Accessibility of Web Search Engines: Towards a Deeper Understanding of Barriers for People with Disabilities

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1. Introduction

Search engines are one of the most important and most-used services on the web. Adults as well as children use web search engines often, sometimes even more than email (exemplary for Germany, see van Eimeren & Frees, 2011; MPFS, 2011). With the overwhelming amount of information available on the web, search engines serve as gatekeepers – they crawl the web, sort and select its content, and organize access (Röhle, 2010). Therefore, in today's information society, web search engines like Google are essential for independent information access regarding nearly every aspect of life.

It is important to consider the relevance of web search engines and their accessibility for people with disabilities because these tools are fundamental to self-determined and independent living. People who have special needs caused by physical and/or mental impairments especially can benefit from online content, because they are able to personalize parameters (e.g. font size, contrast, sound level) to their individual requirements on the web. They can use alternative opportunities for access, and they can be supported by assistive technologies (AT) (e.g. screen readers, switches, headmouses, Braille displays,scanning software)**.** However, to make these technologies fully functional in the context of web searching, search engines need to be accessible for everyone.

This paper seeks to introduce the concept of web accessibility, to review related work and established recommendations about evaluating web accessibility, and to apply the well-tried design of accessibility surveys for websites to web search engines. The intention of the paper is to identify web search engine accessibility as an important topic of research and to develop a theoretical framework for evaluation, including an aggregation of relevant sources. This paper in its "how-to-do"-manner can be seen as a starting point for a future project evaluating web search engines accessibility in the broader perspective of disability and considering the principles of disability studies as well as the idea of inclusion.

2. Disability and its notions

Several alternative models describe disability, including the medical model and the social model of disability. The medical model understands disability as an individual physical problem caused by disease, trauma, or other health conditions, which requires professional treatment and medical care (Disabled World, 2010). In contrast, the social model, which is usually preferred by people concerned and disability rights advocates, as well, views disability not as a personal issue, but rather as a complex socially-created problem and a matter of full integration of individuals into society. Thus environmental modifications by individual, community and large-scale actions are necessary to fully include people with disabilities into all areas of life (Disabled World, 2010).

The concept of inclusion is the guiding idea of the disability rights movement (DRM). In contrast to "integration", the term inclusion is more specifically used to denote active welcoming and support for the participation of people with disabilities rather than their physical presence alone. It suggests that barriers in physical and digital environments as well as in social attitude should be removed and that society, rather than the person with the disability, should adapt (Disability Funders Network, 2009). From this perspective, equal access, physical as well as digital, for everyone is a human rights issue of major concern (Disabled World, 2010).

In information and communication technology, web accessibility (a.k.a. e-accessibility) is a requirement for inclusion. Web accessibility implies that all people – including those with disabilities – can perceive, understand, navigate, and interact with the web, and that they can also contribute to it without barriers (WAI, 2005a). In this context, universal design (a.k.a. design for all, inclusive design) is the process of creating (web) devices, environments, systems, and processes that are usable by people with the widest range of abilities, operating within the widest possible range of situations. Universal design has two major components:

- Designing products so that they are flexible enough to be used directly (without requiring any assistive technologies or modifications) by people with the widest range of abilities and circumstances, and
- Designing products so that they are compatible with the assistive technologies that might be used by those who cannot efficiently access and use the products directly (Vanderheiden, 1996).

Different factors can cause barriers on the web and these in turn can affect different user groups. So the following dimensions should be considered when talking about web accessibility (Ruth-Janneck, 2011; Berger et al., 2010):

- Different kinds of disabilities (e.g., visual impairment/blindness; hardness of hearing/deafness; motor/dexterity impairments; learning disabilities/cognitive impairments)
- Different types of applications/interactions (e.g., form-based applications; extended form- or editor-based applications; media-rich applications)
- Different types of barriers (e.g., technical barriers; editorial/content-related barriers; design barriers; organizational barriers)

To work on accessibility issues and universal design, it is recommended that the principles of disability studies (Albrecht & Seelman, 2001) be used. According to the Society for Disability Studies (2004), the guidelines can be summarized as follows:

- Research should be inter-/multidisciplinary.
- Research should challenge the view of disability as an individual deficit or defect that has to be remedied through medical care or rehabilitation by professionals (cf. medical model).
- Research should study different (national and international) perspectives, policies, and literature with the aim of placing current ideas of disability within their broadest possible context. Attitudes and perspectives toward disability have not been the same across times and places; much can be gained by learning from these other experiences.
- Research should actively encourage participation by disabled staff (if possible leadership positions should be filled by disabled persons), and ensure physical, digital and intellectual access to everyone.

3. Related Work

In recent years, much research has been done on accessibility of different kinds of websites, especially ones that have the legal obligation to be accessible:

- The accessibility of American governmental websites, which are obligated by the Americans with Disabilities Act (ADA) to be accessible, was analyzed, for example, by Ellison (2002) as well as Olalere and Lazar (2011).
- Referring to the Special Educational Needs and Disability Act (SENDA), Kelly (2004) evaluated the accessibility of UK university websites using the web-based tool Bobby.
- Accessibility trends in university libraries and library schools in the USA and Canada were of interest in Comeaux and Schmetzke (2007) and Schmetzke and Comeaux (2009). Craven and Brophy (2003) analyzed the use of digital library interfaces by blind and visually impaired people, while Conway (2011) determined the level of adherence to the W3C standards within Australian public libraries.

In the context of web search engines, evaluation mainly focuses on the quality and structure of search engine results and the search engines' indices. Retrieval effectiveness, freshness and the composition of search engine

results pages are frequent questions in system-centered research (Lewandowski, 2008; Lewandowski & Höchstötter, 2008).

Less research is conducted on the accessibility of web search engines interfaces. Oppenheim and Selby (1999) were among the first who paid attention to interfaces. They asked a small group of visually-impaired and blind users how three popular web search engines presented their information to this special target group. Later, Andronico and colleagues (2005; 2006; Buzzi et al., 2004) aimed at improving usability of web search engines for sightless people, who use assistive technology to navigate the web. They proposed main related issues for people navigating via screen reader (e.g., page content serialization, navigating by tab key and special commands, differences between visual layout and aural perception), and principles to be considered when designing a search engine interface with respect to accessibility (e.g., easy location/clear labeling of edit field and search options, highlighting and arranging results, recognizing sponsored links, adding navigation and help links, alerting by sound). They used them to reengineer Google's user interface (Andronico et al., 2006). Search results are of interest in Ivory and colleagues (2004), who compared users' decision-making and performance on search engine displays for both sighted and blind users. They found that blind people took twice as long to explore search results, and three times as long to explore web pages. They characterized participants' "ideal search result display" and found that sighted participants were interested in having additional information displayed about search pages, whereas blind participants expressed interest in controlling search result displays.

As can be seen, each study has focused on one type of disability, and only deals with blind/visually-impaired people. It seems straightforward to evaluate web accessibility for the blind, as the web is a very visual medium; however, there are many other forms of disability (e.g., cognitive impairment/learning disability, dexterity/mobility impairment, speech and language impairment, special needs of the elderly) that affect information access via web search engines. So in the authors' opinion it is necessary to use a broader perspective on disability while evaluating accessibility and also, to avoid oversimplifications in terms of "accessible relates to the blind".

4. Established Guidelines for Conducting an Accessibility Study

The W3C Web Accessibility Initiative (WAI) advises a three-level-approach to comprehensively evaluate websites for accessibility: (A) a *preliminary review* to quickly identify potential accessibility problems, (B) a *conformance evaluation* to determine whether a website meets established accessibility standards, and (C) *user testing* to include real people with disabilities in a practical use. The WAI recommendations and other helpful hints will be covered below. URLs of all mentioned tools and guidelines are listed in appendix 1.

A. Preliminary Review

A preliminary review combines manual checking of representative pages on a website, along with the use of several (semi-) automatic tools for accessibility evaluation. To get a sense of how people with disabilities interact with computers and the web, there are some introductory videos, (e.g., WebAIMa). Typical steps for the preliminary review are as follows:

Page Sample: Select a representative sampling of pages that includes all pages on which people are likely to enter your site, and a variety of pages with different layouts and functionality (WAI, 2005b).

Manual Evaluation I: Use different graphical user interface (GUI) browsers (like Firefox, Internet Explorer, Safari) and examine the page sample while adjusting some settings in your browser or operating system relevant to…

- people with visual impairments, who use screen readers, and people with audible impairments, who depend on written text: turn off images and sound, to check whether appropriate alternative text for the images and audio content is still available through text equivalents.
- people with visual impairments, who need individual font sizes: vary font size to test whether the font size changes on the screen accordingly and whether the page is still usable at larger font sizes.
- people with dyschromatopsia: change the display color to gray scale and check whether the color contrast is adequate

- motor-impaired people who cannot use a mouse: use the keyboard to navigate through the links and form controls on a page, to examine if you can access all of them
- (WAI, 2005).

Manual Evaluation II: Use a screen reader (e.g., NonVisual Desktop Access (NVDA)), voice browser (e.g., WebAnywhere) and/or text browser (e.g., Lynx) to examine the sample of pages (WAI, 2005b). For the inexpert user, it will probably be difficult to understand the artificial reading (the screen reader announces every word on a page sequentially), and the user will exert much effort in understanding. It may be challenging to ascertain whether equivalent and meaningful information is available through the screen reader and specialized browsers as is available through the GUI-browser. However, with some practice, the user can become familiar with these tools. More information about testing with screen readers can be found in (WebAIMb).

Automatic Evaluation: Use at least two automated web accessibility evaluation tools to analyze the selection of pages (WAI, 2005b) (e.g., Cynthia Says (for further existing tools see WebAIMc, WAI, 2006 or Mifsud, 2011)). It will probably be difficult to understand the functionality and error report, but with some training, one can become accomplished with these tools and identify potential accessibility problems. Be careful: Guidelines like WCAG are not written in a formal manner. Evaluators may have different interpretations of what these rules mean. Thus, different evaluation results might be obtained for a single page, depending on which evaluation tool is being used (Centeno et al., 2006).

B. Conformance Evaluation

A conformance evaluation determines whether a website meets formal accessibility standards, which can be from international bodies (like the Web Content Accessibility Guidelines (WCAG) by the W3C), national or state-level guidelines (e.g., U.S. Section 508, German BITV, Italian "Stanca Act", French Accessibility Law RGAA), or individual organizations guidelines (e.g., IBM Checklist) (Brajnik, 2008a). For each guideline, there are testable success criteria, which result in a level of conformance. A full conformance evaluation combines (semi-)automatic and manual testing by experts. The following points should be considered in such an evaluation:

Data Collection: At first, determine the sites to be evaluated and the targeted conformance level for evaluation (in WCAG 2.0 Level A, AA and AAA, whereas triple A is the level of full conformance). For automatic evaluation, one preferably should use the entire website. If testing of the entire site is not practical (for example because of its size), identify an expanded page selection that covers a wide range of designs, functions and applications as well as the pages critical to the website's business (WAI, 2005c). For manual evaluation, select a smaller representative sample of pages and consider those that are especially of interest for the site's average user.

Manual Evaluation: Examine the representative sample of pages using guidelines and checkpoints from appropriate checklists. WCAG 2.0, for example, determines four principles of accessibility (perceivable, operable, understandable, robust); each principle contains individual guidelines and checkpoints (WCAG 2.0, 2008). Select checkpoints that cannot be evaluated by tools, checkpoints that actually apply to the site and to the targeted level of conformance being evaluated (WAI, 2005c). Use different graphical browsers (in different versions, running on different platforms) and systematically check adjustments, similar to the preliminary review. Browser plug-ins like the WAVE toolbar can help to do some of these manual tests. Finally, the sample of pages should be examined with one text and one voice browser to check whether the same information and functionality is available as when the GUI browser is used (WAI, 2005c).

Automatic Evaluation: Validate markup, including syntax and style sheets of the selected sample of pages, using applicable validators like Markup Validation Service or CSS Validation Service by W3C. Use at least two web accessibility tools on the selected sample of pages and run at least one tool across the entire website or the expanded page selection, respectively (WAI, 2005c).

Page Content Evaluation: Read over the sample of pages and inspect whether the text is clear, simple and appropriate for the website's purpose. To be understandable for people with learning disabilities, documents

have to fulfill well-defined criteria for language, illustrations, design, and layout. A detailed list of these criteria for easy-to-read texts (print media as well as non-print format) can be found in the International Federation of Library Association and Institutions (2010). To get an idea of an easy-to-read text, see appendix 2.

C. User Testing

While conformance is important, there are many benefits to evaluating with real people in order to learn how websites work for users in reality and to gain a better understanding of accessibility issues in practice (WAI 2010). In accordance with the maxim of the disability rights movement "nothing about us without us" (Charlton, 1998), one should integrate people with disabilities in designing research as well as in executing it. The following points should be considered:

User Sample: Keeping in mind the principles of disability studies, the survey should cover all kinds of impairments; generalization by allocating people with different impairments into deficient and medical-focused categories of disability types should be avoided. Rather, one should select the sample of users by characteristics within the context of the website's target group (e.g., gender, age, web experience).
Testing Environment: Depending on the purpose and capacity of the study, one may have to decide between testing in a lab environment or at the user's location. Of course it is easier to control the environment and to gather consistent data in a lab; however, one has to consider physical accessibility in the rooms as well as the availability and functionality of several types of assistive technologies. Users with disabilities often have intricate, highly-personalized setups in their homes and work environments. In a lab setting, it is nearly impossible to recreate a user's actual personal environment (IBM, Human Ability and Accessibility Center). As such, testing in the user's location seems to be preferable.

Planning and Preparing the User Testing Sessions: Based on specific disability considerations, plan the right amount of time and be aware of energy level considerations. In some cases, the time needed for a session will be impacted by a participant's disability. Sometimes fatigue may occur due to medications, the extra time required to use AT, or the disability itself (Henry, 2007).
A method often chosen for user testing is the think-aloud protocol (Brajnik, 2008b). One should thus be informed about the basics of this method and prepare tasks that the participants have to fulfill. Avoid the assumption that people with disabilities cannot or do not use a product (Henry, 2007) or website, or that they have other interests than people without disabilities. One can create tasks and scenarios similar to studies relating to non-disabled.
All written documents (informed consent, task description, test material) must be transformed into easy-to-read texts. If necessary, organize assistance by sign-language interpreters or other needed support.

Conducting the User Testing Sessions: When a panel of users is selected, they are required to perform given tasks while being observed and being asked to think aloud (to express their feelings and thoughts in a way they can). According to usability standard testing procedures, in the end, evaluators generate (from notes, audio and/or video recording, eye tracking) the list of problems and assign severity levels (Brajnik, 2008b). Keep in mind that some people might not want video or audio recording, especially those with obvious physical impairments or impaired speech. To get a sense of the basics for interacting with people with disabilities, see Henry (2007).
In addition to finding accessibility problems, user tests with participants with disabilities also will find general usability problems that impact all users. Therefore, if one wants to make a statement explicitly about website accessibility, it is important to distinguish between usability and accessibility issues as appropriate (Henry, 2007), for example by testing a nondisabled control group.

D. Summarization

Summarize findings considering barriers that users met as well as positive aspects and features that lead to satisfaction. Be careful: Web accessibility depends on several factors of web development and interaction working together; accessibility problems can be caused by one or more different components or by their (non-) interaction. Web browser, hardware, assistive technologies, web content, web experience and other individual characteristics should be considered. Usability problems that affect all users should be isolated from explicit accessibility problems for people with disabilities. Generalization (in view of recommendations as well as in

view of types of disabilities) is best avoided. At best, one should discuss the outcome with people with disabilities, or alternatively, with their advocates. For specifications, one should consider information on writing about people with disabilities, such as Research and Training Center on Independent Living (2001).

5. How to Apply the W3C/WAI-Approach to Web Search Engines

The WAI approach is a proven and well-known model for evaluating accessibility of websites, but to our knowledge no one has applied it to web search engines yet. So it is still uncertain whether there are modifications or expansions necessary to evaluate web search engine interfaces, as these are a special class of websites. In the following section, we do a conceptual idea on how to use the WAI methodology for evaluating search engines' accessibility and illustrate our ideas for that special use case. This theoretical concept should be the preparation for a practical evaluation of web search engine accessibility in a large-scale project taking different types of disability into consideration.

A. Preliminary Review of Web Search Engines

From the users' point of view, web search engines today mainly consist of a homepage with a search box, including different collections for vertical search like images, videos, maps, and products; the search engine results pages (SERP) consisting of organic results, sponsored links, and search suggestions (Höchstötter & Lewandowski, 2009); and adjunct documents like privacy policy, help, and legal information. For preliminary review, select a representative sample of these pages and do the manual evaluation with graphical and specialized browsers as well as the automatic evaluation as mentioned before. Experiment with several collections, universal search results, simple vs. advanced search, and different filter options to get an idea of how complex and manifold web search engines are in contrast to other websites.

B. Conformance Evaluation of Web Search Engines

Homepage and SERP are the most relevant part of a web search engine for the user; therefore, they should be considered in conformance evaluation. As more and more people become aware of privacy and data protection on the web, privacy policy and terms of use should be evaluated as well. An accessible web search engine interface alone, without appropriate accessible results, is unrewarding for people with disabilities; thus, one should include at least the first ten results in the conformance check (at least their homepages) on an exemplary query. This inclusion provides an insight into the extent to which accessible documents are represented within the high-ranked results. Most users just view the first few results on the first result page (Machill et al., 2004; Spink & Jansen, 2004). As such, it should be enough to consider the first SERP (usually showing ten results).
Please keep in mind that people with disabilities do not necessarily only search for topics about disability; usually, they have the same interests and information needs as nondisabled. To choose exemplary search queries, one can consider web statistics like GoogleZeitgeist, which lists the fastest rising searches for a year, or ask users of the website's target group for typical tasks and topics. Manually evaluate the sample of pages using guidelines like WCAG 2.0, graphical and specialized browsers, as well as automatically, as mentioned in Section 4. The next step is page content evaluation, which of course is important for every part of the page sample, including labeling of buttons and links. The focus especially should be on documents with much written text (e.g., help texts, privacy policy, terms of use). First, check whether there are special easy-to-read-texts for people with learning disabilities. If so, examine these. If not, take the standard documents and evaluate them, following the criteria mentioned above.

C. User Testing of Web Search Engines

Regarding the social model, central for user testing are obstacles and hindering conditions in using web search engines, not the individual impairments of test persons. Thus, do not focus on hard categories of impairments, but rather act with the widest perspective of disability in mind, concentrating on barriers of use for disabled people. To structure outcome one for example can use existing classification system of barriers (Berger et al., 2010; Ruth-Janneck, 2011):

- Technical barriers based on used techniques, programming styles and restrictions in hard- and software
- Editorial/content-related barriers containing insufficient editorial or structural content for web requirements

- Design barriers based on the inadequate design of user interfaces
- Organizational barriers based on organizational circumstances or a lack of awareness for accessibility issues

If one has a sample of users and has made a decision about the test environment, one can create realistic search tasks for participants to fulfill. It is recommended to consider tasks with different levels of severity as well as different types of queries (e.g., informational, navigational, transactional (Broder, 2002)). At the least, one should include informational and navigational queries (Lewandowski, 2012). Decide between or mix free search tasks (participant formulates query independently) or guided search tasks (participant gets mandatory query formulation) (Quirmbach, 2011).
Let participants fulfill the tasks, observe their behavior (maybe assisted by audio/video recording, eye-tracking), encourage them to think aloud (or to express themselves in another way), conduct an interview (for details about methods and metrics for example see Tullis & Albert, (2008)), and identify problems as well as positive features.
To structure the observation, one can use one of the manifold existing models of web searching. Monitor and gather data for every step of information seeking: (1) Query formulation, (2) Selection, (3) Navigation (optional), (4) Query modification (Levene, 2006, pp. 21-22). Regard the established parameters of usability (effectiveness, efficiency, satisfaction (EN ISO 9241-11:1998)) and modify them to focus on accessibility. This could be as follows:

- Effectiveness: How many participants can interact directly (without assistive technology or modification) with search engines in the ordinary way (which means: submit a query to the web search engine, select one of the web pages from the SERP, click on the link to that page, and browse, if necessary, reformulate the original query and resubmit it to the search engine, until the desired information is found)? How many participants, who cannot access directly, can use their assistive technology on the search engine effectively?
- Efficiency: How much time is needed to fulfill the tasks without/with assistive technology? How many adoptions of assistive technology are necessary? How much support by third is needed? How many participants give up?
- Satisfaction: How many positive/negative expressions are made while searching, and how satisfied are participants with the search engine?

Doing a mixture of preliminary review, conformance evaluation and user testing, one should obtain a good idea of a web search engine's accessibility and potential barriers for people with disabilities. All violations against established accessibility standards and recommendations should be summarized; if possible, one can suggest improvements. Barriers as well as positive aspects and best-practices for disabled users should be identified. If possible, discuss findings with the people concerned as well as with providers of web search engines.

6. Conclusion

Much research has been conducted on the accessibility of special areas like governmental websites, in terms of requirements for special target groups like the blind, and on behavior and preferences of non-disabled users of web search engines. On the other hand, little to no work has been done on the special issue of web search engine accessibility, taking diverse types of disability into consideration.
This paper introduced the key points of web accessibility and the idea of disability studies/inclusion, and illustrated a hypothetical concept of how to evaluate a web search engine's accessibility based on an interpretation of the proven WAI recommendations.
The main limitation of this work can be seen in its theoretical nature – up to now the proposed model has not been tested; it is rather a kind of conceptual design based on existing literature, methods and guidelines.
Further research is needed to edit the numerous statements by initiatives for/of people with disabilities, as well as by legislatures to emphasize the relevance of accessibility and to fully perceive the meaning of inclusion and disability studies. When the theoretical ground is prepared, we aim to apply the model using the example of German web search engines for children. In a large-scale project children with different types of disabilities (visually impaired; auditive impaired; motor impaired; cognitive impaired) including their relevant assistive technologies (amongst others screen reader, Braille display, magnifier, head mouse, key button, voice control, spell assist program) should evaluate search engines' accessibility; the model will be tested and refined. If one

has a valid framework to identify accessibility problems in web search engines, procedure and results can be transferred to other kinds of search engines, like library catalogues or enterprise search engines, which are crucial for equality and inclusion in information access as well.
Even if the proposed work has not been tested, we would be pleased to start a inspiring discussion and are happy to receive feedback on our preliminary ideas from readers.

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Appendix 1: Alphabetical list of tools and guidelines mentioned

No	tool/guideline	specification	URL
1	CSS Validation Service	W3C service to validate cascading style sheets	http://jigsaw.w3.org/css-validator/
2	Cynthia Says	web content accessibility validation tool to identify errors in design related to Section 508 and WCAG guidelines	http://www.cynthiasays.com/fulloptions.asp
3	IBM Web Accessibility Checklist	WCAG-based checklist for web sites and web applications by the IBM Human Ability and Accessibility Center	http://www-03.ibm.com/able/guidelines/web/accessweb.html
4	Lynx	free text browser for the Web, initially developed by University of Kansas	http://lynx.browser.org/
5	Markup Validation Service	W3C service to check the markup (HTML, XHTML, …) of Web documents	http://validator.w3.org/
6	NonVisual Desktop Access (NVDA)	free and open source screen reader for the Microsoft Windows operating system	http://www.nvda-project.org/
7	Référentiel Général d'Accessibilité pour les Administrations (RGAA)	French Accessibility Law	http://www.rgaa.net/
8	Stanca Act (Disposizioni per favorire l'accesso dei soggetti disabili agli strumenti informatici)	Italian Accessibility law (commonly known as the "Stanca Act" after Lucio Stanca, who served as the Minister for Innovation and Technologies at the time of the act's passage	http://www.pubbliaccesso.gov.it/normative/legge_20040109_n4.htm
9	U.S. Section 508	American Accessibility Law	http://www.section508.gov/index.cfm
10	Verordnung zur Schaffung barrierefreier Informationstechnik nach dem BGG (BITV)	German Accessibility Law	http://www.gesetze-im-internet.de/bitv_2_0/
11	WAVE toolbar	Firefox toolbar providing a mechanism for running WAVE reports directly within Firefox	http://wave.webaim.org/toolbar
12	WebAnywhere	web-based screen reader for the Web	http://webanywhere.cs.washington.edu/
13	Web Content Accessibility Guidelines (WCAG) 2.0	part of a series of Web accessibility guidelines by the W3C Web Accessibility Initiative (WAI)	http://www.w3.org/TR/WCAG/
14	Zeitgeist	the year's 10 fastest-rising global queries of Google searches	www.googlezeitgeist.com

Appendix 2: Abstract easy to read

Search engines are tools that help to find information on the web. Many people use search engines every day. They search for information about their work and leisure time and many other topics. So that every person can use search engines, they have to be useful to everyone. The difficult terms about that are accessibility and accessible. Researchers can check whether search engines are designed in that way. This article describes how researchers can do this. It tells why it is important that every person can handle a search engine.