# CONTENTS

ABSTRACT ................................................................................................................................. 1

1. INTRODUCTION ...................................................................................................................... 2
   1.1 BACKGROUND AND MOTIVATION .................................................................................... 2
   1.2 PROBLEM STATEMENT .................................................................................................... 2

2. WEB ACCESSIBILITY .............................................................................................................. 4
   2.1 IMPORTANCE OF THE WEB ACCESSIBILITY ................................................................. 4
   2.2 LEGAL REQUIREMENTS CONCERNING ACCESSIBILITY ............................................... 4
   2.3 WEB ACCESSIBILITY INITIATIVE (WAI) ......................................................................... 5
       2.3.1 Web Content Accessibility Guidelines (WCAG) ....................................................... 6
       2.3.2 Authoring Tools Accessibility Guidelines (ATAG) .................................................. 6
       2.3.3 User Agent Accessibility Guidelines (UAAG) .......................................................... 7
   2.4 WEB ACCESSIBILITY EVALUATION ............................................................................. 7
       2.4.1 Web development life cycle ..................................................................................... 8
       2.4.2 Testing Techniques .................................................................................................. 9

3. UNDERSTANDING DISABILITIES .......................................................................................... 10
   3.1 VISUAL IMPAIRMENTS ................................................................................................. 10
   3.2 COGNITIVE AND LEARNING IMPAIRMENTS .............................................................. 10
   3.3 HEARING IMPAIRMENTS ............................................................................................. 11
   3.4 PHYSICAL IMPAIRMENTS ............................................................................................ 12
   3.5 AGEING .......................................................................................................................... 13
       3.5.1 Physical changes ...................................................................................................... 13
       3.5.2 Cognitive Changes .................................................................................................. 14
       3.5.3 Behavioural Changes .............................................................................................. 15

4. SWISS ACCESSIBILITY STUDIES 2007 AND 2011 .............................................................. 16
   4.1 THE USABILITY TEST METHOD ...................................................................................... 16
   4.2 TEST TASKS FOR FOUR PEOPLE WITH VARIOUS DISABILITIES ................................. 18
   4.3 THE ACCESSIBILITY TEST METHOD ............................................................................. 23
   4.4 COMPARISON OF THE ACCESSIBILITY-TEST-RESULTS IN 2007 AND 2011 .................... 23
       4.4.1 BEST-PRACTICE EXAMPLES .................................................................................. 24
       4.4.2 BAD-PRACTICE EXAMPLES .................................................................................... 28

5. CONCLUSION .......................................................................................................................... 32

6. LITERATURE ........................................................................................................................... 33
List of Abbreviations

e.g. For example
et al. And others
i.e. That is
vs. Versus
W3C World-Wide-Web Consortium
WCAG 2.0 Web Content Accessibility Guidelines 2.0
PC Personal Computer
AMD Age-related macular degeneration
JAWS Job Access With Speech
PAC PDF Accessibility Checker
PDF Portable Document Format
EPFL École Polytechnique Fédérale de Lausanne
ETH Zürich Swiss Federal Institute of Technology Zurich (Eidgenössische Technische Hochschule Zürich)
tsr Télévision Suisse Romande
rsi Radiotelevisione svizzera di lingua italiana
drs German language service of Swiss broadcaster (Deutsche und Rätoromanische Schweiz)
rsr Radio Suisse Romande
srf Swiss Radio and Television (Schweizer Radio und Fernsehen)
sf Swiss Television (Schweizer Fernsehen)
IQ Intelligence Quotient
ASL American Sign Language
JSL Japanese Sign Language
BSL British Sign Language
Ft Feet
ALT Alternative
HTML Hypertext Mark-up Language
IMG Image
CAPTCHA Completely Automated Public Turin-Test to Tell Computers and Humans Apart
CSS Cascading Style Sheets
WAI Web Accessibility Initiative
WCAG Web Content Accessibility Guidelines
ATAG Authoring Tools Accessibility Guidelines
UAAG User Agent Accessibility Guidelines
CMS Content Managements System
ICT Information and Communication Technology
UK United Kingdom
EU European Union
ABSTRACT

The Internet is dramatically changing the way the governments serve the public. Taking advantage of new technology, many federal and local governments are using the web to offer citizens various services. In doing more with less, the Internet is playing a vital role in allowing governments to better serve all of its citizens. People with disabilities have also the right, to use in the same manner as non-disabled citizens the services of the government.

Many people with disabilities use “assistive technology” to enable them to use computers and access the Internet. Blind people who cannot see computer monitors may use screen readers – devices that speak the text that would normally appear on a monitor. People who have difficulty using a computer mouse can use voice recognition software to control their computers with verbal commands. Poorly designed websites can create unnecessary barriers for people with disabilities. Also, with the regard to the demographic development - most people will be sooner or later limited in the in the mobility, vision or hearing. Therefore is the realization of accessibility a special responsibility of governments. In this paper the main findings of the Swiss Accessibility Studies 2007 and 2011 concerning Web content accessibility of the government websites are presented und discussed.

Keywords
E-government, Web usability, Web content accessibility, Web Accessibility Evaluation, People with disabilities, W3C, WCAG, ATAG, UTAG
1. INTRODUCTION

1.1 Background and Motivation

Being part of something is a powerful social concept. For example, the people want to join the same club, wear the same clothes or surf the same Internet, everyone wants to be part of something. The Internet has made huge amount of information and services available to an extraordinary number of people. Although the Internet is not considered a mass medium in the classical sense, it has a mass media character and differs from the other mass media in principle, that each participant may also be his own publisher. Consequently, the Internet is important for the formation of public opinion, which in turn is essential for democracy and participation. Therefore, it must be accessible for all.

In the reality, not everyone is able to participate in this digital revolution called internet. Economic and social factors play a strong role in creating what is known as the “digital divide”. It considers the possibility to own the requisite technology to get online and having the necessary knowledge to operate it. There is an additional aspect of the digital divide however: possibility to access to online information in its purest sense. This paper address the second aspect of digital divide, the problems facing people with disabilities when they get online and try to access information which is important to their lives. Websites can be accessible to disabled people if they are created according to certain design principles. The web content accessibility is important when a computer user for whatever reason, be it sight or hearing difficulty, reduced motor skills or cognitive difficulties, cannot access the needed information. In the legislation of many countries, an equality act is established that protect e.g., people because of a mental or physical disability against discrimination. According to the Declaration of Ministers of European Union (EU) in Riga from year 2006, the access to all public web sites should be ensured by 2010. Also in Switzerland there are legislative regulations that should promote the equality of people with disabilities concerning the use of services of the public sector on the Internet. These regulations are based on Web Content Accessibility Guidelines (WCAG), published by the World Wide Web Consortium (W3C), a supranational non-governmental organisation created by Internet founder Tim Berners-Lee.

1.2 Problem Statement

According to the study for the 2005 UK Presidency of the EU “eAccessibility of public sector services in the EU”, only 3% of public web sites surveyed comply with the minimum web accessibility standards and guidelines. These circumstances are hindering access to web content and services for people with disabilities who comprise some 15% of the EU population [Meier 2009, p. 24].
Also in Switzerland are the most public and private Internet sites not accessible. This testifies the Swiss Accessibility Studies 2007 and 2011 published by the Swiss Foundation "Access for All". Swiss Accessibility Study 2011 found some improvements, but there is still much to do in this area. In this paper this two studies will be examined. The current state of the art will be determined, and possible improvements will be proposed.
2. WEB ACCESSIBILITY

2.1 Importance of the Web Accessibility

Reading newspapers or consulting a catalogue - for the blind and visually impaired, this was until recently only possible with outside help and great effort. The Internet and assistive technology, which translates web pages into spoken language, have increased the independence of these people enormously. Their assistive technology can only translate what it is readable programmed and here it quickly becomes evident how technology can exclude some people. The use of the computer and Internet, can substantially improve the quality of life of handicapped people. Therefore, it must be possible for them to carry out everyday activities, to maintain social contacts, and to study or engage in any business.

Internet is for the people with mobility disabilities or people with visual impairment in many cases the only possible way to get independently the information and to communicate with others without restrictions. An accessible Internet contributes significantly not only to strengthen the autonomy of people with disabilities and their participation in social, political, but also to facilitate the professional life.

We all benefit from the Web accessibility: Web accessibility guarantees an easy to understand, well-made Internet sites. On this way the service providers are opening up new customer segments.

2.2 Legal requirements concerning accessibility

In the legislation of many countries, an equality right is enshrined, that provides the barrier-free Web access for the people with a physical, mental or physical disability. Moreover, the equality is guaranteed by the law among all citizens, regardless of race, gender, age, language or social status. In 2006, at a European ministerial conference in Riga, a declaration was signed [Ministerial Declaration 2006] with the intention to ensure the barrier-free access to all public web sites by 2010, based on WCAG of W3C [Meier 2009, p. 24]. The most important requirements of the Ministerial Conference can be therefore summarized as follows [Ministerial Declaration 2006; Meier 2009, p. 25]:

- There should be programs developed that encourage old people to use Web.
- Digital divides should be reduced by facilitating affordable access to ICT networks, terminal equipment and contents, and reducing significantly the disparities in internet access between all regions.
- Facilitating accessibility and usability of ICT products and services for all, with a special focus on people with disabilities, such that this will benefit everyone.
- Improve digital literacy and competences.
• Promote cultural and linguistic diversity in relation to inclusion.
• Promote inclusive e-government by promoting and ensuring accessibility of all public websites by 2010, and by designing and delivering key services and public service policies in a user-centric and inclusive way.

In Switzerland, like in many other countries, is the equality of persons with disabilities regulated in the Constitution. Moreover, the Federal Law on the Elimination of Discrimination against people with disabilities and Regulation on the Elimination of Discrimination against people with disabilities protects the rights of this population. In Switzerland are also important the following standards:

• P028 are the guidelines that apply to federal websites. The central requirement is to achieve conformity Level AA according to WCAG 2.0 [Web Accessibility Standard P028 2005].
• eCH-0059 - The association eCH promotes and adopts e-government standards in Switzerland. eCH facilitates electronic cooperation between governments, businesses and private individuals. For this purpose he adopted standards and coordinates their implementation [eCH-0059: Accessibility Standard 2008].

2.3 Web Accessibility Initiative (WAI)

Web Accessibility Initiative (WAI™) is one of four domains of the World Wide Web Consortium (W3C). WAI (created by W3C, in 1997) is a set of guidelines intended for web developers, authors, and designers- about how to make the web content accessible to people with disabilities. Its domains are Architecture, User Interface, Technology and Society, and WAI, which works across the other three domains.

WAI pursues accessibility of the web through five primary activities:
1. Ensuring that web technologies support accessibility
2. Developing guidelines for accessibility
3. Developing tools to evaluate and facilitate accessibility
4. Conducting education and outreach
5. Coordinating with research and development

W3C was created in 1994 to develop common protocols that promote the evolution of the World Wide Web and ensure its interoperability. The HyperText Markup Language (HTML) and Cascading Style Sheets (CSS) specifications are two of the most familiar outcomes of W3C’s work. W3C has more than five hundred member organizations worldwide. Web Accessibility Initiative (WAI) recognises provides following guidelines: Authoring Tool Accessibility Guidelines (ATAG), Web Content Accessibility Guidelines (WCAG) and User Agent Accessibility Guidelines (UAAG) [Web Accessibility Initiative 2011].
2.3.1 Web Content Accessibility Guidelines (WCAG)

WCAG address the information in a Web site, including text, images, forms, sounds, and so on, and explain how to make Web content more accessible to people with disabilities. WCAG is primarily intended for:

- Web content developers (page authors, site designers, etc.)
- Web authoring tool developers
- Web accessibility evaluation tool developers
- Others who want or need a technical standard for Web accessibility

WCAG 2.0 (2008) has 12 guidelines that are organized under 4 principles: perceivable, operable, understandable, and robust. For each guideline, there are testable success criteria, which are at three levels: A (lowest), AA, and AAA (highest) [Web Content Accessibility Guidelines (WCAG) Overview 2011]. Following are briefly presented the WCAG 2.0 [WCAG 2.0 at a Glance 2011]:

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

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

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

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

2.3.2 Authoring Tools Accessibility Guidelines (ATAG)

Authoring tools are software and services that people use to create Web pages and Web content. ATAG 2.0 (2008) documents define how authoring tools should help Web developers produce Web content that is accessible and conforms to the WCAG. The ATAG documents also explain how to make authoring tools accessible so that people with disabilities can use the tools. ATAG is primarily for developers of authoring tools, including [Authoring Tool Accessibility Guidelines (ATAG) Overview 2011]:
• Editing tools specifically designed to produce Web content (HTML and XML editors)
• Tools that offer the option of saving content in a Web format (word processors or desktop publishing packages)
• Tools that transform documents into Web formats (filters to transform desktop publishing formats to HTML)
• Tools that produce multimedia
• Tools for site management or site publication, including content management systems (CMS)
• Tools for management of layout (CSS formatting tools)
• Web sites that let users add content (blogs, wikis, photo sharing sites, and social networking sites)

2.3.3 User Agent Accessibility Guidelines (UAAG)

UAAG 2.0 (2008) addresses user agents (Web browsers, media players, and assistive technologies) and explains how to make user agents accessible to people with disabilities, particularly to increase accessibility to Web content. UAAG is primarily for developers of Web browsers, media players, assistive technologies, and other user agents [User Agent Accessibility Guidelines (UAAG) Overview 2011].

2.4 Web Accessibility Evaluation

With the web accessibility evaluation can be assessed how well the Web can be used by people with disabilities. This includes the accessibility of the authoring tools, the user agents (such as browsers and media players), assistive technologies, and the underlying Web technologies. Web accessibility evaluation is in many aspects similar to software quality assurance. In some points it differs from software quality assurance [Abou-Zahra 2008, pp. 79-81].

Web content tends to change frequently while software is released in discrete versions that do not change much over time. Evaluation means not only production of the Web content but is essential for assessing and monitoring the Web content throughout its lifetime and is more important than the initial evaluation.

Web content is also often published by non-technical Web authors, for example by employees who are using content management systems or other authoring tools that cascade the source code. Software is developed by technical personnel and in more controlled environments. The quality control of Web content is therefore more challenging, because, for example, on many Web sites any end-user can publish or modify Web content using the wikis, blogs, and other interactive communication channels.
And, at the last point, Web content tends to focus more on informational substance (text and multimedia) and its presentation to the user while software tends to be more oriented to the functional features and programming logic.

### 2.4.1 Web development life cycle

The main stages of the Web development process are Requirements, Design, Implementation, and Operation [Abou-Zahra 2008, pp. 81-84] (see Figure 1).

Figure 1: Stages of the Web development life cycle [Abou-Zahra 2008, p. 82].

![Diagram of the Web development life cycle](image)

**Requirements phase** of Web development refers to identifying of the objectives and requirements. The accessibility requirements are ideally also considered during this early stage of development because it will save valuable time and effort in addressing these requirements later. The first step in analysing the accessibility requirements for specific Web content (overall behaviour, text, multimedia) is to learn about how people with disabilities interact with the Web, and understand some needs of specific users.

During the **design Phase** of development, formative and functional evaluations should be carried out on the overall design concepts and templates, for example on the document structure, the navigational features, the colour schemes, and general presentation. Web accessibility standards and guidelines provide important guidance on how to design Web content that is usable by people with disabilities.

During the **implementation phase** starts the realization of the actual Web content. This development stage also involves the creation of the informational substance of the Web content such as the text and multimedia. It is important to understand that accessibility is not the responsibility of the technical developers alone, but also the responsibility of the content authors who need to help assess how well the information is formulated and presented to the end-users.
If the Web content has been developed according to accessibility guidelines, then the evaluations that are carried out during the operation phase are primarily intended to maintain that level of quality or possibly to identify additional optimizations.

2.4.2 Testing Techniques

In general there are three basic types of testing techniques: "automated testing" is carried out by software tools, "manual testing" is carried out by human evaluators who could be experts or novice, and "user testing" which is carried out by end-users in informal or formal settings [Abou-Zahra 2008, pp. 85-87]. Optimal results are achieved by combining different approaches to benefit from each of their specific advantages.

Automated testing is carried out without the need for human intervention. It is cost effective and can be executed periodically over large amounts of Web pages. At the same time, automated testing only addresses some of the accessibility provisions set out by most standards. The provisions that tend to be qualitative and that address user interface, interaction, as well as natural language aspects cannot be tested with automated testing.

Manual testing is carried out by human evaluators, even if it is sometimes guided or supported by software tools. For example, while software tools can quickly determine the existence ALT-attributes in HTML IMG elements, human evaluators need to judge the adequacy of the text in these attributes.

User testing is carried out by real end-users rather than by human evaluators or by software tools. It focuses on the end-users and how well the technical solutions match their needs in a specific context. The biggest problem with user testing is the difficulty to filter out personal bias and preferences, and identify the actual issues. In general one can differentiate between two models of user testing:

- Informal checks - are simple and can be carried out by non-experts. For example by asking individual persons like friends or colleagues for their opinions.
- Formal checks - are usually carried out by professionals who follow well established usability procedures.
3. UNDERSTANDING DISABILITIES

3.1 Visual Impairments

Four critical visual functions that can be considered and assessed for each given individual are visual acuity, contrast sensitivity, visual field and colour perception [Barreto 2008, p.7; Jacko et al. 2002]

1. **Visual acuity** refers to the capability of the eye to resolve two point sources of light that may be located close to each other. Clinically, visual acuity is assessed through the identification of letters of decreasing size. With the use of an eye chart, such as the Snellen chart, acuity assessments are expressed by comparison to a norm. So, 20/20 acuity indicates that a specific subject can see details at a distance of 20 ft as clearly as would an individual with normal vision. 20/30 indicates a decreased visual acuity, by which the subject must be at 20 ft from an object to discern details that a person with normal vision could distinguish at 30 ft.

2. **Contrast sensitivity** describes the ability of a subject to recognize subtle differences in shades of grey present in an image. Clinically, contrast sensitivity may be assessed with the use of the Pelli-Robson chart, in which letters at different levels of contrast are presented to the subject.

3. **The field of vision** is the visual area seen by an eye at a given moment. Clinically, the extent of the field of vision may be assessed through a method called perimetry, which requires the subject to look toward a central fixation point, directly in front of the eye.

4. **The colour perception** capability of the human eye is based on the fact that there are three populations of cones in the retina: red, green and blue, which are sensitive only to electromagnetic radiation in the corresponding spectral regions. Proper colour perception can be tested with pseudoisochromatic color plates, which will fail to reveal the expected numerical patterns if the viewer has specific color perception deficiencies. Color perception can also be tested with Farnsworth ordering tests.

3.2 Cognitive and Learning Impairments

Access to the Web is essential for recognition of the right of people with cognitive disabilities to control their lives. Cognitive barriers to this access are diverse. They depend on the complexity of human cognitive faculties. These barriers are not well managed in current accessibility practice and policy, in part because cognitive accessibility, like usability, cannot be reduced to a checklist of simple attributes. The independence means that they are able to live outside institutions and attend schools for the general public [Lewis 2008, p. 15] Cognitive and learning impairments are extremely diverse, in both origin and impact. Because the human cognitive apparatus is extremely complex and multifaceted, cognitive and learning impairments are extremely diverse, in both origin and impact. [Francik et al. 1996] presents a classification of cognitive functions:
Executive function
Memory
Attention
Visual and spatial perception
Language
Emotions

To this list can also be added the speed of problem solving, fluid intelligence, crystallized intelligence, and specific functions in mathematical reasoning. These functions can be interfered with in many ways. Cognitive impairments can be caused through chromosomal abnormalities (e.g. Down syndrome), injuries to the brain from external impact or from stroke, effects of aging, diseases like Alzheimer's or Parkinson's, or severe mental illness. But also many people have cognitive impairments for which no cause can be identified.

It is wrong to give emphasis to classifying cognitive disabilities. These classifications view the disabilities, and not the people, as important. The focus should be on barriers to Web access, not on impairments. There are two common misconceptions, associated with research approaches in this field. First, sometimes people assume that people with cognitive impairments cannot use computers, or could not be represented in the professional, administrative, or managerial workforce. A survey commissioned by Microsoft produced the estimate that 16% of working-age computer users in the USA have a cognitive or learning impairment. Then, another common misconception is that cognitive disabilities can be understood in terms of IQ. It is increasingly recognized that IQ measures only some aspects of cognitive function. Thus a person with high IQ can have severe cognitive or learning impairments and it is also true that a person with low IQ can function very effectively in some areas [Lewis 2008, pp. 17-18]. Problems that many people with cognitive disabilities have are, broadly, the same usability problems that affect all users, but the impact on people with cognitive disabilities is more severe. For example, all users have trouble when the back button fails to work, but a user with a cognitive impairment may have more trouble solving the problem. All users have trouble processing large amounts of text, but people who cannot read well have more trouble [Lewis 2008, p. 19]

3.3 Hearing Impairments

To get to the information, for some people, the ability to adjust the audio volume may be sufficient. For others, translation to a signed language may be more appropriate. For still others, to have text alternatives may be the best solution. For researchers in Web accessibility it is important to understand that people with hearing impairments may have very different personal backgrounds. For this reason it helps to think of the three models of disability [Cavender/Lander 2008, pp. 25-26; Oliver 1990]:

1. **Medical model** - Medically, a person who is hearing impaired is thought to be broken, in need of repair to restore hearing. They may partially restore hearing with hearing aids and cochlear implants, but such aids are not considered to be cures for deafness.

2. **Rehabilitation model** - In this model a person who is hearing impaired is viewed to be in need of assistance to carry on a more independent life using sign language interpreters or real-time captioning.

3. **Social model** - According to social model a hearing impaired person is viewed to be part of a community or culture. That is, the group of hearing impaired people shares a common language, such as American Sign Language (ASL), Japanese Sign Language (JSL), or British Sign Language (BSL). They have their own language and customs. The most common metric of quantifying hearing loss is the degree of loss in decibels (dB) from mild loss (25-40 dB) to profound loss (90 dB or greater). Pre-lingual deafness means the deafness occurred before spoken language acquisition and post-lingual deafness after. With post-lingual deafness, speech training is much easier and often successful while with pre-lingual deafness, speech training is much more difficult and often unsuccessful [Cavender/Lander 2008, pp. 26-27].

### 3.4 Physical Impairments

People with physical impairments represent the second largest accessibility group, after those with cognitive impairments. Pointing, clicking and typing can be challenging for people with physical impairments. Some people cannot point and click at all, and use alternative access mechanisms such as keyboard shortcuts. Others point and click, but in a very different way, for example by using eye gaze or using regular devices in very individual ways. The impairments (dexterity impairments) that specifically affect the use of the hands and arms have the greatest impact on technology and Web access, since the vast majority of computer input mechanisms are manual. Those can be musculoskeletal and movement disorders [Trewin 2008, pp. 37-40].

1. Musculoskeletal impairments appear in the muscle or skeletal system, or specifically cause the disorder in the interaction between those two systems. They can be caused by deformity, injury or disease. Musculoskeletal impairments may make it difficult to reach a key or grasp a mouse. If both hands are lost or affected, then it may be necessary to control technology with some other body part, such as a foot or elbow, or by typing with a stick held in the mouth.

2. Movement disorders are caused by damage to the nervous system or neuromuscular system. The most common movement disorders are:

   - **Ataxia** - loss of gross coordination of muscle movements leading to unsteady and clumsy motion. It can be caused by many health conditions including stroke, multiple sclerosis, cerebral palsy and tumors.
• Chorea - brief, irregular contractions that occur without conscious effort, caused by over-activity of the neurotransmitter dopamine.
• Dystonia - involuntary sustained muscle contractions, due to damage in the basal ganglia. The muscle contractions cause repetitive movements or abnormal postures, and can be very painful.
• Myoclonus - involuntary twitching of a muscle or group of muscles, due to lesions of the brain or spinal cord. It is found in multiple sclerosis, Parkinson's disease and Alzheimer's disease.
• Partial (paresis) or complete (paralysis) - loss of muscle function for one or more muscle groups is most often caused by damage to the brain or spinal cord.
• Parkinsonism - combined term covering the Parkinson's disease symptoms of tremor, rigidity (increase in muscle tone resulting in resistance to movement), bradykinesia (slow execution of movements) and akinesia (inability to initiate movements). Parkinsonism is produced by Parkinson's disease, Huntington's disease and other disorders of the basal ganglia.
• Spasm - sudden involuntary contraction of a muscle, due to imbalance of signals between the nervous system and the muscles. Common causes of spasticity are cerebral palsy, brain or spinal cord injury and stroke.
• Tremors are unintentional, somewhat rhythmic muscle movements involving oscillations, stemming from problems in the brain. Essential tremor is by far the most common form, and the hands are involved in 90% of cases.

3.5 Ageing

Considering the expectation that by 2020, the number of the world’s older population will exceed one billion, maintaining a high quality of life for these people becomes an important issue throughout the world. The gradual sensory decline typically begins between the ages of 40-55 years old - earlier than the age most people consider themselves "old" [Kurniawan 2008, p.47]. Typical age-related changes are physical, cognitive and behavioural changes.

3.5.1 Physical changes

The most common physical changes are vision, hearing and psychomotor. Vision is the most common physiological change associated with ageing and the one that affects Web interaction the most. Some of the most common vision diseases of people aged over 65 are [Kurniawan 2008, pp.48-50]:
• Age-Related Macular Degeneration (AMD) refers to the breakdown or thinning of the most sensitive cells of the eye clustered in small area in the centre of the retina known as the macula. Symptoms of macular disease usually start around the early mid-50s, typically
starting in just one eye. Starting with the difficulties to read small or faint print, the disease worsens and spreads to both eyes, it becomes difficult even to read large print or to determine any specific details such as pictures. For this reason, any Web pages should be designed with large fonts (minimum of size 12-14 pt) or the options to increase font size.

- Cataracts refer to the loss of transparency or clouding of the lens of the eye. The lens is responsible for producing clear, sharp images. Due to this, Web pages should be designed not using colours in the blue/green/violet spectrum (better in red/orange/yellow). Similar colours should also be avoided. Fonts should be a minimum of size 12 pt and blinking or flashing icons or animations should be avoided.

- Presbyopia is an age-related disorder where the eyes lose the ability to focus on objects or detail at close distances. The onset of presbyopia normally starts in the 40s but is a disorder that happens to all people at some time in their life.

- Glaucoma is a group of diseases that can damage the optic nerve and cause blindness. It is not a direct age-related disorder.

**Hearing** - Older people have more problems localizing sound than younger persons. Especially persons with presbycusis have a reduced ability to follow fast speech (more than 140- 180 words per minute) and conversation in noisy surrounding. Providing audio captions for online news, especially when the journalists reported the news over noisy backgrounds (e.g., an onsite natural disaster report), will help older users [Kurniawan 2008, p. 51].

**Psychomotor** - Older adults, take significantly more response times with more complex motor tasks or in tasks with a larger number of choices. The most common problem faced by older persons is using the mouse, both for pointing and clicking and for scrolling. Because of arthritis or tremors, some older persons are incapable of the fine movements required to manoeuvre a mouse. Age-related diseases that affect their psychomotor abilities are multiple sclerosis, arthritis, osteoporosis, stroke and parkinson's disease [Kurniawan 2008, p. 51].

### 3.5.2 Cognitive Changes

**Attention** is the ability to focus and remember items. Older persons experience more difficulties in trying to focus and maintain attention on activities over long periods of time, or require quick and continuous scanning, which is particularly fatiguing. Activities that require concentration on a specific task in light of distracting information become more difficult for older persons [Kurniawan 2008, p. 52].

**Memory** is a key performance factor in all cognitive tasks, which includes learning, planning, perception, decision making, prioritizing and creativity. Memory performance declines with age and such age-related decrements in performance are much greater in relation to some tasks than in others. There is a decline in intellectual performance and the ability to process items from long-term memory into short-term memory. This is distinct from simply being able to recall items and
explains older adults' problems with text comprehension. Older adults may have problems recalling things such as a specific Web page location, previously followed links or the current location in a particular Web site [Kurniawan 2008, pp. 53-54].

3.5.3 Behavioural Changes

With advanced aging increases the cautiousness (hesitancy about making responses that may be incorrect), because of decline in speed across a variety of situations. Older persons have also less confidence about their ability to use computer technology, including the Web, which causes computer phobia, anxiety, resistance and negative attitude towards computers. This can be partly explained with the fact that some older people have never used or been shown how to use computer technology and have never had the opportunity to learn.
4. SWISS ACCESSIBILITY STUDIES 2007 AND 2011

In the context of Swiss Accessibility Study 2011 100 Web sites of the Confederation, cantons, the ten largest cities, federal-related businesses, media, job fairs, universities and public transport activities, Internet TV services and online shops have been tested for their accessibility to people with disabilities and older citizens. The test results are based on web accessibility tests that have been carried out between April and July 2011 by the foundation "Access for all". It was tested according to international guidelines of the W3C, WCAG 2.0 (Web Content Accessibility Guidelines). These guidelines build the basis of the both, federal standards for the design of accessible websites P028 [Web Accessibility Standard P028] and eCH-Accessibility-Standards 0059 [eCH-0059: Accessibility Standard 2008] for cantons and municipalities. There were websites selected, which content is important for people with disabilities and which make a valuable contribution to their independent life [Schweizer Accessibility-Studie 2011].

4.1 The Usability Test Method

First, it is important to clear the terminology of usability and accessibility of websites. Usability and accessibility are similar terms, but they differ regarding some points. Usability refers to the appropriateness of a product (website) in use by certain users in a specific usage context, to achieve the specified goals effectively, efficiently and satisfactorily. It is therefore closely related to the ease of use (user friendly), represents the first suitability, but not the entire user experience. The usability of the system must be judged in the context of its use. Software applications, websites or products have a high usability, if they can be easily learned and used efficiently by the users to fulfill their intended tasks satisfactorily. "User Centered Design" is such concept that allows obtaining of good usable systems [Accessibility-Studie 2007, p.9].

Accessibility means designing a website to be in such high mass as possible accessible to all users even they have sensory and / or physical disabilities. In particular, websites and portals of government must be accessible to disabled people, e.g. for the blind, color blind, deaf, people with movement difficulties or people who are not able to use either a keyboard or mouse must also have the right to consult public Web content. People with language difficulties or with speech impairments or people with learning problems must also have access to the government portal [Meier 2009, p. 24]. Accessibility is one of the criteria of usability, and usability is a precondition for accessibility.

Web accessibility evaluation differs from software quality assurance (assessment of programming logic), and it often resembles usability assessment which primarily addresses the user interaction rather than the technical implementation. Accessibility is the narrower meaning of the usability. The
field of Web accessibility evaluation has emerged as an independent discipline in quality assurance, between the largely technical domain of software quality assurance and the largely functional domain of Web usability evaluation. It has developed its own (though related) testing techniques, inspection procedures, and support tools [Abou-Zahra 2008, p. 81].

"Access for All" carries out usability tests with people with special needs. These include usability tests with blind, visually impaired and people with physical or cognitive limitations. Depending on the disability, test persons use special input and output devices (assistive technologies). The needs of senior citizens are also increasingly interesting [Accessibility-Studie 2007, p.6].

**The formal usability tests**

There are two groups of formal usability tests: summative and formal.

In the summative evaluation of a system, several alternatives are compared, such as the different mechanisms of site navigation. Here it is important to perform the experiments in controlled environment, usually in a usability lab.

Formative or inductive evaluation aims to identify weaknesses in the functionality and the design of a system.

The test tasks are processed in both methods by representative users. During the test phase, the test person is working in an enclosed test room to prevent distraction and influencing [Accessibility-Studie 2007, p.6].

**The simple usability test - "Usability Walkthrough"**

The main difference to the formal usability test is that the test person is not working alone in a separate testing room. The test administrator accompanies the test person and moderates the process.

Before the starting the test it is important to find out which experiences, habits and expectations in using internet have the test persons. Then, the moderator explains the problem and asks the test person, if possible, to "think aloud". It is important for the test person to know that she or he is not tested, but the Web site, and that the aim of the test is to discover the problems about the website.

The test administrator (moderator) should stay next to the test person in the same room, neither affecting nor detracting the test person. He can pose the questions only if there is a need for clarification, e.g.:

- What do you think or look for at this moment?
- What is unclear or confusing?
- What do you think, does this message mean?
- What reaction did you expect?

The final feedback is very important. The moderator can now pose questions based on the observation protocol to test person. These questions could be such as:

- What overall impression do you have?
• What did you like?
• What did you not like?
• What would you improve?
• What would be your ideal solution?

Unlike the formal usability test, in the simple usability test (usability walkthrough) the moderator has the opportunity to intervene directly. Especially his questions are helpful if the test person is confused. The neutrality and comparability of results are again evident better in the laboratory situation (formal usability test) [Accessibility-Studie 2007, pp.7-8].

Table 1: The Usability Test Method

<table>
<thead>
<tr>
<th>Method</th>
<th>Usability test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test object</td>
<td>Website, web-based application software, device</td>
</tr>
<tr>
<td>Procedure</td>
<td>Testing a standard task by representative user groups</td>
</tr>
<tr>
<td>The result</td>
<td>Reporting and documentation, deficits identified, improvement measures discussed</td>
</tr>
<tr>
<td>Effort</td>
<td>Formal or simple usability test in the laboratory with 5-7 test persons, 1-2 moderators and 1-4 observers</td>
</tr>
</tbody>
</table>

4.2 Test Tasks for Four People with Various Disabilities

Test task for a multi-handicapped person

This test was conducted with the aim to show how people with disabilities concretely use a website, and to let us know, what are their needs and the barriers they encounter in solving certain tasks.

Test Person with Cerebral Palsy

Cerebral palsy is the disorder of movement and posture caused by abnormal development of, or damage to, motor control centres of the brain. Cerebral palsy is caused by events before, during, or after birth. The cerebral movement disorder is the largest group of physical disabilities. In recent decades, an increase of this disease is reported. The reason is the development and the state of modern medicine, which ensures the survival of children more than it was previously possible.

The test person is a 41 years old woman, office employee, lives independently in her own apartment, and uses wheelchair and a normal PC as assistive technologies. She has the following experiences with computer and internet:

• She uses the PC daily in the job with accounting software. Also, she uses the internet for payment processing and information.
• Her internet skills are moderate.
• She almost cannot do simultaneously clicking and dragging the mouse.
• She has to do much effort to do exact targeting and clicking.
• She has difficulties to understand the moving images. Flashing elements disturb her greatly.
• Reading lots of text and complex illustrations are difficult to her.

The test task at www.ch.ch
The task for the test person is to search information about where she can get the new identity card and what she will need for the application.

Findings
Impressions of the test person:
• The home page is clearly laid out, but unclear for this task, the term "Privatpersonen" is in my view is too far away.
• Somehow it has too much information, I have a "storm head," I found the way no more.
• After all, I would try to pick up a phone or try again with Google.

Impressions of the observer:
• For the test person was the subdivision "Privatpersonen, Unternehmen, Behörden" and "über die Schweiz" unclear.
• In two places help was needed.
• Too much information leads to overlooking of important links.
• To scroll long texts is difficult for the test person.
• Small sized links are a not ideal, since the exact clicking is difficult.
• Important information (links) at the end of the text has been overlooked.
• Pop-up windows or new browser windows for the test subject were confusing and disturbing.

[Accessibility-Studie 2007, p. 11].

Test Person with blindness
Blindness is a visual acuity (vision) of less than 2 percent, or a reduction of the visual field to 5 degrees and less. A reduction of the visual acuity to less than 5 percent is called a severe visual impairment. There is a distinction between inborn and acquired blindness. Cataract is the most common cause of blindness. In developed countries, however, is diabetes, followed by glaucoma more often responsible for blindness. Because of the changed age structure, the proportion of people who is affected by blindness has increased significantly. Age-related macular degeneration (AMD) is the leading cause of blindness among people over the age of 55 years. AMD is a medical condition which usually affects older adults and results in a loss of vision in the centre of the visual field (the macula) because of damage to the retina.
The test person is a 25 years old man, student and accessibility specialist, and lives independently in his own apartment. He uses JAWS screen reader and Braille display as assistive technologies.

JAWS (Job Access With Speech) is a computer screen reader program in Microsoft Windows that allows blind and visually impaired users to read the screen either with a text-to-speech output or by a Braille display (or Braille terminal) [JAWS 2011]. Braille terminal is an electro-mechanical device for displaying Braille characters, usually by means of raising dots through holes in a flat surface. Blind computer users, who cannot use a normal computer monitor, use it to read text output [Refreshable Braille display 2011].

He has the following experiences with computer and internet:

- Very good knowledge, he maintains a website.
- He uses the computer daily. For distance study at the university in the United States, the profession and many things like shopping, travel planning, tax declaration etc.
- The Internet is very important to him, and means to him much more independence.

The test task at www.swisscom.ch

The test person needs a new mobile phone subscription with a mobile phone and would like to find information about the prices and subscription options.

Findings

Impressions of the test person:

- I have found the information only because I did not let me be scaring of the crowded home page, and only thanks to my experience, I could find the right link twice.
- The site is very difficult for me to handle, because I always stumble on items that are not accessible to blind people.
- Ideal would be a summary page with a cleanly coded data table with all the products together.

Impressions of the observer:

- The test person has found the information without assistance.
- The test person is a power user. Inexperienced or underequipped users would have greater difficulties with unstructured text elements and dynamic navigation.
- The navigation was very demanding.
- For the blind partially incomplete information. The product titles are represented only with pictures.
- The product overview of the three types of mobile phone subscription is possible only in a roundabout way. Four clicks to get all the information is too much for all users.


Test Person with visual impairment
Generally, visually impaired is that person, who cannot read printed newspaper ordinary, even with reading glasses or contact lenses. There are no legal definitions. Because of the changed age structure, the proportion of people who is affected by visual impairment, increased significantly. The test person is a 55 years old man, accessibility specialist, and lives independently in his own apartment. He uses ZoomText screen magnification (preferably inverse mode and 400 to 700 percent magnification) and screen-reader as assistive technologies. He has the following experiences with computer and internet:

- He has good or very good skills.
- He uses the computer daily. For the job, and research on the Internet.
- He uses eBanking, eCommerce and eGovernment - if it is accessible.
- For him is much information easily available electronically.
- He uses the timetable information almost daily.
- He wants to try soon to buy a ticket online that would be an advantage for him.

The test task at www.sbb.ch

He wants to get information about the prices for GA travelcard (General-Abonnement) for himself and his partner from the same household.

Findings

Impressions of the test person:

- I am a little disappointed that I took so long and would have failed without search function.
- The main navigation disappears for me in the picture, I have big effort to notice and read it.
- Generally, the images are too close to the text and too intense.
- The category "Konzern" is placed at the best place. Category "Konzern" is for me and other customers not unimportant.
- Therefore, rather would ask at the counter for GA travelcard.

Impressions of the observer:

- The test person has found the information without assistance.
- The test person may be a power user, but the difficulties of visually impaired people have become highly visible.
- Sometimes was the targeted link only one or two screen cutouts far away.
- The grouping of links would be important.
- Clearer color and brightness contrasts were important.
- The terminology of navigation and its structuring could be better.


Test task for a senior citizen

The age-related disabilities are common and affect all people. Mainly the visual and fine motor apparatus is affected. Because of the changed age structure, the proportion of older people has
increased significantly. The use of the Internet is already self-evident to many, and already there are more "silver surfers" online than junior. It is the one user group, which will grow in the coming years the most. For all categories of seniors the Internet is becoming increasingly important for the information and communication.

The test person is a 71 years old woman, retired, and lives independently in her own apartment. She uses no assistive technologies, just slight sight correction.

She has the following experiences with computer and internet:

- My skills are middling.
- I use the computer several times a week, even for everyday things, the Internet is very helpful.
- As the editorial employees at seniorweb.ch I surf the internet a lot and I work online with a content management system.
- Some websites cause me trouble, usually due to small type and tiny small sized links and because they are confusing.

**The test task at www.post.ch**

Test person wants to send a large and heavy package and let this pick up at your home. You have been told, the Post offers this service for an additional charge.

**Findings**

Impressions of the test person:

- I am a little disappointed that it was so difficult. I think I didn't look at the wrong place and entirely illogical.
- This “teaser” images on the home page and subsequent pages are disturbing and diverting me. They should fit exactly or are to be omitted.
- The color contrast - on the dark yellow is the font for me no longer legible.
- The font size - on the whole site is the font too small. I must exert myself extremely while reading.
- You can find the things you are looking for not so easy, but once you found it, the information is good.

Impressions of the observer:

- At one place help was needed.
- The information structure of the website follows a strange logic. Since packets can be picked up also for individuals, there should be the entry also to find.
- The design offers many possibilities for improving accessibility: font size, contrast, density of information.
- The information is not well structured; graphical elements compete with each other and have the test person repeatedly distracted.
4.3 The Accessibility Test Method

In the context of Swiss Accessibility Study 2011, 100 websites has been tested on their accessibility. The websites of the federal government, cantons, and the ten largest cities, federal nearby companies, media, job fairs, colleges, public transport operators, internet TV services and online shops has been tested.

It was tested according to international guidelines of the W3C, WCAG 2.0 (Web Content Accessibility Guidelines). The WCAG guidelines are the basis of the standards of the Swiss federal government to design of accessible websites P028 and eCH-Accessibility-Standards 0059. The sites were tested in the period from April to July 2011. Some randomly selected sites of the Internet address have been examined by the test persons and experts and evaluated according to the detailed procedures according to the Accessibility Checklist 2.0. Although there are numerous tools available, that can check certain points of the accessibility of websites, most of the checkpoints can be checked exclusively by humans. Accessibility tests were carried out from the team of experts. Among them there were also accessibility testers with disabilities, who checked the web sites with their assistive technologies. Numerous barriers can only be found only by concerned persons [Schweizer Accessibility-Studie 2011, pp. 15-16]. Based on the WCAG 2.0 the Foundation "Access for All" has created an accessibility checklist. This document and the accompanying explanations are the basis for the necessary technical, creative and editorial measures for the creation of accessible web sites [Checkliste für barrierefreies Webdesign 2.0 2011]. The checklist is numbered and used to evaluate the success criteria for accessibility with "yes" (satisfied), "no" (not satisfied) or "na" (not applicable - if the corresponding elements on the website are not available). There are three levels: Level A for minimum accessibility, Level AA for good accessibility, and Level AAA for excellent accessibility. It is recommended for optimum accessibility, WCAG 2.0 AA conformance to meet [Schweizer Accessibility-Studie 2011, p. 17].

Each website is rated with an overall rating of one to five stars with the respect to accessibility, where one star represent the lowest and five stars the highest level. The results are summarized by four principles of the WCAG 2.0: perceivable, operable, understandable and robust. In addition, for testing the PDF documents from the W3C recommended test tool PDF Accessibility Checker (PAC) is used [Schweizer Accessibility-Studie 2011, pp. 18-19].

4.4 Comparison of the Accessibility-Test-Results in 2007 and 2011

The results of the Swiss Accessibility Study 2011 where applicable, are compared with the Swiss Accessibility Study 2007.
The investigated websites of the central federal government could confirm their good results from the study in 2007. The website of the Federal Court remains completely inaccessible. Here, unfortunately, no improvement could be detected. At all websites of the federal government the insufficient accessibility of PDF documents has been found. There is great need for improvement. Compared with the study in 2007, Federal Swiss Post and SBB reached five accessibility stars. The websites of the two federal institutes EPFL and ETH Zurich, however, are unfortunately not accessible for people with disabilities.

It was pleasant to detect the great website improvement of many cantons with the regard to accessibility. Following cantons improved strongly their websites and now achieve five stars in the evaluation of accessibility: Appenzell Ausserrhoden, Graubünden, Jura, Zürich, Zug, Schaffhausen, Glarus and Bern. Still very bad accessible for people with disabilities are the websites of the cantons of Valais, Neuchâtel and Basel Landschaft. In all cantons, insufficient accessibility of PDF documents has been found.

The websites of Swiss radio and television stations are heterogeneously accessible. The websites srf.ch, sf.tv and swissinfo.ch, are at a good level of accessibility. Still insufficient are the websites tsr.ch, rsi.ch, drs.ch rsr.ch. Private online TV services such as Wilmaa, Teleboy or Swisscom TV Air are practically unusable for people with disabilities.

Of the ten largest Swiss cities only Zurich, St. Gallen and Winterthur reached good accessibility, with five stars. The websites of the cities of Bern, Geneva, Basel, Lugano, Lausanne and Biel, however, are not suitable for people with disabilities.

Among the ten largest public transport companies reached only the website of the public transport in Zurich, Geneva and Bern a sufficient grade.

It is important to mention that in the Swiss Accessibility Study 2011 also websites of some online stores, online communities and job portals has been examined.

[Schweizer Accessibility-Studie 2011, p. 20].

### 4.4.1 Best-Practice Examples

**www.admin.ch** (Portal of the Swiss federal authorities)

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>★★★★★</td>
<td>★★★★★</td>
</tr>
</tbody>
</table>

Positive impressions:

- Text alternatives for visual content
- Contrast between foreground and background
- Use of the Content Headings
- Correct use of lists in HTML
- Accessibility of data tables
Negative impressions:
  - Skip links (anchor links) not good visible

Table 2: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:
The test person is trying to get information on the federal website of the organization of a federal department, to order publications on a particular topic or to register for an event.

The site is constructed properly. The access keys work and there is a good heading structure in the content area. Thanks to correctly designed content tables, it is possible to find the information you want quickly and efficiently.

[Schweizer Accessibility-Studie 2011, p. 25].

www.post.ch  (The Swiss Post)
2007: ★★
2011: ★★★★★

Positive impressions:
  - Text alternatives for visual content
  - Contrast between foreground and background
  - Use of the Content Headings
  - Correct use of lists in HTML
  - Accessibility of data tables

Negative impressions:
  - Skip links (anchor links) not good visible

Table 3: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Scenario and findings:
The test person wants to send a packet with a weight of five kilograms and gathers information on
the website about the costs. Thanks to a good heading structure, the desired information can be
found quickly. More generally, it is easy to use this site, although it is very large and complex.
[Schweizer Accessibility-Studie 2011, p. 36].

www.be.ch (Canton Bern)
2007: ⭐⭐⭐⭐⭐
2011: ⭐⭐⭐⭐⭐

Positive impressions:
• Text alternatives for visual content
• Contrast between foreground and background
• Use of the content headings
• Correct use of lists in HTML
• Contrast between foreground and background

Negative impressions:
• Skip links (anchor links) not good visible

Table 4: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:
The test person tries using a screen reader and starting from the cantonal home page, to find and
fill the form for applying supplementary benefits for the pension.
The website of the Canton of Berne cannot yet be described as completely accessible. A revision
of the navigation elements would probably help also people without disabilities, quicker to get to
desired information. The biggest need for action is in the range of the PDF forms that neither can
be read nor filled out by blind people.
[Schweizer Accessibility-Studie 2011, p. 42].
**www.zh.ch** (Canton Zurich)

2007: ★★★
2011: ★★★★★

Positive impressions:
- Mapping of structure using Headings
- Use of form labels
- Use of the content headings
- Correct use of lists in HTML
- Accessibility of data tables

Negative impressions:
- Order of links

Table 5: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:

The test person tries, using a screen reader and starting from the cantonal home page, to find and fill the form for applying supplementary benefits for the pension.

The canton of Zurich offers a modern, dynamic website. Attempts to make this accessible are evident. It is recommended, however, to extend the successful approaches to all offices. Surprisingly good are the PDF forms - unfortunately they do not quite meet the needs of disabled people.

[Schweizer Accessibility-Studie 2011, p. 52].

**www.stadt-zuerich.ch** (City of Zurich)

2007: ★★★
2011: ★★★★★★

Positive impressions:
- Text alternatives for visual content
- Mapping of structure using Headings
- Use of the content headings
- Correct use of lists in HTML
• Accessibility of data tables

Negative impressions:
• Long descriptions of complex graphics

Table 6: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th>Principle</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:
The test person would like to register a guide dog and therefore is looking for information on how to proceed. If possible, the application should be made immediately online.
The website is well structured. The desired information can be found quickly. However, full details are not available on non-tagged, inaccessible PDF documents.
[Schweizer Accessibility-Studie 2011, p. 58].

4.4.2 Bad-Practice Examples

[www.bger.ch](http://www.bger.ch) (Swiss Federal Court)

2007: ★
2011: ★

Positive impression:
• Contrast between foreground and background

Negative impressions:
• Skip links (anchor links) not good visible
• Order of links
• Search function and / or sitemap
• Scalability of text
• Scalability of control and form elements

Table 7: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th>Principle</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Scenario and findings:
The test person is trying to get information on the federal website of the organization of a federal
department, to order publications on a particular topic or to register for an event.
It is impossible to move with the help of a screen reader on this site. Many of the existing visual
structuring elements are not visible to blind users. This becomes a particular problem within
complex documents.
[Schweizer Accessibility-Studie 2011, p. 31].

**www.ethz.ch** (Swiss Federal Institute of Technology Zurich)

2007: ★★★
2011: ★★

Positive impressions:
- Contrast between foreground and background
- Text alternatives for visual content

Negative impressions:
- Grouping of complex forms
- Not correct use of lists in HTML
- Use of layout tables
- Long descriptions of complex graphics

Table 8: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td>★★★★☆☆</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td>★★★☆☆</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:
At the websites of federal universities, the test person tries to find the timetable of a subject and to
read it using the screen reader. The test person would like also to know whether the lecture room
is accessible by wheelchair.
Although the website for blind people is very difficult to use, the lecture list is easily accessible. The
information about the lecture rooms is not readable using a screen reader.
At the www.epfl.ch (Ecole polytechnique fédérale de Lausanne) the findings are similar. [Schweizer Accessibility-Studie 2011, p. 38].

www.ne.ch (Canton of Neuchâtel)

2007: ★★
2011: ★★

Positive impressions:
- Contrast between foreground and background
- Scalability of website elements

Negative impressions:
- Bad accessibility of graphical CAPTCHAs
- Not correct use of lists in HTML
- Website is available only in French language
- Long descriptions of complex graphics

Table 9: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:
The test person would like to register a guide dog and therefore is looking for information on how to proceed. If possible, the application should be made immediately online.

This website should urgently be adjusted according to guidelines for barrier-free Internet access. The website structure should be accessible also with assistive technologies. The forms, which are currently obtained only in paper form, should be available in future in fully electronic and accessible form.

[Schweizer Accessibility-Studie 2011, p. 46].

www.biel-bienne.ch (City of Biel)

2007: ---
2011: ★

Positive impressions:
- No automatic change of the content
Negative impressions:
- Skip links (anchor links) not good visible
- Bad contrast between foreground and background
- Bad order of links
- Grouping of information blocks
- No scalability of text

Table 10: Fulfillment level of WCAG principles:

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceivable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understandable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scenario and findings:
The test person would like to register a guide dog and therefore is looking for information on how to proceed. If possible, the application should be made immediately online.
The website of the city of Biel is unusable for people with disabilities. There are missing headers, which would facilitate navigation and orientation. In addition, some graphics contain no proper alternative texts.

[Schweizer Accessibility-Studie 2011, p. 55]
5. CONCLUSION

Web accessibility refers to the practice of making Web pages accessible to all users, especially to those with disabilities. Accessibility is a measure of quality and a result of the interplay between the Web content, the browser, and potentially the assistive technology that some people with disabilities may be using to access the content. Therefore is the Web design and build of a Web document the starting point of Web Accessibility.

The achieving accessibility is, in part, facilitated by the Web Content Accessibility Guidelines (WCAG). These guidelines are intended to encourage designers to make sure their sites conform to specifications, and that enable the assistive technologies of disabled users to better interact with the page content. These technologies work satisfactorily as long as the page is designed well. People are actually not disabled by their impairment but are handicapped by the not appropriate technology and infrastructure surrounding them. However, with the growth of the knowledge economy and a move from manual work to more thought and communication-based activities, there is the very real possibility of disabled people to find productive, fulfilling, and social empowering employment.

The Swiss Accessibility Study 2011 shows that governmental websites are still not where they should be. At the federal and cantonal level there is a progress since the last study in 2007. Today we have more and more portals, which are also accessible to people with disabilities. The vast majority of the categories of cities, media, public transport, online shops, job portals and online communities have many hurdles for people with disabilities, with some positive exceptions.

Portals of the Swiss federal authorities (www.admin.ch), Canton of Bern (www.be.ch) are among the best accessible portals, like in the study in 2007. The Swiss Post web site (www.post.ch), web site of Canton Zurich (www.zh.ch) and website of City of Zurich (www.stadt-zuerich.ch) improved their web sites, so they belong also to the best accessible sites.

Almost inaccessible are the web sites of Swiss Federal Court (www.bger.ch), Swiss Federal Institute of Technology Zurich (www.ethz.ch), Ecole polytechnique fédérale de Lausanne (www.epfl.ch), Canton of Neuchâtel (www.ne.ch), and City of Biel (www.biel-bienne.ch).

In general, there is still much to do allowing one million inhabitants of Switzerland with disabilities to have a fully access to the Web, especially to this of the government.
6. LITERATURE


