Summary
People with disabilities face lots of difficulties in everyday life. The Internet opens up many opportunities for this group. Unfortunately, not all Internet resources are available for individuals with certain impairments. In this paper, some good practices and guidelines in the area of web usability for people with disabilities are presented. The corollaries are based on a few reports and research results. In the second part of this article, the results of web-usability tests of an exemplary website is shown. In this section, the authors focused on a Polish website for the disabled.

Keywords: web usability, accessibility, people with disabilities, impairments, web development

“Disability need not be an obstacle to success”
Professor Stephen W Hawking

Introduction
The Internet has become still more efficient source of information and a tool enabling social contacts. It has a special meaning for people who – due to their impairments – suffer or used to suffer from social exclusion. Accessibility in many fields should be given priority in the ongoing work of government, industry and other key stakeholders both individually and collaboratively.

In the terms of easy use of information and communication technologies (ICTs) by people with disabilities, the concept of electronic accessibility, or eAccessibility seems to be an especially important issue. Websites need to be developed so that disabled users can access the information. This means that people with visual impairments should be able to use applications, which read text aloud and describe any visual images: web pages should have adjustable sized fonts and sharply contrasting colours. Those who are deaf or hard of hearing, audio content should be accompanied by text versions of the dialogue. Sign language video can also help make audio content more accessible [19].

1. Disability and the Internet use
Disability is a large-scale problem that affects citizens all over the world. As it is pointed out by the World Health Organization in [20] “More than one billion people in the world live with some form of disability, of who nearly 200 million experience considerable difficulties in functioning”. In Poland, according to the 2011 National Census [4], there are approximately 4.7 million people with a legal disability status in Poland (12.2% of the general population, of which 46.1% are male and 53.9% female). Considering another European report, we can see a different percentage of those who feel a limitation in usual activities.
In the terms of Internet and general computer use, first of all there should be a distinction made among the various disabilities. Disability can be caused by different kinds of impairments. In general, the main groups of impairments are physical, cognitive, mental, sensory, emotional and developmental. In many cases, some combinations of these appear. National research carried out by the Central Statistical Office (CSO) uses slightly different types of impairments. It shows that in Poland, among people with disabilities aged 15 and over, there are 46.1% people with motor impairment; 29.5% visual impairment; 13.9% hearing impairment; 48.5% circulatory system impairment; 29.0% neurological disorders; 7.9% mental health disorders, 2.5% intellectual disability [2]. This structure of disability types in Poland has been shown in Fig. 2.
When we look at the Internet users statistics in Poland, we can see that in 2013 61.4% of the whole population used Internet [11]. In comparison to the European Union, Poland is still below the average (75%) [7].

The distribution of age is quite interesting, not surprising though. The figure below (Fig. 4.a) shows the results of “Net Track” – a continuous survey conducted by Millward Brown monthly since 2000, on representatives of the population aged 15–75 years (48,000 respondents per year)*. According to the survey, 61% of Internet users (aged 15 and over) are 40 years old and over. When we compare the age groups of Internet users with the share of people with disabilities in age groups (in the whole society), we can notice, that (Fig. 4.b) among people aged 40 and over there are a lot of disabled (this survey contains both legal and biological disability).

Large digital divides remain when looking at the share of the population who never used the Internet in different countries. The highest shares of the population with no past experiences in internet use at all whether at home, at work or at any other place were registered in Romania (48%), Bulgaria (42%) and Greece (42%), the lowest in Sweden (5%), the Netherlands, Denmark and Luxembourg (all 6%) and Finland (7%). Another five Member States (Italy, Cyprus, Portugal, Poland and Lithuania) showed proportions between 30% and 40% for the population being excluded and without user skills regarding the Internet. In 2008, in Poland, as many as 68.9% of people with legal disability status (aged 16–74) had never used computer and 75.0% the Internet, compared to 37.7% and 43.7% for the general population [1].

* EU27 without UK
* The technique used in compiling the data is CAPI (Computer Aided Personal Interview). The aim of the study is to monitor the development of the scope of the Internet and changes in the use of this medium, as well as collecting data on the demographic and social structure of Internet users.
Fig. 4. a) Age structure of Polish Internet users b) Share of people with disabilities in age groups

Source: [4, 11].

What is the structure of the sub-population of people with disabilities among Internet users? So far, there has been no research carried out to find the correlation between disability and Internet use. If there was one, the basic questions would be: How many people with disabilities at the age 15+ use the Internet; What kind of impairment(s) do they suffer from and where do they live? The answer would be helpful to determine the scale of the problem; moreover, in web usability research the special needs of the disabled could be indicated. In fact, within the group of individuals who have motor skill impairments, in many cases no special software, assistive technology or an adjustment of the computer is needed. Those who need these are obviously people with sensory disabilities, especially visual impairments. As indicated in [13], web usability is about three times worse for them than for sighted users. As shown in Fig. 2, in Poland this group makes up almost 30% of people with disabilities.

It is difficult to estimate the portion of the population finding it difficult to access the Internet due to disabilities, but it is still a significant group. Businesses would be reckless to omit or even exclude 20, 10, or even 5 percent of their potential customers from their websites. Categorizing disabilities is not an easy task either. Everyone is different. The same disease in two cases can vary a lot, depending on the degrees and types of impairment, or a combination of it. It is impossible to adjust the systems individually, but considering the typical barriers and needs would open the Internet to a broader population.

2. Web usability and accessibility

The Web should be made more accessible for users with various disabilities – everyone will likely agree. This statement contains certain actors: the web developer and the user with disabilities. The developer should be conscious of the special needs of the users then. Various types and degrees of disability may cause different barriers that people with disabilities face. In order to know the barriers and the needs, a distinction among various types of disabilities should be made. The term Accessibility concerns people with disabilities like auditory, cognitive, neurological, physical, speech, and visual impairments. Recently still, more attention in Europe is paid to the eAccessibility...
because of its social and economic importance. As the European Commission has stated in the eAccessibility Communication of 2005 [3]: “making the benefits of ICT available to the widest possible number of people is a social, ethical and political imperative”. The need for improving access to Information and Communication Technologies (ICTs) by people with disabilities has been highlighted.

When reading the usability guidelines one can find that in the stages of planning a website a lot of attention has been paid to the web developers and not really much to the users with disabilities. Thus, an especially precious source of knowledge is any data coming from the research concerning the needs and opinions of this users group. A survey carried out among UK Internet users with visual, hearing impairment, physically disabled, and those with dyslexia/learning difficulties shows some areas of special importance for the usability of websites. The factors that help with Internet usage are shown in Fig. 5.

![Fig. 5. The most important usability issues for disabled Internet users](source: own elaboration based on: [21].)

The first three features seem to be quite obvious and thus determine the starting point. People with disabilities indicate the below-listed issues as the most important when using the Internet:

- clarity of content understood as using straightforward language and a clear, simple layout;
- good navigation – the ability to know where you are within a site;
- meaningful and clear hyperlinks.
- Alternative text is another important point as one third of the respondents indicated it.

Equal access to the Internet regardless of disability is nowadays one of the most important conditions of social integration. The information society should include still more and more members. People with disabilities will be able to equally participate in society, especially in the education and labour market and make substantial contributions to the economy, if the appropriate Internet tools are available. Thus, accessibility of websites is essential.

Interesting results have been published in the "Measuring progress of eAccessibility in Europe" (MeAC) study [8]. As indicated in the report, overall progress towards eAccessibility in Europe has remained very limited. In particular, three gap areas can be indicated. These are:

- The eAccessibility deficit: People with disabilities in Europe continue to be confronted with many barriers to the usage of everyday ICT products and services that are now essential elements of social and economic life. This concerns not only the websites, but also the
whole spectrum of ICT products and services: for example telephony, TV, computers and self-service terminals.

- The eAccessibility gap: From a comparative perspective, the eAccessibility situation for people with disabilities across Europe as a whole compares very unfavourably with that of their peers in Australia, Canada and the United States.

- The eAccessibility patchwork: Finally, the eAccessibility situation across Europe is very much a patchwork at present. This patchwork presents a picture of many important “white spaces”, of uneven attention across the spectrum of eAccessibility themes and of wide disparities across the Member States.

In addition to the evidence of eAccessibility gaps, deficits and patchworks, on the one hand, and of the effectiveness of (good) policy on the other, the evidence and analysis presented in the main MeAC benchmarking report also indicates the importance of EU-level policies in progressing eAccessibility in Europe. In this regard, the report analyses a number of options for further EU-level measures that may need to be considered if satisfactory progress in eAccessibility is to be achieved within any reasonable timeframe.

The examples of Europe’s eAccessibility deficit can be as follows:

Text relay services (essential for deaf and speech impaired people) are only available in one-half of the Member States; emergency services are directly accessible by text telephone in only seven Member States.

Mobile operators in only seven Member States provide dedicated information for customers with disabilities on their websites.

On average, less than one-third of national language broadcasts of main public broadcasters in Europe were provided with subtitling (for the deaf); there is wide variability (from 95% to none) in the amount of subtitling across individual countries.

On average, less than one-tenth of national language broadcasts of main commercial broadcasters in Europe were provided with subtitling; most of this is provided in just a few countries.

Public broadcasters in only five Member States provided any of their programmes with audio description (for visually impaired people) and, where they did, the levels provided amounted to a very small percentage of their overall programming; only in one country did any commercial broadcaster provide any audio description.

Only a very small proportion of key government websites in the Member States meet the accepted minimum international standards on accessibility (12.5% passed automated testing and only 5.3% passed both automatic and manual examination).

The share of key commercial/sectoral websites (e.g. railways, TV, newspapers, retail banking) providing this minimum level of accessibility is even lower (only 3.9% passed automated testing while not a single site passed both automatic and manual testing).

Only in six Member States has one of the leading retail banks installed ATMs with ‘talking’ output (enabling self-service for customers with visual impairments); across countries, on average only 8% of all ATMs that have been installed by the two main retail banks in the EU 25 Member States provide such output, with the bulk of this provided in just a few countries.

In the late 20th and early 21st centuries, a number of countries have passed laws aimed at reducing discrimination against people with disabilities. As it states in the Disability Discrimination Act, binding in Australia, Canada, USA and UK, websites must be made accessible to blind and
disabled people. Three key approaches for EU-level policy intervention were identified: (1) the application of accessibility requirements in public procurement (utilising freedoms given to Member States in transposing the Public Procurement Directive), (2) the introduction of a product and service certification scheme, and (3) better use of existing legislation (e.g. in telecommunications and employment).

In Poland there are only recommendations in this field, not real laws, though still more web designers care about these rules. In a survey analyzing eAccessibility status and policy, Poland is at the very bottom of the countries list (25th place out of 28) [9]. In addition, none of the selected public or commercial websites passed even the automatic evaluation [8]. These results prove how important it is to introduce the web usability rules at the beginning of website development.

For people with disabilities, accessibility means being able to use a product or service as effectively as a person without a disability. This can be achieved by using inclusive design principles to make products and services available for all. Sometimes it appears impossible. To fill the gap, assistive technologies (often abbreviated as AT) should be used. The examples of AT can be adaptive keyboards, oversized trackball mouse, eye tracking, voice recognition software. Most assistive technologies for people with motor disabilities either work through the keyboard or emulate the functionality of the keyboard. For this kind of impairment, developers should focus on making their content accessible to the keyboard and ensure that the site is easy to navigate with as few keystrokes as possible.

3. Usable and accessible websites

At the inception of websites, everything was text. First, visual browsers showed that HTML (originally intended to display research papers only) did not give the designers control over anything on the website. When viewed in different browsers, the websites looked different anyway. Positioning things precisely on a page appeared very hard; styling text demanded crude commands. Quite often the practice was using tables to control the layout then. For years, the only way to control the position of certain elements on a web page was to put them in tables... and tables within tables [6]. The problem was when those with visual impairments tended to read such a page with the use of screen readers. Their very early versions did not work well; they read rather just line-by-line from left to right, which gave no good result and no benefit for this group of users. In 1998, a convention for browser manufacturers appeared to support Web standards that would give designers a consistent target. In the Web Standards Project (WaSP), initiated by a group of designers, some rules like supporting Cascading Style Sheets (CSS) standards were introduced. The WaSP’s primary goal was getting browser makers to support the standards set forth by the World Wide Web Consortium (W3C) [17]. A few years later, within another project: CSS Zen Garden [15], it was demonstrated how to create beautiful, sophisticated designs with the use of CSS. Nowadays, CSS are very well supported by most browsers. The advantages of using them, in the terms of accessibility and usability, are undeniable. They allow greater control of formatting, give flexibility (a single change in a style sheet can change the appearance of an entire site, or automatically generate useful variations like printer-friendly pages). With CSS, the content can be put in sequential order in the source file; this will enable one to see how a screen reader user would hear it. In the table-based layout, this was not possible. Moreover, CSS makes it easy to make text resizable, which is enormously helpful not only for users with visual impairments, but for older people as well.
The technical explanation of how to make web content more accessible to people with disabilities is contained in the WCAG documentation. How should the Web "content" be understood then? In general, it refers to the “information in a web page or web application, including: (1) natural information such as text, images, and sounds, (2) code or markup that defines structure, presentation, etc.” [18].

The process of designing a website is the proper moment to include the accessibility aspect. When coding is done, the task seems much more difficult, though there are some quick actions to check a website for accessibility [10]. To increase the accessibility, a few simple tests listed below can be made at first.

- When we place the cursor over an informational image (i.e. organisation logo), a yellow box should appear with a brief, accurate description of the image. This alternative text will be seen in place of the image by users whose browsers do not support images, or heard by those with sight impairments. It is different with decorative images that just look nice and have no other function. The description of the image is not needed then; the above-mentioned groups of users do not need to know that it is here.

- To include the needs of deaf people, the website should supply subtitles or written transcripts so that this type of content is accessible to hearing impaired users.

- To fill in a form, the users should see or hear a text prompt next to each item in a form. In a contact form it can be, for example, ‘name’, ‘e-mail’ and ‘comments’, each one next to a box where site users will enter their details. When clicking on the prompt text, a flashing cursor should appear in the box next to that text.

- Users with poor visibility should be allowed to adjust the text size on a website. To check it in a web browser, you can scroll with the wheel of your mouse whilst holding down the control key or use the control key together with “+” sign.

- To verify if a website would be accessible, it can be also looked in a text-only browser (like Lynx) that does not support many of the features that other browsers have. If the content of the site makes sense and can be navigated through this, it can be assumed, that the website fulfills many of the web accessibility guidelines.

- It is also worth checking if one can access all areas of the website without the use of a mouse but by using just tab, shift-tab and return. The keyboard- and voice-only users will have difficulties while using pages that demand mouse clicking.

- The site map should also be easy to find.

- The link text should make sense out of context; when visually impaired Internet users browse web pages by tabbing from one link to another, they should hear link text that makes sense.
3.1. PFRON\(^1\) Website automatic evaluation

In order to verify the cited survey results [8], a simple automatic test has been performed. It has been carried out with the use of WAVE – Web Accessibility Tool, available online http://wave.webaim.org. The website tested was http://www.pfron.org.pl/ – the one of State Fund for Rehabilitation of the Disabled (PFRON). There appeared quite a lot of alerts concerning:
- “Redundant alternative text” (the alternative text for an image is the same as nearby or adjacent text),
- “Broken same-page link” (a link to another location within the page is present but does not have a corresponding target),
- “Long alternative text” (an image has very long alternative text).

There were also many contrast errors, i.e. very low contrast between foreground and background colors. The results of the simple test can be worrisome at first, though the authors state that the best practice is to use common sense and a real-user test. In fact, when we run a website through an automatic tool (like validators) to verify the usability, it can be checked more like a grammar checker than a spell checker. Even if it finds some obvious mistakes and oversights that are easy to fix, like missing alternative text, it will also display lots of warnings of doing something wrong. Moreover, a long list of recommendations of things that should be checked will appear. The point is that most of them may not be problems at all. It is better to ask a set of questions from a patient person in order to find things that the developer would fail to think of. User testing is a common part of usability testing. User testing with users who suffer from some impairment adds accessibility findings to the usual usability findings. The best solution would be not to make division of the users but just cooperate to achieve the best possible quality of the websites.

4. Summary

People with disabilities in Europe still face with many barriers to usage of the everyday ICT products and services that are now essential elements of social and economic life. Such eAccessibility deficits can be found across the spectrum of ICT products and services: for example, telephony, TV, web and self-service terminals. Usability focuses on how intuitive and easy it is for all people to use something. Enabling people with disabilities to use websites in such a way that they could find what they are looking for quickly and efficiently is the key point of web usability. It requires some preparation when the website is being developed, though some simple tests can be performed when the code is ready. This article contains some guidelines based on survey results that can be useful when developing a website that could be accessible for people with disabilities as well as for the entire population of Internet users.

It should be also emphasized that to achieve greater accessibility, not only technical side, but also a change in peoples’ attitudes toward disability is fundamental. Usually disability is perceived through the medical model, which aims to “fix” or rehabilitate a person to society’s norms. There is a necessity to widely introduce the social model of disability, which emphasizes a person’s abilities rather than disabilities and encourages independence and capacity by decreasing environmental barriers. As a result, an individual with disabilities should be able to fully participate in the community.

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\(^1\) State Fund for Rehabilitation of Disabled Persons (Państwowy Fundusz Rehabilitacji Osób Niepełnosprawnych).
Bibliography


[3] eAccessibility, Communication from the commission to the council, the European parliament and the European economic and social committee and the committee of the regions, Brussels, 2005.


Streszczenie
Osoby niepełnosprawne napotykają wiele trudności w życiu codziennym. Internet otwiera przed nimi wiele nowych możliwości. Niestety, nadal nie wszystkie zasoby internetowe są dostępne dla osób z pewnymi dysfunkcjami, zwłaszcza dotyczącymi wzroku. W niniejszym artykule przedstawiono kilka dobrych praktyk i wytycznych w zakresie użyczenności stron internetowych ze szczególnym uwzględnieniem osób z niepełnosprawnościami. Na podstawie wielu raportów i wyników badań sformułowano wnioski dotyczące tworzenia stron dostępnych i użyczenych. W drugiej części artykułu przedstawiono także wyniki przykładowej automatycznej walidacji strony internetowej pod kątem wyceny ewentualnych błędów w jej konstrukcji. Za przykład poddany testowi posłużyła strona internetowa PFRON.

Słowa kluczowe: użyczenność stron internetowych, dostępność, osoby niepełnosprawne, niepełnosprawność, tworzenie stron internetowych