Alternatives**

The first principle *Perceivable* has four guidelines and 22 SC, where 11 of them are required in the ADA §11 regulation. The first guideline and SC are presented in table 2.

*Table 2: Guideline 1.1 and SC 1.1.1.*

<b>1.1 Text Alternatives:</b> Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
<b>SC 1.1.1 Non-text Content:</b> All non-text content that is presented to the user has a text alternative that serves the equivalent purpose, except for the situations listed below <sup>1</sup> . (Level A)”

In the “How To Meet WCAG 2.0” document that is linked to in the SC, several different situations concerning SC 1.1.1 are described (W3C, 2012). Each situation has a set of alternative techniques that can help make a web page conform to the SC. For example if situation A (seen in table 3) applies to a web page's non-text content problem and the non-text content is an image, then technique H37 can be used.

<sup>1</sup> The “situations listed below” can be viewed in appendix A.

Table 3: How to meet SC 1.1.1.

<b>Situation A:</b> If a short description can serve the same purpose and present the same information as the non-text content.
<b>Technique:</b> H37: Using alt attributes on img elements (HTML)
<b><sup>2</sup>Description:</b>  When using the img element, specify a short text alternative with the alt attribute. Note. The value of this attribute is referred to as "alt text".  When an image contains words that are important to understand the content, the alt text should include those words. This will allow the alt text to play the same function on the page as the image. Note that it does not necessarily describe the visual characteristics of the image itself but must convey the same meaning as the image.
<b>Example:</b> An image on a Website provides a link to a free newsletter. The image contains the text "Free newsletter. Get free recipes, news, and more. Learn more." The alt text matches the text in the image

See figure 2 for a screen shot of an example code for technique H37:

```
Example Code:  

```

Figure 2: Example Code from technique H37.

### 2.4.1.2 Use of Color

Another example of a guideline under the principle *Perceivable* is 1.4 Distinguishable (W3C, 2008b), that can be seen in table 4. This guideline has 9 SC where 5 are under the ADA§11

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<sup>2</sup> Descriptions such as for technique H37 are provided in a separate web page, for example: (W3C, 2013c).



regulations. The first of these is SC 1.4.1, which is specifically aimed at people with color vision deficiency. As seen in table 5, Situation B can for example be addressed by technique G111, (W3C, 2012), (W3C, 2013b):

Table 4: Guideline 1.4 and SC 1.4.1.

<p><b>1.4 Distinguishable:</b> Make it easier for users to see and hear content including separating foreground from background.</p>
<p><b>SC 1.4.1 Use of Color:</b> Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element. (Level A)</p>

Table 5: How to meet SC 1.4.1.

<p><b>Situation B:</b> If color is used within an image to convey information.</p>
<p><b>Technique:</b> G111: Using color and pattern.</p>
<p><b>Description:</b> The objective of this technique is to ensure that when color differences are used to convey information within non-text content, patterns are included to convey the same information in a manner that does not depend on color.</p>
<p><b>Example:</b> The content includes an interactive game. The game pieces for the 4 players are distinguished from one another using both color and pattern.</p>

One of the examples for technique G111, as seen in table 5, shows that instead of just separating the four players by color, a pattern or symbol can be added so that people with color vision deficiency can distinguish them.

### 2.4.1.3 Keyboard Accessible

The second principle *Operable* has four guidelines and 20 SC, where 12 are under the ADA§11 regulation. The first guideline is 2.1 Keyboard Accessible (W3C, 2008b), and the first SC under this guideline is 2.1.1, as seen in table 6.

Table 6: Guideline 2.1 and SC 2.1.1.

<b>2.1 Keyboard Accessible:</b> Make all functionality accessible from a keyboard.
<b>SC 2.1.1 Keyboard:</b> All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes, except where the underlying function requires input that depends on the path of the user's movement and not just the endpoints. (Level A)

This SC is intended to make sure that content can be accessible by keyboard or a keyboard interface, wherever possible. For blind or low-vision users who do not have the eye-mouse coordination required to use a mouse as input, a keyboard or a keyboard emulators<sup>3</sup> can be used instead, (W3C, 2013e). Table 7 presents a technique that addresses this SC, (W3C, 2013b).

Table 7: How to meet SC 2.1.1.

<b>Technique:</b> G202: Ensuring Keyboard control for all functionality.
<b>Description:</b> The objective of this technique is to provide keyboard operation for all the functionality of the page. When all functionality of content can be operated through a keyboard or keyboard interface, it can be operated by those with no vision as well as by those who must use alternate keyboards or input devices that act as keyboard emulators like speech input software or on-screen keyboards. <sup>4</sup>
<b>Example:</b> A page with images used as links changes when the user hovers over the image with a mouse. To provide keyboard users with a similar experience, the image is also changed when a user tabs to it.

<sup>3</sup> “Keyboard emulators include speech input software, sip-and-puff software, on-screen keyboards, scanning software and a variety of assistive technologies and alternate keyboards.” (Funka n.d.)

<sup>4</sup> This is just the first paragraph of the description, the rest can be seen here: (W3C, 2013b).

## **2.4.2 ATAG 2.0**

The Authoring Tool Accessibility Guidelines 2.0 (ATAG 2.0) (W3C, 2013a), is a set of guidelines for making authoring tools accessible. According to Difi (2010) this standard can be added to the ADA§11 regulation when it becomes a confirmed standard. At this point it is only at the “Last Call Working Draft” stage, and it still has a few stages to go before it is considered finished, (W3C, 2008a).

## **2.4.3 Summary**

Three testable success criteria from three different guidelines of WCAG 2.0 have been presented with example situations and possible techniques to address them. The focus has been on the most basic accessibility issues on web sites: text alternatives for images, color not being the only way of providing information, and that content is available by keyboard or keyboard emulators.

The two remaining principles *Understandable* and *Robust* have 3 and 1 guideline respectively with 17 and 2 SC, where 9 and 2 SC are under the ADA§11 regulation. The guidelines and SC that have not been introduced in this section are available in Appendix A.

There is a possibility that the ATAG 2.0 guidelines can be added to ADA§11 regulation when it becomes an approved standard.

## **2.5 Practitioners Attitudes**

This section describes findings from five studies that try to understand web practitioners knowledge about, and attitudes towards web accessibility. The first three studies are focused on the practitioners themselves, while the last two are focused on companies as a whole.

### **2.5.1 A study of webmaster perceptions**

One of the first studies on the attitudes of web practitioners on the issue of web accessibility was conducted by Lazar et al. (2004). They write that many tools and guidelines for web accessibility exist, so why are so many web sites still inaccessible? To answer this they performed a study of 175

web Masters, investigating their knowledge about the topic and reasons for making, or not making, web sites accessible. They were chosen since the web Master has the most influence on the then currently-existing web sites. To highlight influences on the state of accessibility of a web site Lazar et al. (2004) created a model called the Web Accessibility Integration Model, see Figure 3.

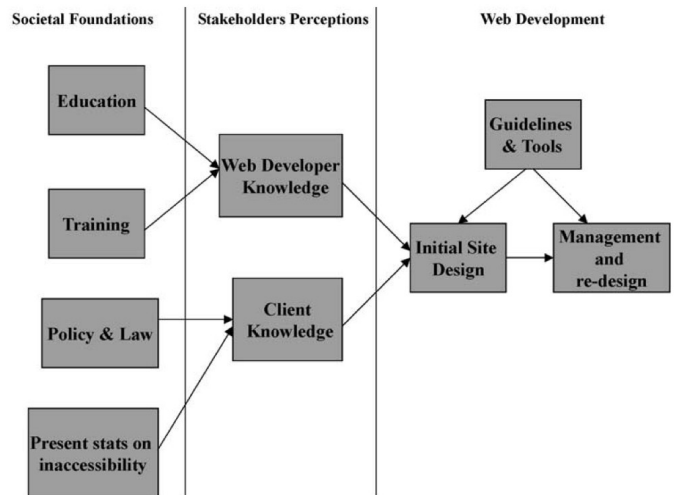


Figure 3: Lazar et al.'s (2004) Web Accessibility Integration Model.

The model comprises of three categories of influence. The first is Societal Foundations, which represents the value put on web accessibility in education, training, policy and law and the present statistics on inaccessibility. Lazar et al. (2004) write that education about web accessibility is missing and that fact clashes with the governments actions of creating laws to increase web accessibility. The authors also state that the present statistics on accessibility are shocking, but yet they do not seem to influence people to make accessible web sites or provide more education on the subject.

The second category is Stakeholder Perceptions, which covers web developers and clients who are influenced by the Societal Foundations. The last category, Web Development, is influenced by the Stakeholder Perceptions, but additionally the existing guidelines and tools. The guidelines and tools that are available are the ones that will be used.

The survey they performed had many interesting results:

- 65.7% answered that they had created accessible web sites for the visually impaired (VI).
- 73.2% indicated that they were familiar with US law on the subject.
- 56% said their current web project was accessible for VI.
- 78.9% said they knew about software tools to check their web site.
- 69.1% said they had used such software.
- 38.9% said they had tested a web site with a screen reader.
- 58.8% said their organization planned to make web sites accessible to VI.
- 112 participants said they were familiar with WCAG (at that time 1.0).

There were also some open ended questions in the survey that offered a more qualitative view of the respondents. On the question of *what the challenges are to achieve accessible web sites for VI*, the answers included: balancing accessibility and graphic design, convincing managers and clients, technical challenges, lack of funding and time, need for training and need for better software tools. Most of the answers to the question of *who is responsible for achieving accessible web sites* indicated firstly web Masters, then programmers, the disability compliance office, system analysts and help desk managers. This question allowed the respondents to give more than one role as an answer, and most of the respondents indicated that achieving accessible web sites was not an individual effort but something that the whole team had to work with together. The question of *what would influence the respondents to make their current web site accessible*, was answered by most of the respondents with government requirements, then, knowing they had users with visual impairments, outside funding, outside pressure from managers and clients, training and better tools. There were also questions concerning ethics and most of the respondents viewed web accessibility as an ethical issue, but some put the responsibility on their clients or others.

### **2.5.2 A Survey on the Accessibility Awareness**

Freire et al. (2008a) performed a survey study of 613 people involved with web development in Brazil. They are critical to Lazar et al.'s (2004) study and claim that it may have a bias. Lazar et al.'s study was disseminated through Human Computer Interaction (HCI) e-mail lists and so the majority of the participants were HCI-related people. Freire et al. say that this is the most optimistic study found in their literature search, and so they assume that this is related to the role of the participants. In their study Freire et al. wanted to have participants from all of the roles involved with web development, but they did not entirely succeed. Over half of their respondents were from research and education fields, and they write that this may be due to the fact that people from these fields tend to participate in research surveys more often. The other major groups represented were system analysts (12.4%), managers (10,28%) and coordinators (8,65%). The reason for there being so many participants from management was suggested to be the fact that e-mail addresses provided by companies often go to them.

The results showed that few people were aware of accessibility issues in web development. One of the main reasons for this, the authors write, is that few of the participants had had any form of training in accessibility. On the question of *what suggestions the participants had to improve web accessibility* the main suggestions were related to “a more intensive promotion of the accessibility legislation and to promote a more effective consciousness, by providing training inside organizations and including accessibility in Web related courses.” (Freire et al., 2008a, p.95). The authors claim it was possible to notice that the effort in 2004 to promote legislation regarding web accessibility was not effective to promote accessibility awareness, since few people knew about the legislation and few applied its requirements. The authors conclude that it is very important to make people involved with web application development aware of accessibility issues to promote an effective inclusive agenda. They also stated that “Accessibility has to be dealt [with] as a serious issue, and should involve government, educators and the whole society to promote consciousness.” (Freire et al., 2008a, p.95).

In a more in-depth study of the survey results Freire et al. (2008b) conclude that accessibility has not been inserted into the agenda of the industry and that that issue is linked with the lack of training and lack of use of proper techniques. The government seems to have problems with making the legislation known, even within the government organizations. They urge academics to include

accessibility in their lectures.

### **2.5.3 Redefining Assumptions: Accessibility and Its Stakeholders**

Lopes et al. (2010) discovered a gap in previous research where the focus had been on web technologies and not on the general state of accessibility. They missed tangible goals to improve accessibility, and so they performed a study of 408 individual stakeholders in Portugal, categorized into five groups: Developers (software developers and designers); Accessibility Assessors; Public Bodies; Service Providers (public and private enterprises and organizations); and, Elderly and Disabled Users. The method was face-to-face interviews and internet questionnaires.

The results showed that the *Developers* wanted more knowledge about (combined) disabilities and assistive technology. They also wanted more advanced education. They had a low awareness of national and international standards and they wanted embodied validators in development tools and accessibility assessment tools. The *Service Providers* were mostly employed in accessible web site design and consulting. They had a high awareness of standards and like the developers and disabled users they preferred to be updated on accessibility, and get information about new tools, online. All Webmasters and Designers indicated that their customers wanted accessible content. The individuals from *Public Bodies* identified the main barrier to accessibility to be the unavailability of internal expertise. They had received training, but still needed external help. All the *Public bodies* expected some form of official accessibility certification. The *Accessibility Assessors* were highly aware of accessibility standards but they wanted more guidelines for creating accessible content. The *Elderly and Disabled Users* were aware of the barriers they faced online, and 75% of them used computers or mobile phones daily. They used a wide variety of assistive technologies and had received some training on them but felt that it was not sufficient. Seventy percent replied that they received help from friends. What this group wanted the most was better compatibility between assistive technology and web pages.

Lopes et al. (2010) conclude that there is a need for assessment tools to make accessibility easier to accomplish. There also needs to be a higher dissemination of WCAG 2.0 (though this was perhaps due to the relative newness of the standard). More advanced disability and assistive technology simulation tools are needed and developers want accessibility tools to be more integrated in the tools they already use.

### **2.5.4 Corporate Attitudes**

Two studies have been found that consider what influences corporate organizations to create accessible web sites. Leitner & Strauss (2010) carried out a case study in the business-to-consumer segments of three industry sectors. They recognize two possible ways for businesses with accessible web sites to profit; they do not get negative media and possible law suits; and, they profit from an enlargement of their consumer group. The results of the case study was categorized into three kinds of motivation for a company to have an accessible web site: Economic Motivations, the monetary benefit of an increased customer base; Social Motivations, the ethical responsibility of an organization; and, Technical Motivations, the organizations willingness to have a high technical quality on their web site.

Loiacono & Djasmasbi (2011) conducted a survey with participants from a wide range of industries. They found three factors that directly impact the level of accessibility for a business: The number of IT professionals in the company; how much usability testing is done; and, legal web accessibility requirements. The number of IT professionals represents the general resources a company possesses, and the higher that is, the more it is able to dedicate to many matters (including web accessibility). The usability testing that is done in a company influences the amount of accessibility testing that is done. They also found that companies that are required by law to comply had more accessible web sites.

### **2.5.5 Summary**

In the first study by Lazar et al. the participants had a high awareness of accessibility. This result was criticized in the next study by Freire et al.(2008a) as the participants were said to be HCI-professionals who already had a focus on accessibility. In the other studies on web practitioners the results showed that there was generally a low awareness of web accessibility laws. Other reasons for not making web sites accessible were lack of time, money, and support from management. A need for more education and training in accessibility was also discovered.

For companies motivations for having accessible web sites were economic, social, and technical. Factors that influenced the accessibility level for a business was the number of IT-professionals in the company, usability testing practices, and legislative web accessibility requirements.



## 2.6 Tools for Making and Assessing Accessible Web Sites

Since the introduction of the WCAG 2.0 guidelines, using automated tools for evaluating web sites has become more prevalent (Vigo et al., 2013). The WCAG 2.0 guidelines were designed to be more testable than their predecessor and is therefore more suited for automated testing. The guidelines are highly interpretive and the normal results given by automated tools are either negative or positive, so a human is needed to look at many of the guidelines in context (Vigo et al., 2013). Still, when an organization does not have an expert available they are increasingly relying solely on automated tools.

Tools are used in the development of new systems and web sites. Most accessibility assessment is carried out at the end of the project, but Vigo et al. (2013) write that it optimally should be done throughout the project to catch the most salient problems at the beginning of the coding, so that more subtle issues can be looked at by experts and end users. Tools are not only used in development, they are also used in the quality assurance of web sites and by accessibility observatories to name a few. They are not focused on fixing accessibility issues but are more aimed at diagnosing web pages, usually in the form of a conformance level. These studies often cover a large number of web sites and is therefore at the risk of relying on automated tools alone (Vigo et al., 2013). Vigo et al. (2013) write “compared to other evaluation methods, tools alone perform poorly in terms of coverage and completeness. Therefore organizations should not rely on automated tests alone.”(p.2).

Vigo et al. (2013) conducted a benchmark study comparing an expert evaluation to 6 automated tools that support WCAG 2.0 guidelines. The aim was to discover how well the tools performed in terms of *coverage* (the number of different success criteria to report at least one problem), *completeness* (the ratio of reported violations to the actual number of violations) and *correctness* (how well tools minimize mistakenly reported violations). Nine web pages were evaluated to level AA of conformance, with an additional two success criteria at level AAA. It was found that only 23-50% of success criteria were covered by the tools. If the web page was highly inaccessible the tools were more effective than with more accessible web pages. This could show that the tools are aimed at finding stereotypical or more frequent accessibility issues. The more subtle and infrequent issues were not well covered. This study is weakened by its small sample size, but the authors claim that they are generally representative of the accessibility issues that users meet online as they cover at

least one violation in all the WCAG 2.0 success criteria and in 75% of the guidelines.

This section introduces several different tools that either help assess web sites or filter accessibility guidelines. One methodology that is shown in a new light when aimed at developing accessibly, is also presented.

### **2.6.1 Personas with disabilities**

Personas is a methodology that can be used in the process of designing accessible web sites. Schulz and Fuglerud (2012) write that a persona is “a rich description of a potential user of your system and consists of several stereotypical traits, such as preferences, needs, attitudes, habits, and desires, composed into a realistic, but fake, person with a name and picture.” (p.145). They recommend making personas with disabilities to ensure that a system is accessible. They found in their research that adding disability traits to personas raised awareness about universal design and accessibility in many areas of the project. They further state that even though using personas with disabilities is a good tool, it should be used only as a supplement to contact with real users, as a way to keep focus on the issues of accessibility throughout the project life-cycle. Schulz and Fuglerud's (2012) version of the personas methodology entails getting actual facts from real people. They can be gathered through focus groups, interviews, surveys and observation. Further information can be found by studying case studies, other research and market information. Recruiting people to extract this information from, can be done through user organizations.

It is important to look at the assistive technology that may be used by the personas. Schulz and Fuglerud (2012) recommend having a person that has experience with assistive technology on the team, at least in the process of creating personas. This can be done by having a persona workshop where all the facts and assumptions are looked through and patterns are found. The different groups that emerge from this process make up the persona skeleton. If the persona has a disability, it is then added to the skeleton, along with information about assistive technology and how it affects the persona. If you are creating personas with disabilities it is important to have enough of them to at least cover the four main groups of disabilities: vision, hearing, cognitive and movement impairments. Maybe an elderly persona could be added as well. They often have mild disabilities from all four groups. Schulz and Fuglerud (2012) also give suggestions to how the personas could be used throughout the project. They suggest sending a monthly email to the team with a story about

the persona, or use the personas in user tests where the team acts out the different personas.

### **2.6.2 Filtering framework**

Baguma et al. (2009) have created a framework for making the WCAG guidelines easier to use and to make it easier to find advice for how to implement them. They argue that the all-in-one view that the WCAG guidelines currently offer makes it difficult to find the information that different practitioner groups are searching for. Their framework offers a filtering engine for the all-in-one view, using CSS and Javascript, to create several different interface options depending on the context of use. The paper cites Donnelly and Magennis (Cited in Baguma et al., 2009) saying that “users of Web accessibility guidelines want information that is tailored to their roles and responsibilities.” (p.2). So Baguma et al. selected four different contexts of use: level of use; type of disability; web page component; and, structure of the document. They created a prototype and tested it with good results.

### **2.6.3 The Accessibility Evaluation Assistant (AEA)**

The Accessibility Evaluation Assistant (AEA), is an educational knowledge management tool to support novice evaluators, developed by Pearson et al. (2011).

Pearson et al. (2011) write that conformance reviews against WCAG 2.0 are too complex for a novice. AEA is based on established accessibility principles taken from a range of guidelines, evaluation methodologies and the authors' experience. It is not an automated tool, but it uses other automated tools where appropriate. AEA contains three types of evaluation:

The *Check Categories* which contains 48 checks and two ways of filtering these checks: by User Group and Site Features. The 48 checks are further divided into five categories. *Design Checks* deal with the visual presentation of the web site. It relies on visual examination of the site. *User Checks* evaluates the site manually by interacting with the site. Automated tools are not usable for these checks. *Structural Checks* ascertain correct implementation of semantic information about the content. *Technical Checks* deal with validating coding elements such as HTML and CSS. The last category is *Global checks* that deal with things that concern the whole site. The User Group evaluation filters these checks by the needs of 10 different disability groups. Site Features filters the

checks by focusing on specific site elements such as forms, images, links, tables etc.

AEA provides a structural walkthrough approach that contains a step-by step walkthrough for each check. It gives information about the user group the check is for, the nature of the barrier, and the procedure for checking and verifying the issue. It also provides a video demonstration for each check.

The authors tested the tool and concluded that “The AEA is successful as a means to encourage students to articulate and justify their decision, consider the accessibility implications of each check in more detail and assist the tutor in giving feedback about erroneous decisions.” (Pearson et al., 2011, p32).

This was only an initial study, however, and the authors intend to study it further to validate the tool.

#### **2.6.4 Hera FFX**

Hera FFX is a Firefox add-on that carries out a semi-automatic evaluation of the accessibility of a web site being browsed. First it carries out an automatic preliminary evaluation, and then it allows the user to analyze the results as well as allowing the user to do a manual evaluation (Fuentes et al., 2009). The first version covered WCAG 1.0, but an ongoing process of upgrading it to cover WCAG 2.0 was presented in 2011(Fuentes et al., 2011).

#### **2.6.5 AChecker**

AChecker is an open source software that can evaluate web sites with several different standards. Gay and Li (2010) write that with a fully automated checker not every potential barrier will be checked. “Anywhere that meaning is being reviewed, for instance, *a human must make a decision.*” (Gay & Li, 2010, p.1). This is the case, for example, when evaluating whether a link text makes sense or an image attribute HTML tag accurately describes the image. AChecker solves this by highlighting where possible barriers may be, and having a person manually check if there actually is a problem. For example, a link text that only contains two words is more likely to not make sense, although there can also be cases where it does. AChecker can not check for everything. It can not,

for example, check if an embedded movie file is captioned or has an audio description file because the technology necessary to do this is not available yet. AChecker, however, has a feature where checks can be manually added to the system. Since AChecker is open source, movie captioning and audio descriptive file checks can be added by the open source community when the right technology emerges. The authors admit that the AChecker does not test for every barrier, but they hope that the users of the system will help to develop it further.

## 2.6.6 Waat: Personalized Web Accessibility Evaluation Tool

The Personalized Web Accessibility Evaluation Tool (WaaT) is a part of the EU ACCESSIBLE Project (CONSORTIUM, n.d.). It was created by Oikonomou et al. (2011) and is a semiautomatic web accessibility evaluation tool. It is aimed at “enabling, designers, programmers, evaluators, disability group users, etc., to conduct specialized semi-automatic accessibility assessments focused on specific disability types, assistive technologies, platforms and/or contextual conditions” (Oikonomou et al., 2011, p.1). Integrated into the tool is the W3C Markup Validator and CSS Validator which also checks the code for general mistakes. The output of the tool is a number of errors and warnings discovered on the checked web page, along with assistive tips to correct them. The results are also grouped into the priority level of the corresponding WCAG 2.0 success criteria. A report is produced in both machine readable RDF format and human-readable values PDF. Figure 4 shows the start up window for the desktop version of the tool. An in-browser version is also available.

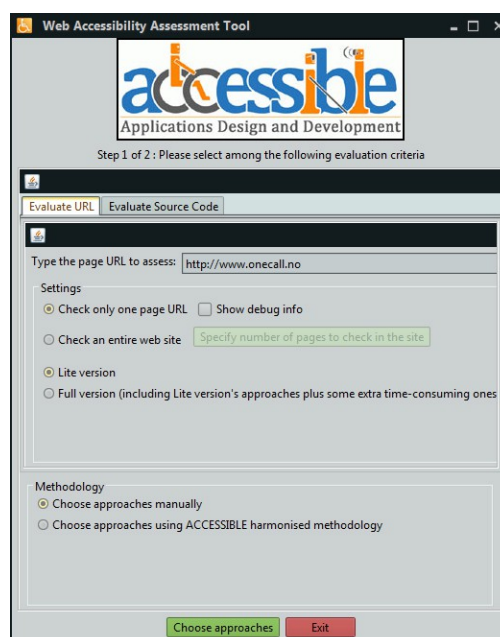


Figure 4: The initial window of the Waat tool.

### **2.6.7 Summary**

Several tools and one methodology for evaluating or creating accessible web sites were presented. It was recommended that there not be a sole reliance on these types of tools, since the tools often miss important accessibility faults, and the standards also require human evaluation.

## **2.7 User Testing**

Wattenberg (2004) writes that *The Digital Media Access Group* at the University of Dundee, Scotland, had a research project where they tried to develop a single evaluation tool that could help developers create accessible web sites. They did not, however, find a single tool or process that could achieve this. There were too many possible combinations of technologies, design attributes, and applications for one method to work in all situations. Computer users capabilities were also too complex for one method to ascertain usability for all people. The best method of determining the extent of accessibility and usability of a product, according to Wattenberg (2004), is to evaluate it by observing people using the product. In other words: user testing.

Theofanos & Redish (2003) write that even though US federal agencies are required to provide access to electronic information to people with disabilities, just meeting the accessibility standards required in Section 508 does not mean that the web site is usable. And if a web site is not usable it is not really accessible.

They performed a research study where they observed and listened to 16 blind users as they worked with web sites using the screen readers they worked with regularly. The participants worked with the researchers in two hour sessions, which began with a few questions about expectations and how the participant typically worked with web sites. During the session they were asked to complete scenarios suggested by the researchers. At the end of the session they were asked about reactions to the experience and specific sites they visited. The researchers wanted to understand how blind users work with web sites and what that means for designers and developers. The results were put into guidelines that can help designers and developers meet not only the letter of the law but actually make web sites usable to people who listen to screenreaders. For example, one of the findings was that screenreader users scan with their ears instead of their eyes and this is presented as a guideline (Theofanos & Redish, 2003):

**Guideline 1.** Write for the Web. Write in short, clear, straightforward sentences. Use bulleted lists. Put the main point at the beginning of a paragraph. Write links that start with keywords.

This guideline makes sure that screenreader users do not have to, in the worst case scenario, listen to the entire content of a page to get to the information he or she is after.

Other examples from the results of the study are guidelines 6 and 7 (Theofanos & Redish, 2003):

**Guideline 6.** Write “home page” as two words.

**Guideline 7.** Do not make up unusual names for products, services, or elements of a Web site. Do not combine two or more words into one name. (Of course, these names often predate the Web site, and designers and developers cannot change them. Just do not add to the problem—and alert others to the problem as well.)

These guidelines refer to the issue of how screenreaders pronounce or *mispronounce* words.

Rubenstein & Hersh write: “In the absence of detailed information, we all work from assumptions about who the user is, what he or she does, and what type of system would meet his or her needs. Following these assumptions, we tend to design for ourselves, not for other people.” (1984, cited in Theofanos & Redish, 2003, p.51). Observing, listening to, and talking with representatives of the target audience is critical according to Theofanos & Redish (2003). “To truly meet the needs of all users, it is not enough to have guidelines that are based on technology. It is also necessary to understand the users and how they work with their tools.” (Theofanos & Redish, 2003, p.51).

### **2.7.1 Summary**

Due to the complexity of the accessibility issue it is very hard to create one tool or method that covers everything. The best way to make sure that a product is usable and accessible is to perform user testing. Through user testing, not only legislative requirements are measured, but also usability issues, that when addressed, can increase accessibility beyond the requirements.

## 2.8 Education

The lack of accessible products and services can be attributed to a number of factors, but one important issue is the lack of knowledge among designers and developers about how to develop accessible technologies, or even awareness of the need to develop them (Waller et al., 2009).

Poor et al. (2009) performed a study where a project that included an accessibility component was given to students taking a class in usability engineering. On the first and last day of the course the students were asked to fill out a questionnaire where their attitudes towards accessibility was measured. The results showed that the course increased the awareness of the students on issues related to accessibility and usability.

The School of Computing at the University of Dundee is an internationally recognized centre for the development of assistive technologies for disabled people. Waller et al. (2009) write that courses where students have experienced the needs of disabled users through the use of assistive technologies have been effective. Normally accessibility as a topic is not fully integrated into the wider curriculum, e.g. it is only taught as a special topic in an HCI course. Taking advantage of the resources available at the University, knowledge and experience with accessibility has been integrated throughout the entire education of the School of Computing students. For example, students are taught that the needs of older and disabled people are an integral part of usability. Students are expected to view user diversity as the norm and regular coursework is marked down if user diversity is not considered. In the Software Development course user diversity is discussed when considering user needs, and the students are in general encouraged to consider the reasons for why accessibility is important, for example, in terms of legal implications, good design, technical reasons and commercial reasons. The curriculum for the undergraduate program is shown in table 8.



Table 8: Curriculum for The School of Computing's undergraduate program.

<b>Undergraduate Curriculum</b>	
<i>First Year</i>	Explicit teaching of accessibility in introductory modules on software development and data structures
<i>Second Year</i>	Accessibility issues in year-long Information Technology and Applied Computing modules
<i>Third Year</i>	Accessibility taught in HCI and Internet programming modules, along with practical experience and team projects
<i>Fourth Year</i>	Research Frontiers modules and individual Honours projects

The School of Computing at the University of Dundee also educates beyond graduate programs. One example is staff members who develop online resources. Some of them may be unaware of web accessibility or are too busy to develop skills, so the University tries to provide the best authoring tools they can get to reduce the need for post hoc evaluation and repair (Waller et al., 2009).

Not every university has a research environment focused on accessibility issues and Weber & Abascal (2006) suggest that educators share their teaching materials concerning accessibility, and experiences with them, in some form of a database. This can then support lecturers when they build new accessibility focused courses.

### **2.8.1 Summary**

There is a need to educate designers and developers about accessibility issues. This can effectively be done by introducing these issues into projects for students. Even more ideal is the integration of these issues into the whole education of computer science students. There is also a need to educate beyond graduate programs, for example web content authors at universities. A good help for lecturers creating new courses focused on accessibility issues, could be a database where educators can share their teaching materials on the subject.

## **2.9 Economy**

According to Putnam et al. (2012) designing to include a more diverse user group is not only an altruistic ideal; it also makes sense financially. They report that The World Health Organization (WHO) estimate that about 10% of the worlds population lives with a disability (about 680 million). They are the worlds biggest minority, and the disabled population in the US alone is estimated to have a discretionary income of \$220 billion. This is also supported in Theofanos & Redish (2003).

Loiacono (2004) conducted a study of the Fortune 100 home pages. The results indicated that, based on the Section 508 criteria, 94 percent of the Fortune 100 companies did not provide fully accessible home pages. Loiacono (2004) writes that there are several demographic trends that will dramatically increase the number of potential customers with disabilities. The first trend is a sizable aging and affluent middle-aged population that will begin to experience declines in physical mobility. This will increase the attractiveness of online versus brick-and-mortar purchases. This demographic will also likely develop chronic health conditions such as hearing loss, and impaired vision. That will cause obstacles for using the web. The second trend is that medical improvements have boosted the survival rate of children born with or suffering from disabling injuries. This demographic will grow up to become adult consumers with all the purchasing power that this entails.

### ***2.9.1 Cost of applying WCAG 2.0 in Norway***

Difi (2010) developed an impact assessment report that describes the estimated cost of upgrading existing web sites or making new web sites conform with the ADA§11 regulation, WCAG 2.0 level AA. They divided the costs into four categories:

- Cost of acquiring new content management systems,
- Cost related to continuously publishing content,
- Cost related to transferring old content into new content management systems, and
- Training of the people who publish content on the web site.

Difi (2010) reports that normally content management systems are upgraded every 4-6 years, and since the existing systems have until 2021 to conform to the WCAG standard, most systems will be upgraded by that time. They assume that the cost of getting universally designed web sites will be highest during the first years after the regulation takes effect. And after some time, when suppliers have built up expertise on the subject and WCAG 2.0 is embedded into products, the competition between suppliers will push the additional costs down towards 2021. Difi (2010) writes that Standards Norway<sup>5</sup> have estimated that the cost of upgrading existing web sites to a WCAG 2.0 AA level will cost 737 million kroner; 103,8 million of that accounts for government web sites. Costs of procuring new content management systems is estimated to 380 million kroner, about 10 000 kroner per business assumed to be covered by the ADA§11 regulation.

The WCAG standard may cause publishing content to take a little more time than before, but the estimate of this cost is set to negligibly low, provided that the content management system supports ATAG 1.0 and that some training is given to ensure that the WCAG 2.0 requirements are followed. Most modern content editors follow the ATAG 1.0 demands and are reasonably known by content publishers according to the report. One area that may cause a significant amount of cost though, is multimedia content. Depending on whether multimedia content is considered a principal activity of a web site, the cost of transcribing audio and video can be quite high. With today's technology the hourly rate of subtitling video will be 9000 kroner, and for transcribing audio 720 kroner. One of the areas of the government where this can account for a significant amount of money, is in multimedia broadcasting of municipal council meetings. This is estimated to cost 52,3 million kroner in total for all the municipalities in Norway.

The cost in the government sector for transferring content from old to new systems is estimated to 5,9 million kroner. For the private sector the cost is estimated to 1,3 million kroner. The reason for why the estimate is higher for the government sector is that it is assumed that there is more old content there that needs to be transferred to new systems than in the private sector.

For the training of content publishers the report suggests that an e-learning course is developed so that it can be taken at any convenient time and there will be no need for travel costs. An e-learning course will also allow content publishers to go back and repeat parts of the course if needed. The

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<sup>5</sup> Standards Norway is a private and independent member organization that publishes about 1200 new Norwegian Standards(NS) each year. They are the Norwegian national member of the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN), (Norway n.d.).

estimated cost of creating an E-learning course is 2 million kroner. The cost for the training in the government sector will then be 6,4 million kroner, and 65,9 million kroner for the private sector. With traditional courses the estimate for the government sector will be 26,9 million kroner, so an e-learning course is considered more cost reductive.

The report acknowledges that the estimates are uncertain. One of the reasons for this is the long time span of the introduction of ADA§11. Another reason is the uncertainty of how “main solution” should be interpreted. There are also no statistics available on the total costs of the procurement of content management systems in the government or private sector.

### **2.9.2 User, Service Provider and Societal Gains**

In the Difi (2010) report several gains of ADA§11 are listed. They are sorted into gains for the *user*, *service provider*, and, the *society*. Gains for the *user*, for example, is the possibility of increased independence and societal participation. Mastering a task without external help is a fundamental prerequisite for an independent and free person. In addition to having other areas such as buildings and transport accessible, WCAG 2.0 can make it easier for people who are disabled to participate in the labor market. Saving time is also a gain. When the websites a user needs to access becomes accessible, a lot of time will be saved. Another possible gain can be that when assistive technologies communicate better with web browsers, the user may have less need for a personal assistant (Difi, 2010).

Gains for *service providers* can potentially be time saved by making accessible solutions early on so that there is less need to have direct contact with the public, and perhaps some resources now being spent on customer services can be reallocated to other tasks. The second gain mentioned is that when more customers are reached there is more money to be made. There could become an increase in trust towards a service provider when they follow the WCAG 2.0 standard, similar to the effect environmentally friendly stamps have had with customers. Web sites that follow WCAG 2.0 will also increase their ranking in search engines since there is a focus in the standard on marking and structuring content semantically.

*Societal* gains also include saving time. When government web sites become accessible to more people, less time will have to be spent on one-to-one contact with them. Information on web sites

that follow WCAG will also be more available for people who don't have special needs. Difi sites Fuglerud, saying that 60 percent of the US population will likely benefit from accessible technology (Fuglerud, n.d cited in Difi, 2010). The WCAG standard will also be an important effort to provide equal opportunities and rights. Increased income for *service providers*, caused by reaching more customers, and the effect of some disabled people now being able to enter the work force will also increase the tax money and benefit the society. Diminishing the technological gap by making the internet more accessible will mean that disabled and elderly people can be included on the same basis as the rest of the population.

Difi (2010) write that it proved to be difficult to quantify the gains recognized in the report. They write that the gains will no doubt be significant for *users*, *service providers* and the *society* as a whole. They also claim that the gains will be bigger than the costs.

### **2.9.3 Summary**

It makes good business sense to make web sites accessible. Demographic trends combined with the existing disabled population in the world show that this is a large minority that has a significant discretionary income and is a part of the working force. They will also have a better opportunity to participate in the working force with accessible web sites, creating even more income and purchasing power.

There will be a cost in Norway to make private and government sector web sites accessible, but the gains are also significant. Not only will businesses gain access to a new section of the population, but more users will be able to feel more independent and have equal access to online services. All in all the gains are estimated to outweigh the costs.

## 3.0 Method

This chapter outlines the methods that have been used in this research. The methods are: desk research resulting in a literature survey, interviews and a web site assessment using a semi-automatic tool.

The research questions for this research are:

1. How has web accessibility legislation been introduced and received in other countries?
2. How is Norway dealing with web accessibility legislation?
3. How are web development professionals addressing web accessibility laws?

To answer the first research questions, desk research that resulted in a literature survey was carried out: a literature survey that was focused on gaining experience from other countries with similar legislation. To answer the second research question interviews, combined with findings from the literature survey, showed how Norway is dealing with web accessibility in comparison to how other countries have dealt with similar legislation. To answer the third research question the literature survey examined web practitioners attitudes towards web accessibility laws in other countries, and web professionals in Norway were interviewed. A web site assessment was also conducted to provide input to the first and second question by showing the need for such legislation.

### 3.1 Desk research

According to the [businessdictionary.com](http://businessdictionary.com) desk research is defined as “gathering and analyzing information, already available in print or published on the internet” (BusinessDictionary.com, 2013). The desk research conducted in this research project was a literature survey that looked at research and conference papers, as well as legal web sites for different countries and some books about web accessibility and usability. The information that was gathered was categorized into nine themes and presented in the literature survey.

### 3.1.1 Literature Survey

According to Oates (2012) a literature survey has seven different activities: *searching*, *obtaining*, *assessing*, *reading*, *critically evaluating*, *recording*, and, *writing a critical review*. The first step, *searching*, involves defining key search words. They are then put into a phrase. Then the phrase is split into separate concepts, and alternative terms for the concepts in the phrase must then be found to ensure that as much information as possible is found.

The next steps in the process are described by Oates (2012): *Obtaining* the information can be done in a library, but also on the internet. The information must then be *assessed* to see if it is from a good source. Then it must be *read* by “gutting” the text quickly, for example, by focusing on the abstract, introduction and conclusion. The information must then be *critically evaluated* to see if the information is valid in itself and if it adds something to the research project. The material that is being read and evaluated must be *recorded* and kept in order in some way. Lastly, a *critical review is written* that gathers and presents evidence from the information, creating some new knowledge.

For this research project the key words “Universal Design”, “Web Design”, “Interaction Design”, “Inclusive”, and, “Accessibility” were defined. They were then put into topic phrases: “Interaction designers attitudes about accessibility in web design”, and, “Legislation and Accessibility”.

Concepts from the first topic phrase can be found in table 9, and their alternative terms can be seen in table 10.

*Table 9: Concepts from the topic phrase: Interaction designers attitudes about accessibility in web design.*

Concept 1	Concept 2	Concept 3	Concept 4
Interaction Design	Attitudes	Accessibility	Web Design

Table 10: Alternative terms for the concepts from table 9.

Concept 1	Concept 2	Concept 3	Concept 4
Interaction Design	Attitudes	Accessibility	Web Design
User Experience	Beliefs	Universal Design	Front End
System Architecture	Experiences	Inclusive Design	Developing
	Prejudice		
	Motivation		

The first search was conducted on ACM, an online database where articles were obtained through an account for which the University of Bergen pays. The search was based on the key words: “Accessibility”, “Web Design” and “Interaction Design”. The search resulted in 465 articles. All the articles were then scanned and assessed, with a focus on the main title and the abstract. Forty-six articles were then elected by evaluating the source and if the article contributed something to the research. More searches were conducted, with other concepts, keywords from articles that came up in previous searches and on other online databases such as Springerlink and Web of Science. References from articles that were found were also used to find additional information. Notes about the different articles were recorded, and the bibliography was entered into Mendeley, a citation tool with a web browser and word processor plug-in. The material was then categorized into different subjects that were relevant for this research project. The categories were changed and refined as the work progressed, and in the end nine categories were left. Oates (2012) suggests creating a matrix that maps which papers cover which concepts. This was done with the papers that were used in the literature survey presented in chapter 2 and can be seen in Table 11. Only articles and conference papers were included in the matrix.



Table 11: Topic matrix for the literature survey.

	What is Accessibility?	User Diversity	Web Accessibility Legislation	Guidelines	Practitioner Attitudes	Tools	User Testing	Education	Economy
Aslaksen, 1997		*							
Baguma et al., 2009						*			
Burgstahler, 2011	*	*							
Conway, 2011			*						
Eika Sandnes, 2011		*							
Freire, Russo & Fortes, 2008					*				
Freire, Russo, Cibebe & Fortes, 2008					*				
Fuertes et al., 2009						*			
Fuertes et al., 2011						*			
Gay & Li, 2010						*			
Goldstein et al., 2011	*		*						
Krug, 2006	*								
Lazar et al., 2012			*						
Lazar, 2010			*						
Lazar et al., 2004					*				
Lazar et al., 2005			*						
Leitner & Strauss, 2010					*				
Loiacono, 2004									*
Loiacono & Djasmasbi, 2011					*				
Lopes et al., 2010					*				
Newell & Gregor, 2000	*								
Oikonomou et al., 2011						*			
Pearson et al., 2011						*			
Poor et al., 2009								*	
Putnam et al., 2012									*
Shculz & Skeie Fuglerud, 2012						*			
Shneiderman, 2000	*								
Theofanos & Redish, 2003							*		*
Vigo et al., 2013						*			
Waller et al., 2009								*	
Wattenberg, 2004							*		
Weber & Abascal, 2006								*	

The nine categories are introduced in the literature survey in chapter 2. They are then analyzed and discussed in relation to the research questions in chapter 6.

### **3.2 Interview**

According to Oates (2012) an interview is a particular form of conversation between people that has a set of assumptions that do not apply to a “normal” conversation. Usually one person has a purpose for the interview and will steer the conversation to their topics of interest. There is also usually an agreement that what the interviewee says is treated as “on the record” and can be used by the researcher later.

Oates (2012) writes that there are three types of interviews: structured, semi-structured and unstructured. The form that was chosen for this research project was the semi-structured interview where you have a list of themes and questions to be covered. Rather than being concerned with the order of the questions, you let the conversation flow and can ask additional questions if the interviewee brings up issues you were not prepared for. Oates (2012) writes that “The interviewees are able to speak with more detail on the issues you raise, and introduce issues of their own that they think relevant to your themes”(p.188). This type of interview is used when the primary purpose is “discovery”, rather than “checking” and is not useful for drawing generalizable research conclusions. This is because you will not have responses about the same topics and the time requirement means that you will usually only have a small number of interviews to draw conclusions from (Oates, 2012).

Oates (2012) recommends scheduling the interviews for no longer than two hours and at a location where the interviewee feels comfortable, e.g. their office or home. It can also be a good idea to give the interviewees a list of topics or questions ahead of the interview so that they can be prepared, and that will also establish credibility for the researcher. An interview guide with the initial questions that were going to be asked was prepared for each of the interviews: see Appendix B. The interviews were scheduled to last around 30 minutes, and they were all finished within that time. The interviews were all held in the offices of the interviewees.

There are several ways to record an interview. Oates (2012) writes that you should not rely on memory alone, because memories are unreliable and prone to bias and error. The recording method

chosen for the interviews in this research project was digital audio recording. This method provides a complete record of everything that is said which allows the interviewer to concentrate on the process of the interview, the tapes can also be listened to by other researchers. (Oates, 2012) The interviews were recorded on an iPhone with a small microphone attached, and transcribed using the software ExpressScribe. The interviewees all signed a consent form that outlined the research project and stated that they gave permission for the use of audio recording (see Appendix B). Four out of 7 respondents asked for a citation check and were given a summary of their transcribed interview to review and check for errors.

Although it was not planned to hold group interviews, two of the interviews had 2 and 3 respondents and essentially became group interviews. According to Oates (2012) group interviews allow the group members to interact with each other and have group discussions that can bring up new insights that the individual members have not previously recognized. She writes that the positive aspects of group interviews include that they can help generate consensus views, generate more responses as one participant's views can be challenged by others or stimulate others to new ideas. There are also some disadvantages to group interviews according to Oates. Some members might dominate the conversation and quieter ones can struggle to be heard. Some may be reluctant to express their views in front of others and opinions that are voiced might be those that are deemed acceptable within the group. In the group interviews in this research the members were not chosen by the researcher. It appeared that the people who were contacted for the interview gathered the people they thought were necessary to answer the questions, and this was not a problem for the interviewer. There were no issues with one respondent dominating the conversation during the group interviews, the respondents all added different aspects to the topics that were discussed.

A synopsis and analysis of the interviews is presented in chapter 4.

### **3.3 Web Site Assessment**

To illustrate a few of the accessibility issues that the ADA§11 regulation addresses, and to show why the regulation is needed, an assessment of two web sites was conducted. The desk top version of the semi-automatic tool Waat (Personalized Web Accessibility Evaluation Tool) was used for the evaluation. Three examples from each website's assessment was presented and analyzed. The web site assessment are presented in chapter 5.

## 4.0 Interviews

This chapter presents a synopsis and analysis of the interviews. Four interviews were conducted. The first with a universal design expert and the second with the government agency that is going to supervise ADA§11. The last two were interviews with professionals who are affected by the law – one from the private sector and one from the public sector.

This section presents the questions and answers from the interviews, the next section presents a summary and implications are presented in the last section.

*Table 12: The respondents and their respective company and sector.*

Respondents:	Company	Sector
Respondent I	Include	Private
Respondent II	Difi	Public
Respondent III	Difi	Public
Respondent IV	Evry	Private
Respondent V	UiB	Public
Respondent VI	UiB	Public
Respondent VII	UiB	Public

### 4.1 Expert interview

The first interview was with an expert in universal design and was conducted on March 8, 2013. The respondent has a company that now primarily works on creating assistive technology, but has previously worked with individual facilitation and counseling for universal design. The respondent has counseled government agencies and municipalities and held courses for developers, partly to increase awareness and partly to show how disabled people use assistive technology. He has also given lectures and conference presentations on universal design. A semi structured interview guide (see Appendix B) was prepared for this interview, but it was only used towards the end of the

interview because the respondent first wanted to give his general view of the field.

The respondent began by talking about universal design's origin in architecture, that originally it only concerned the physical world. The challenge with this is, according to the respondent, that in IT you can make your own rules, even your own gravity. So there is a problem with taking something that applies to the rules of the physical world and transferring them to the virtual world, where the rules are different, he said. The respondent used the example of a ramp up to a door. In the physical world a ramp facilitates so that as many people as possible can get to the door. A baby carriage pusher can get to the door, and a wheelchair user too. In addition everyone else who walks can also get to the door, so it works for everyone, he said. From a universal design perspective, however, in a perfect world you would not make something for everyone, you would make something that fits us all individually. The respondent is afraid of the perspective in universal design that wants to find one solution for everyone. In that perspective the distinctiveness of certain impairments, and therefore the identity, disappears. Being blind is not wrong, the respondent said, "We have to take care of the fact that being blind means that we can use braille and have our own written language. There is a lot of identity attached to these things that may disappear in the hunt for the ultimate thing that everyone can use". The respondent also thinks that there is a tendency that instead of everyone having the best possible experience, everyone has it equally bad, with the help of universal design. "It becomes half good for everyone", he said. The respondent thinks that with IT the ramp from the physical world can be adapted. "When I identify myself with my capabilities, whether I am blind or long and thin, the entrance way will adapt to my needs to get through that door" he said. This can be done in the virtual world, "You can personalize things" he said.

The respondent's critical view of universal design is that individual adaptation becomes the counterpart to universal design. In the government's argumentation and in the hearing draft, individual facilitation becomes the counterpart, or what they are trying to reduce the need of with universal design, said the respondent. He thinks that individual adaptation should not be made into something that is wrong. "We need it, individual adaptation is great. Because in many cases and situations, my needs must be taken care of, isolated from the rest of the world", he said. We can not go from only having individual adaptation, to suddenly thinking that this is wrong and going over to only having universal design. That way we lose the individual or it becomes less valuable, and the respondent fears that this will happen.

“I think the ultimate universal design is personalization. Which is that web sites, computers, software know who I am through some kind of identifier, and adapts itself”, the respondent said. For example, if a young child uses a computer, the interface becomes simplified. “That is what I think is the ideal universal design, and it is not for all, it is for each one of us. I am trying to unite these two”, he said.

The respondent also thinks there are no universal people, and that that is one of the issues here. But he thinks that the intention of universal design is good, “I support everything that has to do with the intentions of universal design”, he said. The critique that has come forward towards the requirements of ADA§11 concerning WAI and exceptions from it, where people point out that this is not sufficiently accessible, is completely right, said the respondent. There will never be rules that cover everything. “So it is an ideal we are working towards”, he said, and when that ideal is suddenly supposed to be practically feasible, it will not work. “So I say we have to do these halfway good things through universal design, there is nothing wrong with it not being perfect, because we will fill up on the other side with individual adaptation, and then we will have what we need”, the respondent said. “I am not talking about replacing universal design with individual adaptation, I am talking about supplementing with it”, he explained. And the respondent is missing that perspective in the discussion.

On a practical level the respondent thinks that starting with the web is starting too high up. “If we think of this as a house, then you have in my book started pretty high up in the floors, and not thought about the foundations”, he said. There is a machine layer between the user and the interface. “If I am blind it does not help me no matter how universally designed this web solution is, if I cannot use my assistive technology here”, said the respondent. And this is important. “Universal design is not adaptation for people only, it is also adaptation so that machines and software can understand each other and *represent* audio for those who can not read or braille for those who prefer to read that”, he said. The respondent thinks that this perspective is not there. The focus is on the human perspective, the user, he said. Which is positive and not wrong, the respondent thinks. “We do this, not so that the disabled get access, but so that they can use their assistive devices”, said the respondent. In that way they get access. “There is a link here that is skipped”, he said. “And when we skip this link we forget to go deep into the technology, and we do not specify set rules for communication between technologies”, the respondent explains. That is why the regulations do not secure all people with disabilities, he thinks. There are many established standards today for

accessibility API's. "If we specified how this type of communication should happen, we could at the same time work on how this type of information should be presented, because that is what these WAI regulations are about first and foremost", said the respondent. "What colors are allowed, contrast ratios etc. This is important stuff. But if the technical perspective is not included, then we will not in fact help these users", he said. The respondent thinks that Norway could standardize communication protocols between assistive technologies. And that this discussion has not been had. "If we do not do this it will be an inferno in a few years when the law passes and the regulation is in place. And I think that we have not seen this inferno yet, it will come. And there will be a lot of issues because of the ambiguities attached to this", said the respondent.

Later in the interview the respondent was asked about how the company worked, or used to work, with universal design. One example was given where the respondent was asked to help review a standardized test for public schools (Nasjonale prøver) for universal design issues. One of the tasks was an english task where there was an image of a dog and an image of a hat and the students were asked to "Place the hat onto the dog's tail". According to the guidelines all images must have alternative text. So then the alternative text became "hat", "tail" and "dog" and the developers were happy with themselves, because the guidelines had been followed. But the pedagogical task had been ruined. Because what a blind person was tested on was whether he could drag the hat onto the dog's tail, not if he had understood what a hat was, or a tail or a dog in the image. This shows one important thing: "We have to understand why the guidelines are like they are. Because then we can do two things. We can use them properly, but we can also choose not to use them when we see that they do not serve their purpose. Because the WAI guidelines are not always correct", said the respondent.

On a comment from the interviewer that these are exciting times for universal design, the respondent said that this was not the case in his view. There is a paradox in that these are exciting times but also very boring times, he said. "I do not think we are having the interesting discussions", said the respondent. He thinks that the discussions going on today were also going on around the millennial shift.

Towards the end of the interview questions about information given by the government were asked. The respondent said that the information was fine, but that it was a bit awkward because of the long time period that had passed. And he thinks that part of the reason for why the government spent a

long time on this is because they were not looking at some important parts of the issue, and so the discussions were about the same things as many years ago. On the question of how he got information about the law, the respondent answered that he got it through his network of people who are interested in the topic. But that he thinks that the question should be asked to people who are not in their camp, but are still affected by the law. The respondent thinks that most of them do not have a clue of what the law is about, and that they will probably only see increased costs.

In conclusion the respondent said that he unfortunately thinks that we need this law. “In principle I am very much against this law, because it is an admission of failure for our own inability to include other people. That we need a law to tell us that we have to include others is sad, but when we first need it it is ok that it is coming”, he said.

## **4.2 Supervisory Authority**

The second interview was with The Norwegian Agency for Public Management and eGovernment (Difi) on May 31, 2013. They are tasked with the supervision of ADA§11. There were two respondents present in this interview. They will be called respondent 1 and 2 here.

The first question concerned the agency's role in the first year after the ADA§11 regulations comes into force. At the time of the interview the regulation had not yet been finally approved and so respondent 1 said that they were currently preparing for their role, and that when the regulation comes into force they will take on the role of a supervisory authority according to the law and the Ministry of Government Administration, Reform and Church Affairs. The first year the agency will be focused on giving information and providing support for those who are affected, said respondent 1.

The second question asked if they had a strategy for spreading information about the regulation. Respondent 1 answered that they up until now had not done a lot of that. They had not officially been given the responsibility of supervising the law yet, and thus had no extra resources for this. Respondent 2 said that the agency had an e-mail address and a web site where people could get information and ask questions. They had also given information about the regulation at several conferences. The purpose of not having the regulation be in affect until after the first year is to give those who are affected by the law time to comply with it, and so they have to be given information



and guidance about the content of their duty to fulfill ADA§11, said respondent 1.

One of the things the agency was doing at the time of the interview was preparing a new web site that will provide information about ADA§11. The web site “will be our main channel for information and guidance in this field.” respondent 2 said. The agency may also after a while hold courses and conferences, but this was at the planning stage at the time of the interview. “This will be a step by step start.”, said respondent 2. Respondent 2 also said that “It is clear that as a supervisory authority we have a duty to inform about the regulation and make it known. So that will be an important part of the authority’s strategy.”

The support material being made is about guiding the process of making a universally designed web site. It will also include guidance about the regulation. For example what the end user has a right to expect, and where that person should go to report issues. Also how they should relate to Difi as a supervisor and the Equality and Anti-discrimination Ombud<sup>6</sup>, said respondent 1.

The next question asked whether they had included the end user when developing the support material. The answer was that on the support web site they had included the user groups they considered to be the main users. First and foremost web developers, but also business owners, designers and developers. The people who will use their guide to get their own web system up to the standard it must have. “The end user is relevant here, but not the primary target group for the guidance material that we are working on now”, said respondent 1.

Then they were asked if there was anything concerning user testing in their support material. The answer was yes. “I think that user testing is incredibly important. It is the way that you can be completely certain that your solution actually works, and you can uncover problems that do not work and that you cannot get with only reading WCAG”, respondent 1 said. “I have personally done user tests with people who have an impairment, and you get a completely different experience of how your web site works, how your service works, by pulling in the users”, said the respondent. Respondent 1 also said that the regulation only demanded WCAG 2.0 with level AA compliance with a few exceptions, so that is the minimum demand. They recommend user testing on top of that.

The next question concerned the definition of new and existing solutions in the text of the law.

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<sup>6</sup> The Equality and Anti-discrimination Ombud will handle complaints concerning ADA§11. (Difi n.d.)

Respondent 2 said that the regulation of the law had not yet been approved so they did not yet know the exact wording, but they were of course going to work on the definition. “We envision that this will be something that must be considered when we get practical problems on the table”, respondent 2 said. “Then we have to consider if this is new or not. And then a level will be developed through the concrete cases we get for assessment”, the respondent explained. Respondent 2 also said that they would work on giving more precise guidance on this issue.

When asked about how they are going to find those who do not follow the regulation, respondent 2 answered that first they have to build up a knowledge base of the field, about the different ICT-solutions, where they are and their scope, etc., and based on that knowledge they will consider how they as a supervisory authority should align themselves to achieve the purpose of the law to the greatest extent. “So the first part of the process is to give information and guidance, and parallel to that build up a knowledge base to make good assessments”, said respondent 2.

The next question asked what the consequences will be for not following the regulation. Respondent 2 said that other than their possibilities they had not defined anything yet. When asked to explain what she meant with the word possibilities the respondent answered that she meant the possibilities derived from the regulation. For example a rectification order, or if the business does not rectify the issue, a coercive. Respondent 2 also said that it will be as important to motivate businesses to follow the regulation, “To give them an opportunity to fulfill the requirements, by having good information and guidance”. Respondent 2 was also asked to further explain what a coercive will mean in this context. “It means that they can receive a running demand, a running coercive”, she said. When asked if it was like a fine, respondent 2 said that it was similar to a fine, but more like a monetary claim. “First they will get a rectification order, and then a new deadline, and if they do not follow these deadlines we can consider giving a running coercive”, respondent 2 explained. The amount of money in the running coercive, however, will be decided at a later time, said respondent 2.

Lastly the respondents were asked a question that was based on the previous interview with the expert in universal design. The question was about a criticism of the regulation: that there are no standards concerning a lower technical level for communication between assistive technology and computers. Respondent 1 said that the regulation regulates the part of a user interface that businesses use to communicate with the users, and in that sense, it would be relevant to have

standards for communication with assistive technology. Respondent 1 also said that you have to start somewhere, and that it might be most appropriate to start with the part that will have the biggest impact. The part of the solution that reaches the most people, which is the front end code that can be opened in a browser. Which can be used without using assistive technology, he said “But, to be honest, this is not a problem we have thought that much about.” said respondent 1. Respondent 2 said that this issue has not been their concern, they as an organization have been dealing with the draft of the regulation. Respondent 2 also said that the regulation is assumed to be further developed quite often, and that the input from the expert will be brought along and be assessed. As new standards are introduced they will also be assessed, and new technical development and user input will be considered in the development of the regulation, said respondent 2. Respondent 1 mentioned that in the case of self service machines it would be an innovative concept if the self service machines were able to automatically communicate with the users' assistive technology. Respondent 1 also said that the last WCAG 2.0 guideline (guideline 4.1 Compatible: Maximize compatibility with current and future user agents, including assistive technologies) demands that a web site should be machine readable by user agents like web browsers, screenreaders, assistive technologies etc. So respondent 1 thinks that guideline touches upon this issue.

A follow up question was sent to the Supervisory Authority in October 2013 via email. The question was if they had looked at experiences from other countries about implementation of web accessibility legislation?, and if that was the case, which countries? Respondent 1 from the interview in May answered that they had looked at legislations from other countries and linked to the consultation paper for the Norwegian regulation (FAD, 2012). The consultation paper did not contain anything about the implementation of the different countries laws, only what their laws entailed and how they were supervised.

### **4.3 Private sector, Evry Consulting**

The third interview was conducted on September 23, 2013 with a respondent that works for the IT-consulting company, Evry Consulting in Bergen.

The first question asked what experience the company has had with universal design. The respondent answered that they had not had much experience with it, but that they have had a few

customers who have had this as a requirement or focus area, typically from the public sector. They have worked with The Competition Authority where accessibility was an issue, and now they are working on a new project for The National Institute of Nutrition and Seafood Research (NIFES), who are making a new seafood portal. They are affected by the requirements of ADA§11 since they are starting the project at this point. So this will be the first real project we are running in-house where accessibility is a focus area the whole time, said the respondent. Other than that has been up to the customers that the consultants are placed with, whether they have focused on accessibility or not. The respondent is currently placed with DNB, and she said that two years ago they were making a new personal bank where accessibility was mentioned but did not become a priority. And now they have a project there about accessibility, so they have had to go back and redo a lot of things. It would have been easier to do a lot of those things in the first place, said the respondent.

Some parts of the second question was answered in the first question, but the respondent clarified that the type of customers that requested accessibility were typically from the public sector. The respondent also thinks that they will see customers requesting accessibility more and more as people become aware of what it actually means. “My impression is that there is still not a lot who knows what it actually entails”, said the respondent. “We have not heard much in sales meetings really, beyond public sector customers”, she continued.

The next question asked how the respondent heard about ADA§11. The respondent answered that she really does not know. No information about it has come to me, said the respondent. No one has come to me and told me anything about it, she continued. “I have just picked it up, I think. Read it on Digi or, yes a bit randomly maybe” the respondent said. The respondent also said that they had talked a bit about it at the DNB project. But the respondent thinks it is more about her being aware of it, because she likes to stay updated on things like this, than anything received from public discussions. It has not been very well communicated out to us, she said. The respondent said that they had talked about it a few weeks ago at the company, but that no one from management had heard about it.

The following question asked whether the company had noticed anything after the requirements were put into force this summer. The respondent answered that no, they had not noticed anything. The interviewer then referred to the NIFES customer previously mentioned, who required accessibility, but the respondent said that that project had started before the summer. The

interviewer then asked whether NIFES required accessibility because of the law, and the respondent said that she thought so.

The next question asked if they were going to brief their customers about the regulation, or whether they would leave it up to the customers to require it. The respondent said that they would have to be professional and inform their customers themselves. She also said that they would first have to learn about it internally, and then have it be a subject in bidding processes and customer meetings. They will have to keep focusing on accessibility, because if they do not, it is bound to backfire on them, said the respondent.

Then the respondent was asked how she thought ADA§11 would affect the company. For example getting more customers or needing more employees. The respondent said that she thought that they will not get more customers or need more employees because of this. She thinks accessibility will be like a base layer, and that it will not mean anything because of the long deadline for existing web sites. “I cannot envision an avalanche of customers now who want to upgrade”, said the respondent. The respondent does not think it will have a big impact in that way.

The next question asked if the company had any employees with expertise in this area. The respondent answered yes to that question. “We had a course last week with Funka<sup>7</sup>”, she said. There were about fifteen employees who attended the four-five hour course, said the respondent, and that course is a cost that the developers have to take, as a part of their professional toolbox, she continued. “You cannot ignore it”, she said. “We cannot push that cost onto the first customer that comes after. We cannot take a million more because all the developers have to learn about accessibility”, the respondent continued. The person who is the head of the NIFES project has focused on this and is trying to learn more, and he will share his experience with others, said the respondent. The course they attended was very good, and the person holding it was very good at creating an awareness about why they had to do this, and not just because it is the law, said the respondent. The interviewer asked if they learned about any tools in the course, and the respondent said that they talked about it a little bit, but that there was no demonstration of any tools.

The last question asked if they used any tools in the company when working with universal design. The respondent answered that they did, but that it was up to each person what tool they knew and

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7 A company that among other things offers courses, analysis and training in Universal Design. (LDO n.d.)

used and that it was different for each project. The respondent said that she usually uses validators and things like that when she is working with code. But she also said that the goal will have to be to follow the minimum standard of the law, and that in the DNB project they are using WAI ARIA as well to get the product to work at all. The respondent also said that they are probably going to have a more specialized course about universal design after Christmas.

The respondent said that accessibility has not been a focus area because they have not had a specific project in-house where this has been focused on. But that now they will get that with the NIFES project, so then they can look at their experiences from that project to see what works and what does not work. The respondent also said that some of the different groups of professionals in the company would not have that much focus on this area, like the back-end developers. And that groups like the User Experience (UX) designers would maybe have a different focus on accessibility. For example with regards to user testing, which they already perform at the company, that now perhaps will get a new layer.

#### **4.4 Public sector, University of Bergen**

The fourth and last interview was conducted on October 7, 2013 with three respondents who are working on the new web pages and content management system for the University of Bergen (UiB). The respondents will be called A, B and C here.

The first question asked what experience the respondents had had with universal design of web sites. Respondent A answered that the previous platform they switched from was universally designed. And that both in the development of the new platform and in the training of the personnel who will be publishing content there has been a focus on universal design, respondent A continued. In the training we give advice to the content publishers about how to work with formatting text and putting alternative text on images, so that they will be perceivable for blind or visually impaired people, respondent A explained.

The interviewer asked if they had standards before ADA§11 since they are a public institution. Respondent B said that they were not a part of the development of the old system, but that she thought that was the case. Respondent C said that it was a part of the specifications for the old solution from 2009. Respondent C said that there was a requirement in the old system but that there

is two things with this: The universally designed system as it is, and how the content publishers use that system, with regard to alternative text and links. Respondent B said that they have seen that people become better at publishing universally designed content after they have had training. We have strongly pointed out and explained why they have to do these things, respondent B explained. Some people write “woman” as an alternative text to an image of a woman, and some write more descriptive texts. But at least they write something and that is because we focus on it, said respondent B.

The interviewer asked if they were talking about everyone who publishes content at UiB. Respondent B said that yes, every content publisher is supposed to go through training on this subject. They receive training for the system itself and how they should format text so that it becomes universally designed. We touch on issues such as not using headings unless the text is a heading, not for when you want the text to be bigger, respondent B explained. But then respondent A said that with around 900 content publishers, not all of them are active and some have not received training in a long time. So the challenge becomes to make a publishing solution that takes into account that people are not aware of the requirements.

Respondent C said that they had the old version of their learning platform (MiSide) analyzed for issues with universal design. After it had been in use for a while a consultant was hired to go through the system and look for challenges and errors. The issues he found were followed up and put into the system. Respondent C also said that there is a close collaboration with a woman who works for UiB and is the head of the committee for universal design there. She is visually impaired and respondent C said that they had been given a demonstration of the assistive technologies that she uses.

Respondent C said that with the new system the specifications for universal design are in the content management system itself. So if you write a headline in the headline field it automatically becomes H1. “These things go by themselves”, said respondent C. Respondent B, however, said that in the text field you have to format the text yourself.

The next question asked how they heard about ADA§11, and if they had received any information from the supervisory authority(Difi) or the government. Respondent A said that she could not remember if they got the information from Difi first or if some of the staff were extra observant and

picked it up elsewhere. Then all the respondents agreed that they thought it was the last case. Respondent A said that they are in contact with Difi, but that in this case it was picked up and they looked at it to see if they already fulfilled the requirements or if there was something they had to do. The result was that they will have to do some adjustments. “This is also a part of Difi's biannual quality survey of public web sites<sup>8</sup>. So we also get pointers about improvements we have to do there”, said respondent A.

The following question asked how the requirements from ADA§11 will affect them. Respondent B said that it will not affect them dramatically, but that it will be something extra that they have to think about. Respondent C said that he experienced these requirements as being very compatible with good web use and good practice for conveying things, and that the requirements are similar to search engine optimization. “They are not unreasonable demands, they are natural”, said respondent C. “They fall naturally in many ways, even though we have to do some training with people”, respondent C continued.

The next question asked what expertise the employees at UiB had in universal design. Respondent A said that people from both the IT-department and the communication department<sup>9</sup> have attended courses on universal design. They are also sending respondent B, among others, to a new course soon. “So we try keep people updated on that”, said respondent A. Respondent A also said that there are people in the IT-department who are specifically working on this subject, in other areas than the website too, and that a representative from the IT-department could have answered that in more detail.<sup>10</sup> Of all the competencies that people have to have when they are working on a web site, this is another piece that we have to be updated on, said respondent A. “It is not tacked on, it does not come in addition. It is very integrated in the work, the systems and the way they think. It is with us all the time”, said respondent C. Respondent A also said that they periodically check if they are up to the standard that they are supposed to deliver. “We quality assure ourselves every now and then”, said respondent A.

The last question asked if they used any specific tools while working with universal design. For example if they use validation tools or perform user testing. Respondent B said that they do simple things like making sure that contrasts are good. They see when they tell people to use certain colors

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8 (W3C 2013d)

9 Where the respondents work.

10 There was supposed to be a representative from the IT-department present during the interview, but he could not make it.



with a text color, that people often ask why they have to use them. They understand once they are told why. Respondent also B said that they try to teach people good etiquette, not just semantically but also how to build pages that are readable. For example using a bulleted list when listing something up, and not just using a dash. Respondent B said that she did not know that much about user testing in this case because another person had had that responsibility. Respondent A said that they had not done user testing with people who need universal design, on the new system. The plan, however, was to have a company validate it for them when they had more in place with the new system.

Lastly the respondents were asked if they had any comments or questions. Respondent A said that she had previously worked in the private sector and that no one there had talked about universal design of web sites. But when she came to this position the issue came up quite early. Respondent A thinks that it is like respondent C said, that at UiB it seems very integrated in the way you initially think about web sites. That does not mean that everything is perfect from the start, but it is not forgotten, respondent A said.

## **4.5 Summary**

This section will summarize and discuss the four interviews.

The first interview was with an expert in universal design. The expert had a critical view of ADA§11 and its requirements. He thought that the requirements started in the wrong end of the problem, with a focus on the web interface instead of the communication between technologies. He also thought that with ICT-technology more individual adaptation was possible, and that focusing on universal design by itself was wrong. He mentioned situations where following the requirements was not always right, or not enough, and that understanding why we have to follow the requirements is important to knowing when they are useful and when they are not. The expert also mentioned that he thought private companies would only see increased costs. The respondent from private company that was interviewed for this thesis did not see it like that. They will simply add universal design to the bidding process. It may be that the expert was referring to private companies that are not based on IT consultancy, and where the main web site is affected by the regulation.

The second interview was with two respondents from Difi, the supervisory authority of ADA§11.

The interview took place before the requirements were put into force, and so they were not functioning as a supervisory authority at that point. The first year after the regulation is put into force their main task will be to inform and guide those who are affected, and so their focus at the time of the interview was on that first year. They did not have a clear strategy for how they were going to function as a supervisory authority yet, other than what the regulation mentioned as their main tasks. This meant that they knew that they could in the worst case, and as last resort, issue a coercive if a business did not comply with the regulation. But they did not know the amount of money they could demand or even how they would find out if business did not comply. The process they envisioned involved building a knowledge base during the first year. They were also asked about the criticism of the regulation that the expert talked about: the focus on the interface instead of the foundations, i.e the communication between assistive technologies and computers. They answered that they dealt with the regulation as it stands, but that the regulation is meant to be developed as new issues or standards come up. And so they were going to take this criticism into consideration.

The last two interviews were more similar in form than the first two. They were both with companies or institutions that work with web sites, so they were given similar questions and will therefore be compared to each other. They respondents from the private company and public institution were first asked if they had any experience with universal design. The respondent from the private company said that they had worked with universal design with a few customers from the public sector who had that as a requirement. It had also come up when they had worked with a customer a couple of years ago, but the customer had not prioritized it, and so now they had to redo a lot of work. The respondents from the public institution had worked with it in previous versions of their system, and they had also had universal design requirements on their system before ADA§11 regulation came into force. They also had experience with universal design through the training they gave their content publishers. Both the private company and public institution had heard about ADA§11 and its regulation through unofficial channels. An employee who was interested in the subject of universal design had found information about it. The public institution had contact with Difi, but in this case the information did not come from them.

The respondent from the private company was given a few industry-specific questions that focused on their customers: They had not noticed anything after the regulation was put into force, and they would brief their customers about the regulation and not leave it up to them to ask for it.

The respondent from the private company did not think they would be affected in a big way by the ADA§11 regulation, with regard to getting more customers or needing more employees. The respondent thought that since there was such a long timeframe until the deadline for existing web sites, there would not be an avalanche of new customers now needing to add universal design to their web site. The respondents from the public institution also did not think they would be dramatically affected by the regulation. Universal design was already integrated into their everyday work, and the new regulation just adds a few points that they have to consider.

On the question about the employees expertise in universal design the respondents from the public institution answered that people from both the IT-department and the Communication Department had previously attended courses in universal design, and that they were now just about to send some employees to a new course. They tried to keep their staff updated on this issue. The respondent from the private company answered that 15 of their employees had recently attended a course in universal design. In addition the respondent said that the employees would take the responsibility of adding skills about universal design themselves and not expect the first customer that comes after the regulation has been put into force, to take that bill.

The last question asked how they worked with universal design, if they used a particular tool or performed user tests. The respondents from the public institution said that they checked for simple things like contrasts, and that the main way they worked with universal design was through the content publisher training they provided. User testing for universal design had not been performed on the new system, but the plan was to let a company validate their web site. The respondent from the private company said that she used validators for her code, but that what tools were used was different for each employee and each project. The way that the employees worked with universal design was also different for the different professions in the company, where some did not focus on it at all and some focused on it in a different way. For example the UX-designer who already performed user tests, would now maybe add a layer of universal design to that. The respondent also said that they would gain experience with universal design through their current in-house project with NIFES, and that they would probably also attend a more specialized course in universal design after christmas.

## 4.6 Implications

This section will discuss two implications derived from the interviews.

The universal design expert that was interviewed thought that the ideal universal design was personalized and that technology should recognize a user and adapt itself to her. This thought is shared by Gajos et al. (2012). They write that compliance with accessibility standards and guidelines is not embedded in mainstream software engineering and user interface design practice, and so developers must be reminded, begged, and threatened to make software accessible. They then ask if this is sufficient, or if we are “blinding ourselves to tomorrow’s challenges as we fight yesterday’s battles?” (p.69). Gajos et al. (2012) write that it is both the accessibility and *efficiency* of access that is necessary for meaningful and equitable participation in society. They propose a long term vision of *Personalized Dynamic Accessibility*, “we believe that user interfaces will enable more effective interaction if they reflect each person’s unique abilities, devices, and environment.”(p.69). They also write that current assistive technology is “designed on the premise that our software is immutable and that users must adapt themselves to the software”(p.70), and that their aim is to reverse this situation. Gajos et al. (2012) rest their vision on four pillars (p.70):

- *User interfaces should share the burden of adaptation.* Interactions adapted to an individual’s abilities and input devices can improve a user’s range of activities, their efficiency, and subjective perceptions of the experience. Such specialized interfaces do not eliminate the need for assistive devices but offer the promise of more efficient interaction and the ability to perform more activities.
- *Personalization.* Due to the diversity of abilities, needs, and assistive devices, no single user interface adaptation can address the needs of all users with impairments. Personalized Dynamic Accessibility thus relies on mechanisms for assessing a user’s unique needs and functional abilities and then translating these assessments into personalized user interface design adaptations.
- *Dynamic adaptation.* Needs and abilities change over time due to fatigue, medication, progression of the disease, or situation. Naturally, to be effective, personalized adaptations have to reflect the dynamic nature of these abilities and needs.
- *Scalability.* Solutions that require access to scarce resources (such as designers and experts) are not feasible, because there are many individuals with unique abilities and needs. The success of Personalized Dynamic Accessibility depends on novel approaches that leverage

automation, crowdsourcing, and user communities, as well as innovations that empower end users to create and modify their interfaces and to share these designs.

There are several challenges to achieving *Personalized Dynamic Accessibility*, for example, technology for measuring and modeling users' abilities is needed. Gajos et al. (2012), however, expect that “within five years we will see tools enabling personalized access to Web-based interactive content.” (p.71).

The other implication comes from the fact that aside from the supervisory authority's respondents, none of the respondents had received information about the ADA§11 regulation from the Norwegian government. They had all come across the information through other channels. This implies that the government, specifically the supervisory authority, has not been sufficiently disseminating information about the regulation. In chapter 2 of this thesis Freire et al. (2008a) write that practitioners suggested more intensive promotion of legislation to improve web accessibility. Freire et al. (2008b) also report that the government seemed to have problems with making legislation known, even within government organizations. Lopes et al. (2010) reported that practitioners had a low awareness about national and international standards. These studies show that governments must work to promote web accessibility legislation to increase the compliance to, and awareness of, such legislation, and this research shows that the Norwegian government has a way to go regarding this issue.

## 5.0 Website assessment

The home pages of two websites were assessed to illustrate a few of the issues that the new Norwegian law addresses, and to show that this legislation is needed. The desktop version of the semi-automatic tool Waat (The Personalized Web Accessibility Evaluation Tool), presented in the literature survey, was used for the assessment. The websites that were chosen were komplett.no, a company that sells ICT hardware, and amnesty.no the Norwegian website for the international organization Amnesty. They were chosen because web sites are their main communication channel to the Norwegian public and they are therefore affected by the law. They also represent two different groups that are affected by the law: private businesses and organizations.

### 5.1 Assessment and results

When Waat initializes the first window, as seen in figure 4, requests a URL or source code and type of approach. There is a standardized approach available, but there is also an option to customize which WCAG 2.0 or WAI ARIA guidelines that shall be used in the assessment. To simulate the new Norwegian regulation the second approach was chosen. Figure 5 shows the second window in Waat where the different guidelines can be specified.

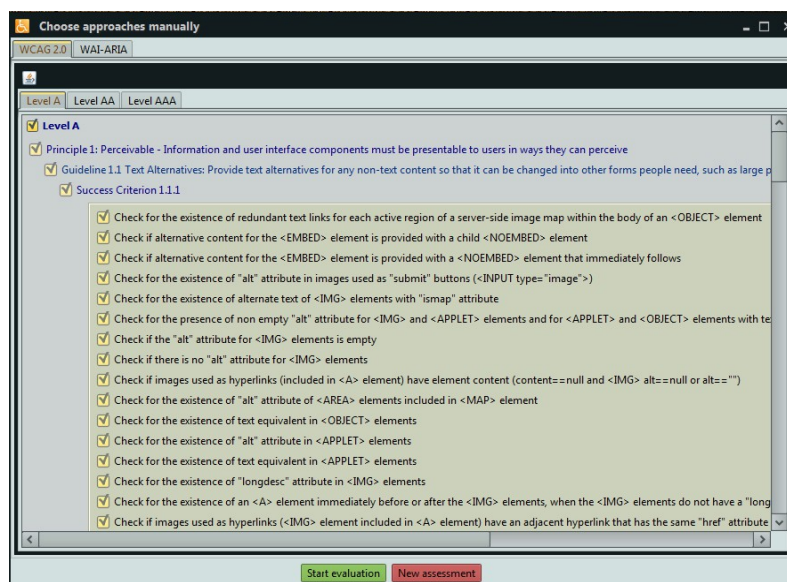


Figure 5: Waat guideline customization window.

The level A and AA guidelines, excluding the exceptions, were checked and the assessment started. In the next window, see figure 6, the web page that has been assessed receives an overall accessibility score, where 100% means that the page is fully accessible. Errors and warnings are marked in red and orange colors and can be further inspected by clicking them. A report is also available that describes the issues further, and it can be downloaded in three different formats: pdf; EARL and RDF/XML.

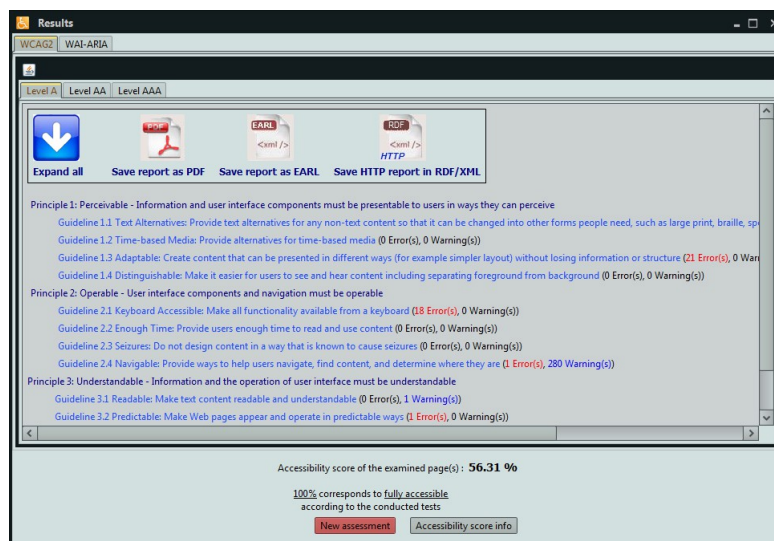


Figure 6: Waat results window for komplett.no.

The accessibility score for the home page of komplett.no was 56,31%. The report contained 394 pages and was therefore too long to put in the appendices, but table 13 shows the report's assessment overview.

Table 13: *Komplett.no's* assessment overview.

Guideline	Level	Error(s)	Warning(s)
<a href="#">1.1</a>	A	<a href="#">24</a>	<a href="#">83</a>
<a href="#">1.3</a>	A	<a href="#">21</a>	<a href="#">0</a>
<a href="#">2.1</a>	A	<a href="#">18</a>	<a href="#">0</a>
<a href="#">2.4</a>	A	<a href="#">1</a>	<a href="#">280</a>
<a href="#">3.1</a>	A	<a href="#">0</a>	<a href="#">1</a>
<a href="#">3.2</a>	A	<a href="#">1</a>	<a href="#">0</a>
<a href="#">3.3</a>	A	<a href="#">21</a>	<a href="#">0</a>
<a href="#">4.1</a>	A	<a href="#">434</a>	<a href="#">1</a>
<a href="#">2.4</a>	AA	<a href="#">2</a>	<a href="#">35</a>

Komplett.no had 522 errors and 400 warnings. The errors and warnings are listed under their respective guideline in the report. The problematic code is shown in the rightmost column and techniques and a tip for solving the issues are suggested, see table 14.

Table 14: Example from *komplett.no's* assessment report.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
<b>Guideline 1.1 - Level A</b>					
1	<a href="#">1.1.1</a> (automatic)	<a href="#">H2</a> (Step 1)	Number of images used as hyperlinks with adjacent hyperlinks with the same "href" and description	For images used as hyperlinks with adjacent hyperlinks modify either the "href" attribute or the description so that they do not match	<pre>&lt;a href="/k/k.aspx?action=custserv&amp;topic=contactdetails"&gt;img src="/mlf/skins/komplettno/men ucontact.gif" alt="" /&gt;&lt;/a&gt;</pre> <p style="text-align: center;">at line 115</p>

The accessibility score for *amnesty.no* was 58,13%, a little better than *komplett.no*, but *amnesty.no's* report was 769 pages long because there were more errors and warnings per guideline. Table 15 shows the assessment overview for *amnesty.no*. There were 638 errors and 1544 warnings.



Table 15: Amnesty.no's assessment overview.

Guideline	Level	Error(s)	Warning(s)
<a href="#">1.1</a>	A	<a href="#">34</a>	<a href="#">62</a>
<a href="#">1.3</a>	A	<a href="#">10</a>	<a href="#">2</a>
<a href="#">2.1</a>	A	<a href="#">18</a>	<a href="#">0</a>
<a href="#">2.4</a>	A	<a href="#">0</a>	<a href="#">118</a>
<a href="#">3.1</a>	A	<a href="#">0</a>	<a href="#">1</a>
<a href="#">3.2</a>	A	<a href="#">3</a>	<a href="#">0</a>
<a href="#">3.3</a>	A	<a href="#">10</a>	<a href="#">2</a>
<a href="#">4.1</a>	A	<a href="#">449</a>	<a href="#">864</a>
<a href="#">1.4</a>	AA	<a href="#">114</a>	<a href="#">495</a>

## 5.2 Analysis

The assessment resulted in 1160 errors, 1944 warnings and 1163 pages combined, so only a few examples will be presented here. The focus will be on the first three guidelines in the website's assessment overview: 1.1; 1.3 and; 2.1. For each guideline one error from each of the websites will be analyzed.

### 5.2.1 Guideline 1.1, Success Criteria 1.1.1

**Guideline 1.1, Success Criteria 1.1.1** All non-text content that is presented to the user has a text alternative that serves the equivalent purpose (Level A) <sup>11</sup>

In komplett.no's report this guideline and success criteria had 5 different types of errors. Table 16 shows one of the errors. Type of error, how to fix it, and from which code line it comes is described. Two techniques are also suggested. Technique H37 is described in section 2.4.1.1 in the literature survey and it requests that image elements have a short text description in the "alt" attribute, which is the same as what the tip in the report says.

<sup>11</sup> Success criteria 1.1.1 also has a set of exceptions that can be seen in Appendix A.

Table 16: *Komplett.no*, success criteria 1.1.1, error 2.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
<b>Guideline 1.1 - Level A</b>					
1	<a href="#">1.1.1</a> (automatic)	<a href="#">G95</a> (Step 1) & <a href="#">H37</a> (Step 2)	Number of <IMG> elements with empty "alt" attribute	Provide a non-empty "alt" attribute to <IMG> elements	<pre>&lt;img src="/mlf/skins/komplettno/men ucontact.gif" alt="" /&gt;</pre> <p>at line 115</p>

Amnesty.no's report lists 7 different types of errors for this guideline and success criteria. Table 17 shows one of them. This error is not easy to understand. The description states that there is an image used as a hyperlink with the same "href" and description. First of all it is not clear what the report means with the word "description". One option is that it means the content of the "alt" attribute. In the code the "alt" attribute is empty, so it is not the same as the "href". This error type seems to report something that is not an error. There are 10 errors of this type in the amnesty.no report. The code lines from the 10 errors are also reported as having the same error type as in table 16 later in the report, since their "alt" attributes are all empty. So it would seem that this report contains 10 false errors.

Table 17: *Amnesty.no*, success criteria 1.1.1, error 1.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
<b>Guideline 1.1 - Level A</b>					
1	<a href="#">1.1.1</a> (automatic)	<a href="#">H2</a> (Step 1)	Number of images used as hyperlinks with adjacent hyperlinks with the same "href" and description	For images used as hyperlinks with adjacent hyperlinks modify either the "href" attribute or the description so that they do not match	<pre>&lt;a href="/aksjon/nega" class="imagecache imagecache-1000x410 imagecache-linked imagecache-1000x410_linked"&gt;&lt;img src="http://www.amnesty.no/sites/default/files/imagecache/1000x410/eskinder_nytt_bilde.png" alt="" title="" class="imagecache imagecache-1000x410" width="1000" height="410" /&gt;&lt;/a&gt;</pre> <p>at line 128</p>

## 5.2.2 Guideline 1.3, Success Criteria 1.3.1

**Guideline 1.3, Success Criteria 1.3.1** Info and Relationships: Information, structure, and relationships conveyed through presentation can be programmatically determined or are available in text. (Level A)

This guideline and success criteria has 2 different types of errors in the komplett.no report. One of them can be seen in table 18. The error points out that this INPUT element does not have a label or a “title” attribute. The technique that is suggested says:

### H65: Using the title attribute to identify form controls when the label element cannot be used.

**Description:** The objective of this technique is to use the title attribute to label form controls when the visual design cannot accommodate the label (for example, if there is no text on the screen that can be identified as a label) or where it might be confusing to display a label. User agents, including assistive technology, can speak the title attribute.

(W3C, 2013e)

This technique and the report tip's solution is to add a “title” attribute to the INPUT element which among other things will make it readable for assistive technology.

Table 18: *Komplett.no*, success criteria 1.3.1, error 1.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
<b>Guideline 1.3 - Level A</b>					
1	<a href="#">1.3.1</a> (automatic)	<a href="#">H65</a> (Step 1) & <a href="#">H65</a> (Step 2)	Number of <INPUT type="submit"> elements without label and without "title" attribute	Provide a "title" attribute to <INPUT type="submit"> elements that identifies the purpose of the <INPUT type="submit"> element	<input class="submit" type="submit" value="S&oslash;k" />  at line 68

Amnesty.no's report has 5 different error types under success criteria 1.3.1. One of them is shown in table 19. This error describes an issue where an INPUT element does not have a preceding label. In the tip column it says to add a label before the element or to use a “title” attribute instead. In this case there is a “title” attribute in the code, so this error seems unnecessary.

Table 19: Amnesty.no, success criteria 1.3.1, error 2.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
2	1.3.1 (automatic)	H44 (Step 1) & H44 (Step 4)	Number of <INPUT type="text"> elements without a preceded label	Provide a label that is immediately before the <INPUT type="text"> elements. Otherwise, when the visual design cannot accommodate the label, or where it might be confusing to display a label, then a title attribute can be used to identify the form control, based on Technique H65.	<input type="text" name="email" id="subs_email" title="Epost *" class="inline_label_display required" />  at line 624

### 5.2.3 Guideline 2.1, Success Criteria 2.1.1

**Guideline 2.1, Success Criteria 2.1.1** Keyboard: All functionality of the content is operable through a keyboard interface without requiring specific timings for individual keystrokes (Level A)<sup>12</sup>

The report for komplett.no has 2 error types under success criteria 2.1.1. One of them is shown in table 20. The error description says that <A> (link) elements should have a “title” attribute. The technique from WCAG 2.0 that is listed, however, says that a “title” element is not necessary as long as there is text within the link or an “alt” attribute if there is an image in the link. In the code

<sup>12</sup> Success criteria 2.1.1 also has an exception and two notes that can be seen in Appendix A.

from table 20 there is a text provided in the link (Privat), and so this error is false. There are also 15 errors in the report with the same error type that also have text.

### H91: Using HTML form controls and links

**Description:** The objective of this technique is to use standard HTML form controls and link elements to provide keyboard operation and assistive technology interoperability of interactive user interface elements.

HTML element	Role	Name	Value	State
<a>	link	'title' attribute, text within <a> element or 'alt' attribute if image link. Concatenated if both text and image 'alt' attribute are provided	'href' attribute	

(W3C, 2013g)

Table 20: *Komplett.no*, success criteria 2.1.1, error 1.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
1	2.1.1 (automatic)	H91 (Step 2)	Number of <A> elements without "title" attribute	Provide a "title" attribute to <A> elements	<pre>&lt;a href="/k/k.aspx?action=SetSegment&amp;SegmentId=1" class="active"&gt;&lt;span&gt;Privat&lt;/span&gt;&lt;/a&gt;</pre> <p>at line 54</p>

The amnesty.no report also has 2 error types for this success criteria. The one that is shown in table 21 is the same error type as the one in komplett.no's example, but the links in the code are different and it is therefore interesting to look at the same error type again. The code from table 21 has an image inserted in the link, and should according to technique H91 then have an "alt" attribute. The code does have an "alt" attribute, but it is empty, and so this error is a true error. There are another 10 errors like this one in amnesty.no's report, and there are also 5 errors that have neither an image nor text.

Table 21: Amnesty.no, success criteria 2.1.1, error 1.

Analysis of the detected errors					
#	Success Criterion	Technique	Error description	Tip	Problematic element
<b>Guideline 2.1 - Level A</b>					
1	<a href="#">2.1.1</a> (automatic)	<a href="#">H91</a> (Step 2)	Number of <A> elements without "title" attribute	Provide a "title" attribute to <A> elements	<pre>&lt;a href="/aksjon/nega" class="imagecache imagecache-1000x410 imagecache-linked imagecache- 1000x410_linked"&gt;&lt;img src="http://www.amnesty.no/site s/default/files/imagecache/1000 x410/eskinder_nytt_bilde.png" alt="" title="" class="imagecache imagecache-1000x410" width="1000" height="410" /&gt;&lt;/a&gt;</pre> <p style="text-align: right;">at line 128</p>

## 6.0 Discussion

This chapter discusses the findings from the research in relation to the research questions. The first research question asked how web accessibility legislation has been implemented and received in countries around the world (RQ1), and the second research question asked how Norway is dealing with web accessibility legislation (RQ2). The third research question asked how web development professionals were addressing web accessibility laws (RQ3).

Findings from the literature survey is discussed in the first section, and findings from the interviews and web assessment is discussed in the following section. In the summary all of the findings will be discussed together in relation to Lazar et al.'s (2004) Web Accessibility Integration Model, and implications for Norway will be discussed in the last section.

### 6.1 Literature Survey Findings

The literature survey presented nine themes related to the field of web accessibility. The theme that has the biggest impact in regards to RQ1 is: *Web Accessibility Legislation Around the World*. It brings up issues related to implementation of web accessibility laws.

In the *Web Accessibility Legislation Around the World* section the findings showed that the reason for why there was low compliance with web accessibility legislation in Brazil was little enforcement by the government (Lazar et al., 2012). This was also the case in Portugal: vague goals were given; no suggestions about implementation or maintenance were given; and, there was no enforcement and no penalties for non-compliance with the regulation. The situation was addressed by the government and specific compliance demands were given, and a task force was set up to ensure coordination, training and help. The new directive caused the government web sites to go from less than 70 % compliance to 95 % compliance (Lazar et al., 2012). Both Brazil's and Portugal's web accessibility legislation only applies to government web sites. In Australia they have policies for both the government sector and private sector (Conway, 2011). This is similar to the Norwegian legislation, but the Australian legislation has a shorter time frame, with the last deadline for private businesses' existing web sites being December 2013, and for government web sites December 2014 (Conway, 2011). It could therefore be interesting to see how the implementation of their regulation goes and compare it to the Norwegian regulation's implementation process.

The section about *Practitioners Attitudes* in the literature survey is relevant for both RQ1 and RQ3, it concerns how web accessibility is received by professionals. Lazar et al. (2004) write that missing education about accessibility clashes with governments actions of creating laws to increase web accessibility, and that the present statistics on web accessibility are shocking yet do not seem to influence people to make web sites accessible. Their study showed that challenges to achieve accessible web sites were: balancing accessibility and graphic design; technical challenges: lack of funding and time: and, need for training and better tools. The participants in the study also said that what could influence them to make their web sites accessible were: government regulation; knowing that they had users who needed it; outside funding; pressure from managers and clients; training; and, better tools.

Freire et al. (2008a) also conducted a study on practitioners attitudes. They discovered that there was a very low awareness about web accessibility and they write that this was due to little or no training. The suggestions to improve web accessibility found in their study were: more intensive promotion of the legislation; providing training inside the organization; and, including web accessibility in web related courses. The authors state that web accessibility is a serious issue and that the government, educators and the whole society should be involved to promote consciousness. In a more in depth article about the same study Freire et al. (2008b) write that accessibility has not been inserted into the agenda of the industry and that this is linked to lack of education and lack of use of proper techniques. The government seemed to have problems with making the legislation known, even within government organizations. The authors also urge academics to include web accessibility in their lectures.

Another study on practitioners attitudes conducted by Lopes et al. (2010) showed that the practitioners wanted more knowledge about (combined) disabilities and assistive technology. They also wanted more advanced education. They had a low awareness about national and international standards, and they wanted embodied validators in development tools. The participants from the *Public Bodies* group reported that the main barrier for accessible web sites was unavailable internal expertise, they had received training but still needed external help. The *User* group wanted better compatibility between their assistive technology and web pages. The authors conclude that there is a need for assessment tools that make web accessibility easier to accomplish. There also a need for more advanced disability and assistive technology simulation tools, and generally more integrated tools.



Two studies were conducted that address companies attitudes or views about web accessibility. Leitner & Strauss (2010) found two possible ways for businesses to profit from web accessibility: no negative media and lawsuits; and, an enlarged consumer group. They also found three motivations for businesses: Economic, the monetary benefit of an increased customer base; Social, the ethical responsibility of an organization; and, Technical, the organizations willingness to have a high technical quality on their web site. Loiacono & Djamasbi (2011) found three factors that directly impact the level of accessibility for a business: number of IT professionals in the company; how much usability testing is conducted in the company; and, legal web accessibility requirements.

Table 22 and 23 summarizes factors for the implementation and reception of web accessibility legislation and web accessibility in general found in the literature survey.

*Table 22: Findings from the “Web Accessibility Legislation Around the World” and “Practitioners Attitudes” sections in the literature survey.*

Reasons for low compliance with legislation:	Challenges to achieve accessible web sites:	Influencing the making and improvement of accessible web sites:	Enablers of more accessible web sites:
<ul style="list-style-type: none"> <li>• <b>Low enforcement from the government.</b></li> <li>• Vague Goals</li> <li>• No suggestions about implementation or maintenance.</li> <li>• No penalties for non-compliance.</li> </ul>	<ul style="list-style-type: none"> <li>• Balancing accessibility and graphic design.</li> <li>• Technical challenges.</li> <li>• Lack of <b>funding</b>.</li> <li>• Lack of time.</li> <li>• Need for <b>training</b>.</li> <li>• Need for better <b>tools</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Government regulation.</b></li> <li>• Knowing that there are users who need accessible web sites.</li> <li>• Outside <b>funding</b>.</li> <li>• Pressure from managers and clients.</li> <li>• Better <b>training</b>.</li> <li>• Better <b>tools</b>.</li> <li>• <b>More intensive promotion of the legislation.</b></li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge about (combined) disabilities and AT.</li> <li>• Embodied validators in development <b>tools</b>.</li> <li>• Better compatibility between assistive technology and web sites.</li> </ul>

Table 23: Findings from the “Practitioners Attitudes” section of the literature survey.

Factors and motivations for businesses to make accessible web sites:
<ul style="list-style-type: none"> <li>• <b>Economic.</b></li> <li>• Societal.</li> <li>• Technical.</li> <li>• Number of IT professionals.</li> <li>• Usability testing being conducted.</li> <li>• <b>Legal accessibility requirements.</b></li> </ul>

Table 22 and 23 show the findings from the *Web Accessibility Legislation Around the World* and *Practitioners Attitudes* sections. The first column of table 22 show that low enforcement, vague goals, no penalties for non-compliance, and no suggestions about implementation or maintenance from the government can cause low compliance. In the other columns the themes that recur are: more education; better tools; and, more funding. Businesses are motivated by economic, societal and technical factors. The prevalence of accessible web sites in businesses is influenced by their resources, their current practice of paying attention to users, and legal accessibility requirements.

## 6.2 Interviews and Web Assessment Findings

This section presents findings from the interviews and the web assessment that are related to RQ2 and RQ3. The interviews show how Norway is dealing with web accessibility legislation, and they also show how some web development professionals address such legislation. The web assessment illustrates a few of the guidelines that the Norwegian web accessibility legislation is based upon and also show that such legislation is necessary.

### **6.2.1 Interview Findings**

The first interview was with a universal design expert. He was generally critical to the notion of universal design of the web and therefore also the Norwegian regulation that is based on this. He thought that the focus should be on personalization, where technology recognizes and adapts to each individual user. He also saw a problem with the regulation because it does not specify communication protocols between assistive technologies and computers and he thought that ambiguities caused by this will cause an inferno after the regulation is in place. The accessibility expert also reported that he had heard about the legislation through his network, via e-mailing lists.

The supervisory authority's (Difi) interview was affected by the fact that the regulation had not been finally approved at the time. They did not have a clear plan of action for what they were going to do the first year after it passed. They did, however, have an initial plan of giving information and guidance about the regulation to web developers, business owners and designers through a web site, and would consider holding conferences and courses. One of the respondents said that they would have a step by step start and that they would build up a knowledge base as they received cases to assess. In the case of enforcement the agency had the ability to, in a worst case scenario, give a rectification order, and if that is not followed, a running coercive. Their main task, however, was to motivate businesses and organizations to make their web sites accessible.

The respondent from the private company (Evry Consulting) said that the company had worked with accessibility for public sector customers, but she had not heard about accessibility in sales meetings with private businesses. The respondent found out about ADA§11 because of her own willingness to search for news about the field of web development, online. No one from management had heard about it. The company had recently sent some employees to a course about accessibility, and they were planning to send them to another after Christmas. The respondent felt that it was her professional responsibility to inform her customers about the legislation, and that the company would take the bill for training and not give that responsibility to the first customer that comes to them who is affected by the law.

UiB, as a public institution, had accessibility as a requirement before the new legislation. Currently they are working on implementing a new content publishing system and are conducting training courses for the employees that publishes content, with a focus on accessibility. One of the respondents had attended courses about accessibility before and was soon going to attend another.

The institution had regular contact with the supervisory authority because of a biannual quality survey for public web sites, but in this case the information about the legislation was found by one of the employees.

Although the supervisory authority did not have a clear plan for how they are going to function they have an enforcement strategy for worst case scenarios. They have also released a web site that guides and gives information about the legislation and regulation. An issue, however, is that they do not seem to have a good enough strategy for advertising their web site, or the regulation itself. The regulation for ADA§11 has been in force for five months at this time, and yet the author has only found one newspaper article (NTB, 2013) that concerns it. None of the other respondents had received the information about the new regulation from the supervisory authority. This is not a survey study so that does not mean that other businesses or public institutions have not heard from them, but together with the low media coverage this does indicate an issue.

Both of the interviews with web practitioners showed that they are active in educating themselves about accessibility. The public institution was also conducting accessibility courses for their employees.

### **6.2.2 Web Assessment Findings**

The web site assessment was conducted with a semi-automatic tool. A human is necessary for this type of assessment, and this was proved when several false negatives were found. The level of knowledge about the WCAG 2.0 guidelines, and their success criteria and respective techniques, that is needed to analyze the assessment report is very high. This is a time consuming assessment technique. The fact that amensty.no's assessment report was 759 pages long made the task of analyzing it seem overwhelming. One of the reasons for why the report was so long was that for every error and warning the entire section of code it concerned was inserted, and many times that code ran over several pages. This is something that should be improved in the tool, for example, by providing a report where the code details are linked to and not included in the document.

## **6.3 Answering the research questions**

RQ1: The literature survey showed that low enforcement from the government, vague goals, no

suggestions about implementation or maintenance, and, no penalties, causes low compliance of web accessibility legislation.

RQ2: The literature survey showed that Norway has a good base for encouraging accessible web sites by having a legislation, and a supervisory authority that have enforcement capabilities. However, the interviews showed that there has been little promotion of the legislation and regulation.

RQ3: The web development professionals that were interviewed were positive towards the Norwegian web accessibility legislation and they were attending courses to educate themselves about the field. Better tools, more training, more intensive promotion of government policy, and, awareness of users who were in need of accessible web sites were shown, in the literature survey, to influence web development professionals to create accessible web sites. The web assessment that was conducted resulted in issues such as too long reports and false negatives, and thereby illustrated the need for better tools

## **6.4 Summary**

The results from the literature survey, interviews and web assessment show that education and training, funding, better tools, and well promoted legislation are necessary for a successful implementation of accessible web sites. This section discusses the findings from the literature survey, interviews and web assessment related to Lazar et al.'s (2004) Web Integration Model, and also in relation to implications for Norway.

### ***6.4.1 The Web Accessibility Integration Model***

Lazar et al. (2004) created a model to show what influences the making of accessible web sites, see figure 7.

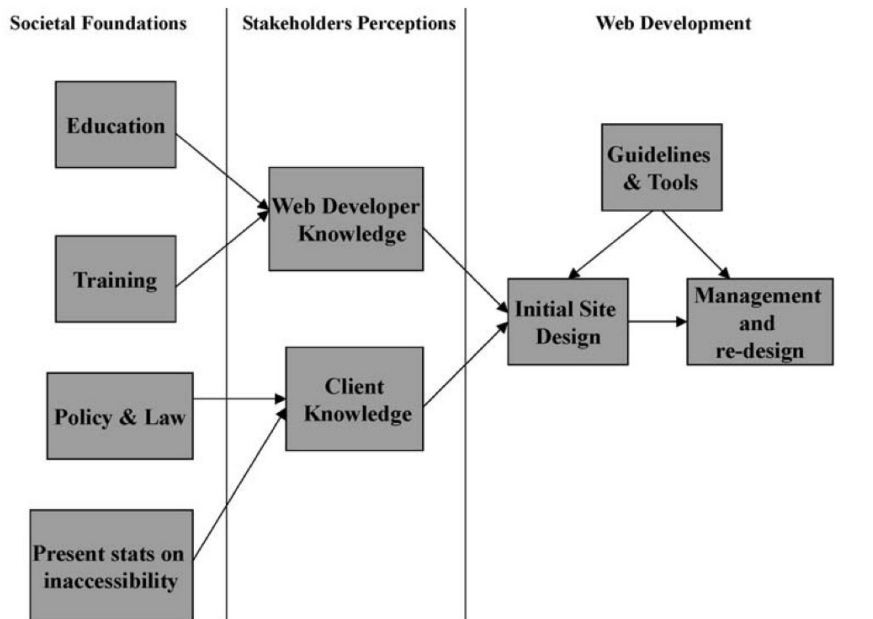


Figure 7: Lazar et al.'s (2004) Web Accessibility Integration Model.

The model was also presented in chapter 2 section 2.5.1, and shows the societal foundations that influence stakeholders, that again influences the development of accessible web sites. According to the model education and training influences the web developers knowledge, and policy & law and present statistics on inaccessibility influences the client knowledge. Policy & law does not influence the web developer in this model and that seems strange, especially since the results from the same study that presents the model show that web Masters are influenced by government regulation. The findings from the interviews in this research also show that the web development practitioners are influenced by government legislation: they take responsibility for informing their clients themselves and take the cost of training.

Based on the findings from this research a modified version of Lazar et al.'s (2004) Web Accessibility Integration Model is presented, see figure 8.

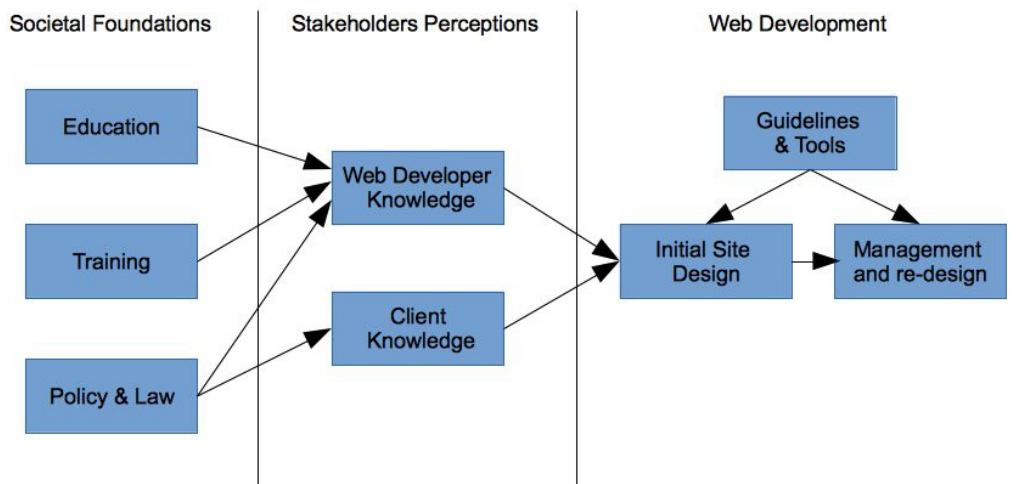


Figure 8: The modified Web Accessibility Integration Model (based on Lazar et al. 2004).

The important differences between this version and the original is that *Present stats on inaccessibility* has been removed because of low relevance in the findings, and *Policy & Law* is now influencing the *Web Developer Knowledge* as well. The emphasis is on the recurring themes from the findings: *Education* and *Training*; *Tools*; and, *Policy and Law*. It is important to have a good educational base, and further training must be available. The policy and law must be well implemented and be available to both the web developer and the client.

The other important factor is good tools, and that is something that must be developed further. Most of the tools that are presented in chapter 2 are developed in research projects and are not available yet. Goldstein et al. (2011) write that governments change the international standards before they adopt them and that makes it hard for developers to use the same tools in several countries. Vigo et al. (2013) write that organizations should not rely on automated tests alone because they perform poorly in terms of coverage and completeness. This was also shown in the web site assessment part of this thesis where several false negatives were found. Wattenberg (2004) writes about a research project that tried to develop a single evaluation tool that could help developers create accessible web sites, but they did not succeed because there were too many possible combinations of technologies, design attributes, applications and user capabilities. According to Wattenberg (2004) the best way of determining the extent of accessibility and usability of a project is to evaluate it by observing people using the product. User testing is also recommended by the supervisory authority, but it is not required by the law.

The literature survey also showed that funding and economy are important factors for making web sites accessible. While there will be a cost in upgrading a system to be accessible or adding accessibility to the technical specification, the literature survey also showed that this will open up a new section of consumers for businesses, and will save the government money because individuals with impairments can become more self sufficient. These factors were not added to the model because the cost and gain seem to zero each other out, Difi's report even claims that the gains will outweigh the costs.

#### **6.4.2 Implications for Norway**

The situation for Norway, as found in this research, is both positive and negative. It is positive because there *is* a supervisory authority and because the law gives them enforcement possibilities. However, the situation could benefit from a more intensive promotion of the legislation and regulation. It will also be important to focus on web accessibility in the education sector to build a good base for the understanding, and awareness, of why web accessibility is needed, and training must be provided for both the public sector and the private sector. Developing tools that are easy to use is an area that should be looked at, and it should be emphasized that user testing is the best way to achieve accessibility.

The universal design expert introduced his alternative view of universal design, personalization, as a better way towards accessibility. His thoughts were shared by Gajos et al. (2012), who asked if we are “blinding ourselves to tomorrow’s challenges as we fight yesterday’s battles?” (p.69). They asked this because they had seen that accessibility standards and guidelines were not embedded in mainstream software engineering and user interface design and so developers had to be reminded, begged, and threatened to make software accessible. The question then becomes if the Norwegian legislation will only work as a threat to developers? If they do not understand why they have to make accessible web sites this may become the case. Gajos et al. (2012) propose their vision of *Personalized Dynamic Accessibility*, and the accessibility expert also thought that communication protocols between assistive technology and computers should be a focus area. The supervisory authority, however, were at this point dealing with the regulation as it stands, but said that it was assumed that the regulation will be frequently revisited and further developed. So perhaps in the future these points of critique will be added to the regulation.



## **7.0 Conclusion**

This chapter summarizes the findings from the research, discusses its research contribution and presents ideas for further research.

### **7.1 Thesis Summary**

This study was conducted to look at how Norway is dealing with web accessibility legislation. Because the regulation has so recently been approved in Norway it was decided to look at how other countries have dealt with similar legislation and how web development professionals address web accessibility laws. The findings showed that there are both positive and negative aspects of how Norway is dealing with web accessibility legislation. Norway has a good basic structure for the supervision of the legislation and can enforce it if necessary. The supervisory authority has also published a web site that informs and guides developers and stakeholders about the regulation. However, there has been little promotion of the law and its regulation, only one newspaper article has been found about it has been found by the author (NTB, 2013). This is something that should be addressed by the supervisory authority. The findings also showed that education and tools are necessary for a good implementation of web accessibility legislation, and the Norwegian government should invest into those areas to ensure that the web accessibility legislation succeeds in making all web sites, that are aimed at the Norwegian public, accessible. Personalization is also an area that should be looked into. As the technology for this is further developed, the Norwegian government should look at merging it into their accessibility regulation.

### **7.2 Research Contribution**

The field of research that this study belongs to is that of Web Accessibility, with an emphasis on Web Accessibility Legislation. This research studies how several countries have implemented their web accessibility legislation, and how it has been received. This was done to contribute to the Norwegian web accessibility implementation process. However, it can also contribute to other countries that are in the same situation. In regards to the field of Web Accessibility this study provides a summary of existing research with a supplement of how some stakeholders are dealing with the Norwegian web accessibility legislation, and an analysis of a web accessibility assessment tool.

### 7.3. Future Research

As written in section 6.1 *Literature Survey Findings*, Australia has a similar web accessibility legislation to Norway. Conway (2011) proposes a study that will address the success of the Australian *Web Accessibility National Transitioning Strategy* (NTS). The research will be a case study that incorporates a longitudinal study that includes approximately 100 web sites from the government, non-profit organizations, and, corporations. The research will result in a framework to assist other organizations in building more accessible web sites. The framework “will provide information on how to achieve compliance, what obstacles they may face and propose intervention strategies to assist them to overcome these obstacles.” (Conway, 2011, p.2). It would be interesting to conduct a similar study in Norway and to compare it to the findings of Conway. When the Norwegian web accessibility legislation has been in effect for a few years it could also be interesting to see how the factors found in this study have affected the situation.

One of the factors that influences the making of accessible web sites is education. This study has not looked into the situation for web accessibility in the educational institutions in Norway, but it could be useful to see if this field needs strengthening. This research has also revealed that better web accessibility tools are needed, both for the development of accessible web sites and for assessing existing web sites, and that personalization could be a better strategy for making the web accessible; these are two areas that seem promising.

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# Appendix A WCAG 2.0

## WCAG 2.0 Guidelines

This section is normative.

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

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

[Understanding Guideline 1.1](#)

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

[How to Meet 1.1.1](#)  
[Understanding 1.1.1](#)

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

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

[Understanding Guideline 1.2](#)

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

[How to Meet 1.2.1](#)  
[Understanding 1.2.1](#)

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

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

[How to Meet 1.2.2](#)  
[Understanding 1.2.2](#)

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

[How to Meet 1.2.3](#)  
[Understanding 1.2.3](#)

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

[How to Meet 1.2.4](#)  
[Understanding 1.2.4](#)

**1.2.5 Audio Description (Pre-recorded):** Audio description is provided for all pre-recorded video content in synchronized media. (Level AA)

[How to Meet 1.2.5](#)  
[Understanding 1.2.5](#)

**1.2.6 Sign Language (Pre-recorded):** Sign language interpretation is provided for all pre-recorded audio content in synchronized media. (Level AAA)

[How to Meet 1.2.6](#)  
[Understanding 1.2.6](#)

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

[How to Meet 1.2.7](#)  
[Understanding 1.2.7](#)

**1.2.8 Media Alternative (Pre-recorded):** An alternative for time-based media is provided for all pre-recorded synchronized media and for all pre-recorded video-only media. (Level AAA)

[How to Meet 1.2.8](#)  
[Understanding 1.2.8](#)

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

[How to Meet 1.2.9](#)  
[Understanding 1.2.9](#)

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

[Understanding Guideline 1.3](#)

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

[How to Meet 1.3.1](#)  
[Understanding 1.3.1](#)

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

[How to Meet 1.3.2](#)  
[Understanding 1.3.2](#)

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

[How to Meet 1.3.3](#)  
[Understanding 1.3.3](#)

*Note:* For requirements related to color, refer to [Guideline 1.4](#).



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

[Understanding Guideline 1.4](#)

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

[How to Meet 1.4.1](#)  
[Understanding 1.4.1](#)

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

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

[How to Meet 1.4.2](#)  
[Understanding 1.4.2](#)

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

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

[How to Meet 1.4.3](#)  
[Understanding 1.4.3](#)

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

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

[How to Meet 1.4.4](#)  
[Understanding 1.4.4](#)

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

[How to Meet 1.4.5](#)  
[Understanding 1.4.5](#)

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

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

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

[How to Meet 1.4.6](#)  
[Understanding 1.4.6](#)

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

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

[How to Meet 1.4.7](#)  
[Understanding 1.4.7](#)

- **No Background:** The audio does not contain background sounds.
- **Turn Off:** The background sounds can be turned off.
- **20 dB:** The background sounds are at least 20 decibels lower than the foreground speech content, with the exception of occasional sounds that last for only one or two seconds.

*Note:* Per the definition of "decibel," background sound that meets this requirement will be approximately four times quieter than the foreground speech content.

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

[How to Meet 1.4.8](#)  
[Understanding 1.4.8](#)

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

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

[How to Meet 1.4.9](#)  
[Understanding 1.4.9](#)

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

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

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

[Understanding Guideline 2.1](#)

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

[How to Meet 2.1.1](#)  
[Understanding 2.1.1](#)

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

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

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

[How to Meet 2.1.2](#)  
[Understanding 2.1.2](#)

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

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

[How to Meet 2.1.3](#)  
[Understanding 2.1.3](#)

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

[Understanding Guideline 2.2](#)

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

[How to Meet 2.2.1](#)  
[Understanding 2.2.1](#)

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

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

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

[How to Meet 2.2.2](#)  
[Understanding 2.2.2](#)

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

*Note 1:* For requirements related to flickering or flashing content, refer to [Guideline 2.3](#).

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

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

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

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

[How to Meet 2.2.3](#)  
[Understanding 2.2.3](#)

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

[How to Meet 2.2.4](#)  
[Understanding 2.2.4](#)

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

[How to Meet 2.2.5](#)  
[Understanding 2.2.5](#)

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

[Understanding Guideline 2.3](#)

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

[How to Meet 2.3.1](#)  
[Understanding 2.3.1](#)

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

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

[How to Meet 2.3.2](#)  
[Understanding 2.3.2](#)

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

[Understanding Guideline 2.4](#)

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

[How to Meet 2.4.1](#)  
[Understanding 2.4.1](#)

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

[How to Meet 2.4.2](#)  
[Understanding 2.4.2](#)

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

[How to Meet 2.4.3](#)  
[Understanding 2.4.3](#)

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

[How to Meet 2.4.4](#)  
[Understanding 2.4.4](#)

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

[How to Meet 2.4.5](#)  
[Understanding 2.4.5](#)

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

[How to Meet 2.4.6](#)  
[Understanding 2.4.6](#)

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

[How to Meet 2.4.7](#)  
[Understanding 2.4.7](#)

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

[How to Meet 2.4.8](#)  
[Understanding 2.4.8](#)

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

[How to Meet 2.4.9](#)  
[Understanding 2.4.9](#)

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

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

*Note 2:* This success criterion covers sections within writing, not user interface components. User interface components are covered under [Success Criterion 4.1.2](#).

[How to Meet 2.4.10](#)  
[Understanding 2.4.10](#)

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

### Guideline 3.1 Readable: Make text content readable and understandable.

[Understanding Guideline 3.1](#)

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

[How to Meet 3.1.1](#)  
[Understanding 3.1.1](#)

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

[How to Meet 3.1.2](#)  
[Understanding 3.1.2](#)

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

[How to Meet 3.1.3](#)  
[Understanding 3.1.3](#)

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

[How to Meet 3.1.4](#)  
[Understanding 3.1.4](#)

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

[How to Meet 3.1.5](#)  
[Understanding 3.1.5](#)

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

[How to Meet 3.1.6](#)  
[Understanding 3.1.6](#)

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

[Understanding Guideline 3.2](#)

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

[How to Meet 3.2.1](#)  
[Understanding 3.2.1](#)

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

[How to Meet 3.2.2](#)  
[Understanding 3.2.2](#)

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

[How to Meet 3.2.3](#)  
[Understanding 3.2.3](#)

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

[How to Meet 3.2.4](#)  
[Understanding 3.2.4](#)

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

[How to Meet 3.2.5](#)  
[Understanding 3.2.5](#)

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

[Understanding Guideline 3.3](#)

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

[How to Meet 3.3.1](#)  
[Understanding 3.3.1](#)

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

[How to Meet 3.3.2](#)  
[Understanding 3.3.2](#)

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

[How to Meet 3.3.3](#)  
[Understanding 3.3.3](#)

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

[How to Meet 3.3.4](#)  
[Understanding 3.3.4](#)

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

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

[How to Meet 3.3.5](#)  
[Understanding 3.3.5](#)

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

[How to Meet 3.3.6](#)  
[Understanding 3.3.6](#)

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

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

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

[Understanding Guideline 4.1](#)

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

[How to Meet 4.1.1](#)  
[Understanding 4.1.1](#)

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

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

[How to Meet 4.1.2](#)  
[Understanding 4.1.2](#)

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

## Appendix B Interview guides & Consent form

### Spørsmål til Include

Hvor mange ansatte har dere?

Hva slags kompetanse har deres ansatte?

Hva slags kunder kommer til dere?

Hvordan arbeider dere med universell utforming av nettsteder?

Følger dere en standard? Hvilke(n)?

Bruker dere valideringsverktøy?

Har dere bidratt til DTL §11 på noen måte? Hvordan?

Hvordan vil DTL §11 påvirke deres arbeid?

Hvordan fikk dere høre om DTL §11?

Hva synes dere om informasjonen som har blitt gitt ut til nå ang. DTL §11?

Er det noe annet du vil legge til?

### Spørsmål til UiB

1. Hva er deres erfaring med universell utforming av nettsteder? Har dere jobbet mye med det?

2. Hvordan fikk dere høre om den nye loven?

Har dere fått noe informasjon fra Difi eller det offentlige ang. Loven? Hvis ja, når?

3. Hvordan påvirker den nye loven dere?

4. Hva slags kompetanse har deres ansatte på dette området?

5. Hvordan arbeider dere med universell utforming av nettsteder?

Følger dere en standard? Hvilke(n)?

Bruker dere valideringsverktøy? (Hvilke)

Bruker dere brukertester?

## Spørsmål til Difi

1. Hva vil deres rolle være i det første året etter at DTL §11 trer i kraft?
2. Hva vil deres rolle være etter det året?
  
3. Har dere hatt noen strategi for å spre informasjon før forskriften er godkjent? Hvis nei: Hvorfor ikke?
4. Hva er strategien deres for å spre informasjon om DTL §11 og forskriften etter at kravene vedtas?
5. Hvordan skal dere nå bedrifter og de som påvirkes?
6. Hva slags støttemateriale til forskriften skal dere lage?
  
7. Har dere tatt med brukergruppene som dette skal hjelpe i utformingen av kravene  
Hvorfor/Hvorfor ikke?
8. Kommer det til å stå noe om brukertesting i støttematerialet deres? Hvorfor/Hvorfor ikke?
  
9. Hvordan definerer dere skillet mellom nye og eksisterende nettsteder i DTL §11?  
Under høringsmøtet kom det frem at dette var nødvendig å få på plass denne definisjonen. IKT Norge påpekte at det nå ikke lages helt nye løsninger fra scratch, men at nettsteder oppgraderes delvis og løpende.  
På deres nettsider står det at "Nye IKT-løsninger betyr en total utskifting av en teknisk løsning, oppgradering av versjoner, utskifting eller større endring av kildekode og større endring av utseende eller utforming. Gradvise endringer over tid som til sammen medfører slike endringer, vil også regnes som ny IKT-løsning." Dette er ganske vage formuleringer, kommer dere til å definere det klarere? Hvordan?
  
10. Hvordan skal dere finne de som ikke følger forskriften? Hvordan skal dere drive tilsynet?
11. Hvilken følge vil det ha for de som ikke følger forskriften? På høringsmøtet kom det frem at dere kan innføre tvangsmulkt, men hva innebærer det her?
  
12. Har dere noe kritikk til forskriften eller hvordan den er blitt håndtert?

## Spørsmål til Evry

1. Hva er deres erfaring med universell utforming av nettsteder? Har dere jobbet mye med det?

2. Er det noen kunder som krever universelt utformede nettsider?

Hva slags type kunder evt.?

3. Hvordan fikk dere høre om Diskriminerings- og Tilgjengelighetsloven (DTL) §11?

Har dere fått noe informasjon fra Difi eller det offentlige ang. Loven? Hvis ja, når/hvordan?

4. Har dere merket noe etter at DTL§11 trådte i kraft i sommer?

Er det noen kunder som nå krever universelt utformede nettsider?

5. Vil dere informere kundene om denne loven nå fremover? Eller legger dere det ansvaret på kunden?

6. Hvordan tror dere at den nye loven vil påvirke dere?

Flere kunder?

Flere ansatte?

Økonomisk?

7. Hva slags kompetanse har deres ansatte på dette området?

8. Hvordan arbeider dere med universell utforming av nettsteder?

Følger dere en standard? Hvilke(n)?

Bruker dere valideringsverktøy? (Hvilke)

Gjennomfører dere brukertester?

## Samtykkeskjema

Denne masteroppgaven skal utforske hvordan Diskriminerings- og tilgjengelighetsloven (§11) påvirker profesjonelle i deres arbeid med utforming av nettsteder. Det vil fokuseres på hvordan arbeidsprosesser endres, utvikling av strategier for å møte lovens krav og tilegning av kunnskap om loven. Dette skal gjennomføres ved å intervju profesjonelle i webutviklingsbransjen, brukere som påvirkes av loven og statsorganet som skal overse loven.

Intervjuene vil bli tatt opp på lydbånd hvis ikke deltagerne har noe i mot det. Hvis ikke noe annet er avtalt vil alle deltagere bli anonymisert i oppgaven og all innhentet data vil bli destruert etter at oppgaven er vurdert.

Jeg \_\_\_\_\_ gir samtykke til at intervjuet blir tatt opp på lydbånd.

\_\_\_\_\_  
Underskrift her.