The German Web 2.0 Accessibility Survey

Empirical Findings and Recommendations

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Abstract. The German BIENE award (Barrierefreies Internet Eröffnet Neue Einsichten / Accessible Internet Provides New Insights) happened to be a best practice competition for accessible websites organized by the social association "Aktion Mensch" and the endowment "Digitale Chancen". For the last 2010 competition 224 web pages have been checked for their barrier free accessibility. Web applications that facilitate interactive sharing of *user generated content* have been of particular importance. In this respect it soon turned out, that Web 2.0 services cannot only be made accessible by applying common design guidelines and ad-hoc adaptations. In addition to conventional software ergonomic verification procedures, accessibility validation has to rely on sociological reasoning about unique Web 2.0 entities and corresponding usage obstacles. Empirically these considerations have been conceptualized by an online survey amongst 671 respondents with all kinds of different disabilities, carried out by "Aktion Mensch".

Keywords: Accessibility, Usability, Human-Computer Interaction, Web 2.0.

1 Introduction

The German BIENE award (Barrierefreies Internet Eröffnet Neue Einsichten / Accessible Internet Provides New Insights) happened to be a best practice competition for accessible websites organized by the social association "Aktion Mensch" and the endowment "Digitale Chancen". For the last 2010 competition 128 contributions out of originally 224 additionally went through a special ergonomic test procedure of process-oriented interaction with competitors' web pages. Accessibility was analyzed on the basis of on-line transactions like purchase, money-transfer or public authority form-filling dialogues. However, of special importance in this respect are transactions that facilitate interactive sharing of user generated content, when it comes to Web 2.0 technologies. Special attention has to be paid to the technological evolution step concerning the offer and the accessibility of the World Wide Web to a web with which not any more the pure spreading of information or product sales are in the foreground, but the participation of users and the user-centered generation of other additional use. In this respect it soon turned out, that Web 2.0 services cannot only be made accessible through common methods such as the application of conventional design

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guidelines and/or ad-hoc adaptations. In addition to more or less software ergonomic verification procedures, accessibility validation has most basically to rely on sociological reasoning about unique Web 2.0 entities and corresponding usage obstacles.

2 Sociological Issues of Inclusive Web 2.0 Design

Inclusive Design is a way of designing products and environments so that they are usable and appealing to everyone regardless of age, ability or circumstance. Amongst other issues it follows the concept of working with users to remove barriers in the social, technical, political and economic obstacles to overcome digital divide. As user participation is at stake inclusive design or Web 2.0 accessibility for all becomes a purely sociological issue. The actualization of topical contents continuously occurs through intensive user participation, so that websites become more dynamic and more adapted to user needs, especially to the needs of disabled end users. On account of the immediate participation of the users it is often spoken also of the "democratization" of the net, because the contents of the web are no longer influenced any more by only the operators of the websites, but by the users as well. “We see through a range of already very well-known websites (…), that networks are taking shared responsibility for the construction of vast accumulations of knowledge about themselves, each other, and the world. These are dynamic matrices of information through which people observe others, expand the network, make new 'friends', edit and update content, blog, remix, post, respond, share files, exhibit, tag and so on. This has been described as an online 'participatory culture' [1] where users are increasingly involved in creating web content as well as consuming it” [2]. The (social) role of website operators has changed in web 2.0 in this respect, as that they are responsible, primarily, for the supply of a properly designed platform suitable for interactive and collaborative use as well as for its administration. Finally, the success of a platform provided by the operator or better designer appears in the intensity of its use which generally correlates with the quality of the contents in terms of "customer use" (“Usefulness”). Only in this respect, quality of contents correlates secondarily with the highest possible absence of usage barriers (“usability”) [3], [4]. Avoidance of usage barriers in turn depends on a specific execution of certain (social) roles of website developers in general. As Web 2.0 is primarily associated with the term “user generated content” the crucial questions thus arises, in how far end user content generation coincides with low or barely existent usage barriers. Equally the question has to be answered in which way website developers support end users to generate barrier-free content.

2.1 Social Roles of Website Developers and Barrier-Free User Content

Four types of usage obstacles can be distinguished with respect to (social) roles of website developers. These roles can be derived from certain areas of responsibility for website operability, i.e. the responsibility to minimize or remove defined barriers [5].

1. Techno-functional barriers:

— relate to insufficiently applied software technologies or programming and hard- and software restrictions by assistive technologies

- examples are CAPTCHAS (non machine-readable graphics code[1]), accessibility of Flash-players, missing form identifications etc.
- area of responsibility: Web programmer and service provider

2. Editorial and content barriers:

- relate to insufficient editorial or structural preparation and implementation of **content** (poor CMS)
- examples are difficult language, missing text-structure (e.g. CSS), missing desc. txt etc.
- area of responsibility: Web editors

3. User interface design barriers

- relate to insufficient software **ergonomic** design
- examples are low contrast, confusing background pictures, non readable fonts etc.
- area of responsibility: Web designer

4. Organizational barriers

- related to insufficient organizational **circumstances** and environment
- examples are missing budget or missing demands for alternative website regeneration and assistive technologies (e.g. speech output for the blind, font size and contrast modification for the vision impaired etc.)
- area of responsibility: Customers

Due to not always clearly defined areas of responsibility overlapping between these four usage barriers is possible. Such as the responsibility for an adequate web appearance of pictures or Wiki applications in principle lies with the editor, it may partially as well lie with the designer or even with the programmer, when declarative programming statements are needed.

In a two factorial design different role responsibilities of web programmers, service providers, editors, designers and customers interfere with distinguishable content generating and content perceiving usage patterns of end users, thus revealing further refined insights into Web 2.0 usage obstacles. Three kinds of usage patterns can be distinguished:

1. Simple form-based usage (e.g. user registration, processing of user profiles, commenting, reading in Wiki-applications and Weblogs)
2. Extended form- or editor-based usage (e.g. writing in Wiki-applications and Weblogs)
3. Media-intensive usage (e.g. uploading and viewing of pictures, videos, hearing of podcasts)

[1] …which cannot be processed by screen readers and is thus not accessible for vision impaired or blind end users.

Table 1. Accessibility problems by type of usage barrier and usage pattern

Usage Barrier / Usage Pattern	Techno-functional barriers	Editorial and content barriers	User interface design barriers
Simple form-based usage	Captchas, indications for form-fillings and buttons, accessibility of Flash-players…	Intelligibility of explanation texts, expected input and error messages…	Design of forms…
Extended form or editor based usage	Graphic editors, font sizes in editors, problems with Java script, accessibility of Flash-players		Design of forms, Perceptibility of editor functionality…
Media-intensive usage	Media upload/download	Quality (Resolution), size and contrast of media, sign-language videos, Podcasts, desc. txt	Controllability of players, Quality (Resolution), size and contrast of media

3 Empirical Findings and Recommendations

Empirically these considerations have been conceptualized by an online survey amongst 671 respondents with all kinds of different disabilities, carried out by "Aktion Mensch" [5]. Respondents' age was between 14 and above 70, amongst them 293 female and 378 male respondents.

The online survey itself was realized free of barriers. Participants with most different impediments were moved with the help of different aids into the position to perceive the survey and to navigate and understand the forms. According to the results of previous BIENE test procedures, all survey contents have been processed accessible for screen readers, by sign language videos and in simple language. The "Aktion Mensch" thus conducted the first truly accessible online survey among people with disabilities. Five complexes of unique Web 2.0 usage obstacles and corresponding recommendations to eliminate these barriers could be attributed to the results of this survey.

3.1 Elimination of Barriers to the Use of Wiki-Applications

To increase the accessibility of Wiki-applications, especially the content has verbally to be elaborated. Comprehension problems caused by complicated language stand in the foreground. The online survey revealed that about one-third of affected end users with limitations in the understanding of written language - amongst them users with reading disability and dyslexia, learning and cognitive disabilities, and deaf end users - had problems in reading Wiki pages. Missing videos in sign language impeded comprehension for deaf end users. Motor-impaired respondents indicated problems in navigating and controlling search fields by speech recognition. Missing values in

writing or commenting Wikis indicate that none of the respondents experienced problems caused by their disability. Most of the barriers lie therefore, on the one hand, in the intelligibility and orientation on the GUI of Wikis and to the other in applying the mostly graphic editors and forms to write and annotate content. For the blind, the flow of text for screen readers is partly disrupted due to the large number of links, since these are always especially announced.

Table 2. Barriers by Disability (5)

Disability / **Barriers**	Vision impaired (n=133)	Blind (n=124)	Hard of hearing (n=96)	Deaf (n=260)	Motor impaired (n=75)	Dyslexia/ reading disability (n=41)	Cognitive/learning disability (n=46)
Barriers total[2]	48%	82%	21%	26%	34%	23%	44%
Non-specified barriers in general	13%	42%	5%	8%	8%	3%	9%
Missing tags/Captchas	5%	39%	1%	-	-	-	3%
Orientation problems	15%	8%	-	2%	6%	10%	12%
Information overload	9%	9%	3%	3%	8%	10%	9%
Missing subtitles and gesture language	2%	-	5%	10%	-	-	-
Understanding problems	2%	1%	5%	6%	6%	-	3%
Problems with Flash	3%	8%	3%	-	3%	-	3%

3.2 Elimination of Barriers to User Registration and Editing of User Profiles

Most problems appear in the perceptibility, controllability and orientation during user registration or editing user profiles. In many Web 2.0 offerings user registration is the prerequisite for the productive use of the services. It should therefore be very thoroughly examined and adapted in terms of accessibility. Particularly critical in this respect is the programming of forms and captchas. Improvement should also be carried out concerning the intelligibility of explanations, expected inputs and in particular of error messages. Programming of error messages should as well be checked for compatibility with different assistive input and output devices. In particular, visually impaired and blind end users have massive problems with user registration. Nearly half of the blind end users are able to carry out a user registration independently. The most frequent problems in this respect originate on the basis of security and spam

[2] Because multiple barriers have been taken into account for single barrier values, they do not sum up to total barrier value.

defensive measures from Captchas which are discernible neither from screen readers nor by enlargement software. Unless it is not alternatively offered by audio files this non machine-readable graphics code for access authorization is also hardly accessible for the vision impaired. It can be assumed that roughly two third of the partially sighted and blind end users abort registration processes, leave corresponding applications and are thus excluded from a large variety of Web 2.0 services.

3.3 Elimination of Barriers in Dealing with Pictures (Photos), Videos and Podcasts

Many contents on the Internet are multimedia, which basically leads to disability-caused usage barriers on the side of partially sighted and blind users regarding the visual - and with the hard of hearing and deaf users regarding the auditive share of web offers. Differently than with purely text-based websites screen readers can offer a solution for blind end users only with an appropriate design of multi-media contents (e.g. appropriate 'desc. txt'). To the vision impaired, multimedia web offers are often too small and badly dissolved. Subtitles and sign language videos which could lift the barriers for auditively impaired users do normally not exist with most of the web offers. For uploading and embedding photos and videos, instruction forms are often problematic, since their design is neither clear and concise nor are certain form elements (e.g. buttons) sufficiently distinguished from each other. Additionally, visually impaired end users often get disoriented, because enlargement software limits the view area and complicates thus the allocation of multimedia content. Especially previewing of pictures may no more be recognizable. Even with downloading of podcasts download buttons are often not marked unambiguously. Often Java scripts impede a smooth download of podcasts by assistive technologies (e.g. screen readers). In summary barriers in dealing with multimedia content have therefore to be reduced by improved programming of upload and download forms. For instance, an offer to provide own multimedia content should encourage the user additionally to indicate content descriptions to the media to be uploaded, so that access to all end users can be granted regardless of their perceptive abilities. These additional descriptions can also be recorded by forms and added to the uploaded medium as an appropriate alt attribute. Barriers due to Captchas, Java-script or Flash elements can be minimized by programming alternatives. Inclusion of assistive technologies can thus be simplified.

3.4 Elimination of Barriers to Commenting Functions and Weblogs

Again, using commenting forms and related Captchas is particularly difficult for vision impaired and blind end users of assistive technologies. Input pages are mostly poorly structured and screen readers do not adequately read form fillings in editing fields and therefore do not forward it readably to a braille display. Users with cognitive and learning disabilities experience disability related barriers in dealing with written language by filling out input boxes. End users with dyslexia and reading disability are more likely inhibited by personal self-assessment and public biases in the use of weblogs and commenting functions. In writing web log entries technical as

well as linguistic barriers likewise appear. Blind and vision impaired respondents report about problems to completely monitor and control formatting and representation options. Here again usability of editors depends on their controllability by assistive technologies. Thus, the amount of links in a Weblog leads to disorientation and navigation problems, because - if at all - it takes a while for a screen reader to display an entire list of links. As usage of weblogs and commenting functions is mostly form-based, accessibility problems again arise from insufficiently structured form-filling dialogues. To reduce these difficulties, the available elements of the applied descriptive language and a logical sequence of end user operations should hence be put into effect.

3.5 Eliminating Barriers in Dealing With Social Networking Sites (SNS)

So far at least between 15% and 29% of differently handicapped survey respondents use SNS. They only mention a few problems, which have partially appeared in the perceptibility and usability of executable functions and the perspicuity of the overall website. Most of the difficulties stem from the multiplicity of functions, information overload and from advertising banners disturbing website access by assistive technologies like screen readers. Also forms, graphic menus and buttons are often not properly designed. Especially for the blind and visually impaired respondents accessibility is a nevertheless particular factor to consider. As 91% of the blind respondents use a screen-reader, compatibility between speech processing software and readability of the web application is of crucial importance to usability. Despite low use of social networks, even the quite low problem values for cognitively and reading impaired survey respondents at least in tendency point out to the fact, that usability apart from raised requirements for media competence is also relevant for this user group. One non neglectable reason for relatively low user rates could also stem from previously indicated barriers of user registration, treatment of user profiles and photos or videos, which are often a precondition for activities in SNS applications.

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