

# Accessibility and Computing

A regular publication of the ACM Special Interest Group on Accessible Computing

## A Note from the Editor

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Dear SIGACCESS member:

Welcome to the June issue of the SIGACCESS newsletter. This is the 100<sup>th</sup> issue of the newsletter and we are excited about the growth of the SIGACCESS community through the years.

This issue includes three articles. Dr. Giorgio Brajnik discusses the pitfalls in web accessibility evaluation and proposes suggestion to avoid those traps. The second article, written by Dr. Shari Trewin, provides a comprehensive summary on how to organize an accessible conference. In the third article, Mr. Clay Braziller discusses opportunities in assistive technology commercialization.

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### *Who we are*

SIGACCESS is a special interest group of ACM. The SIGACCESS Newsletter is a regular online publication of SIGACCESS. We encourage a wide variety of contributions, such as: letters to the editor, technical papers, short reports, reviews of papers of products, abstracts, book reviews, conference reports and/or announcements, interesting web page URLs, local activity reports, etc. Actually, we solicit almost anything of interest to our readers.

Material may be reproduced from the Newsletter for non-commercial use with credit to the author and SIGACCESS. Deadlines will be announced through relevant mailing lists one month before publication dates.

We encourage submissions as word-processor files, text files, or e-mail. Postscript or PDF files may be used if layout is important. Ask the editor if in doubt.

Finally, you may publish your work here before submitting it elsewhere. We are a very informal forum for sharing ideas with others who have common interests.

Anyone interested in editing a special issue on an appropriate topic should contact the editor.

# The Troubled Path of Accessibility Engineering: an Overview of Traps to Avoid and Hurdles to Overcome

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## Abstract

Web accessibility entails far more than just paying attention to a handful of HTML tags and attributes: it deals with human behavior. As consequence we have a number of pitfalls that hamper accessibility evaluation of web pages. In this paper I review some of the research my coauthors and I did in the last four years that provides some experimental evidence. In fact, the three fundamental processes of (1) selecting the pages to be investigated, (2) finding their problems, and (3) measuring the corresponding accessibility levels are ridden with potential traps which affect reliability and even validity of evaluations. Knowing which traps are there and figuring out how to overcome them should rank high in the priority list of researchers and practitioners in accessibility. This is what is needed in order to move towards an *engineering* of accessibility.

## Introduction

Web accessibility engineering improves the accessibility level of web sites and applications through a systematic, disciplined and quantifiable approach to their development and analysis. While at first sight accessibility seems to be a relatively objective property, grounded on mark-up languages and seemingly syntactic properties, like the Alt attribute of the IMG tag, or the LABEL/@FOR construct for form controls, or the TH/@SCOPE and TD/@HEADER mark-up for data tables, it is a difficult goal for developers to reach. Not least because it has to do with human behavior.

One of the reasons may be that so far, as a research and practice community, we have not been so systematic and disciplined and rigorous as the definition given above assumes. We have however to improve such a status and become better accessibility engineers. In fact, on one side the push of new technologies and of new user interfaces techniques and paradigms, such as multimodal ones, lead to more and more potential and diverse accessibility barriers that need to be dealt with. We need more effective design and analysis processes to cope with such a moving frontier. On the other side, in the current evaluation practice there are several traps which undermine our ability to identify and address the true problems that possibly residing in a web application. Again, more effective analysis processes are needed badly.

In this short paper I would like to recap some of the results found in experiments that others and I did in the last four years concerning methodological aspects of web accessibility evaluations. We discovered that errors and subjectivity can creep in at different steps of an

evaluation: during page selection you can introduce up to 20% of the errors if you follow the wrong page selection criterion; during elicitation of accessibility problems, even if you are an expert, something more than 20% of your ratings might be wrong, you might produce more than 29% of false positives and miss more than 29% of the true problems; finally, if you want to measure the level of accessibility, and adopt one of the published automatic accessibility metrics, you are likely to use one that does a very poor job in discriminating high vs. low accessibility pages.

The stakes are high: whether you are a web developer that needs to know what the accessibility status of your application is, or you are working in quality assurance and are comparing accessibility of the current version of an application to previous ones, or you are an accessibility consultant that has to determine if an application is conformant to WCAG 2.0, or you are a chief information officer worried about the conformance status of your sites, or you are a legal consultant for somebody who is in the process of writing a law concerning accessibility of certain types of sites, the consequences of unreliable or invalid conclusions regarding accessibility might be very costly.

My conclusions are easy to summarize: First, web accessibility is not an objective property, and in order to be dealt with in engineering terms it has to be contextualized. Second, I would like this research community to spend more efforts in studying and improving the methods that we (scholars and practitioners) adopt when designing or analyzing applications, so that subjectivity and errors can be estimated and kept under control. After all, what De Marco said 30 years ago for software engineering – “you cannot control what you cannot measure” – nowadays applies equally well to accessibility engineering (De Marco, 1982).

## **Background**

Let's start from the words “web accessibility”. In (Brajnik, 2008) I listed as many as nine different definitions, ranging from the one used in the WCAG 2.0 (a web site is accessible if it is perceivable, understandable, operable by users despite their impairments and if it is robust with respect to user agents and assistive technologies) to the one proposed by Petrie and Kheir, which reduces accessibility to usability (... if it can be used by specific users with specific disabilities to achieve specific goals with effectiveness, efficiency and satisfaction in a specific context of use, Petrie & Kheir, 2007). The fact that there are so many definitions means that the notion of accessibility by itself is likely to stir disagreement. In addition, the fact that most of these definitions are not operational (i.e. cannot be easily mapped to more objective criteria) make the whole issue ill-defined. For example, how would you decide if a site is robust? Or what does “people with disability” mean?

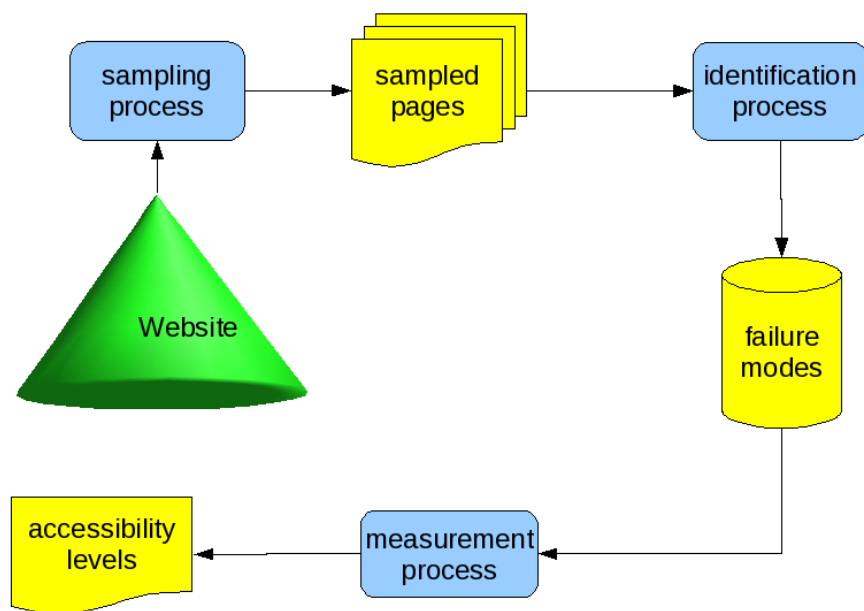
### **Comment n. 1: accessibility is relative.**

My first conclusion is that accessibility needs to be contextualized, as it is done for usability. Within a specific context (for example, restricted to a certain group of people, a certain group of goals/tasks, and a certain group of computing platforms and operating situations) we could define accessibility as the extent to which effectiveness is achieved, when measured in terms of success rates and errors. After obtaining similar results for a corresponding control group with no disability, we could say that a site is accessible if the two groups achieve the same level of effectiveness. As a consequence it would make no

sense to say “site www.example.com is accessible” without declaring the context (people, tasks, situation) of such a claim.

At the moment there are a few accessibility models (frameworks that establish how accessibility depends on which factors). A well known model is the one proposed by W3C/WAI, which is based on three fundamental tiers and two additional hypotheses: to support accessibility, web content must be accessible according to the WCAG; the user agent used by the user has to be accessible according to the UAAG (User Agent Accessibility Guidelines); the web authoring tool used by the developer has to produce code that is accessible (Authoring Tool Accessibility Guidelines); assistive technologies have to be compatible with WCAG and UAAG, and finally the operating system has to provide the appropriate support (in terms of the accessibility architecture) to allow proper interaction between user agents and assistive technologies.

Another model was suggested by Kelly et al. (2007), based on a model of the accessibility stakeholders and their motivations combined with an extensible list of accessibility criteria and methods.



*Figure 1: The three processes of selection (sampling) of pages, problem elicitation (identification) and accessibility measurement.*

Yet another model is the simple one I suggested in (Brajnik, 2008) based on the notions of *properties*, *context*, and *processes*. By *properties* I mean an operational definition of “web accessibility”. By *context* I mean a characterization of the context of use, in terms at least of user and user platform profiles). By *processes* I mean a definition of how the following three processes are to be carried out: selection of the pages to be analyzed, elicitation of accessibility problems, measurement of accessibility levels (see Figure 1). Notice that this is nothing new compared to a well written accessibility policy which, among other things should state details about properties, context and processes.

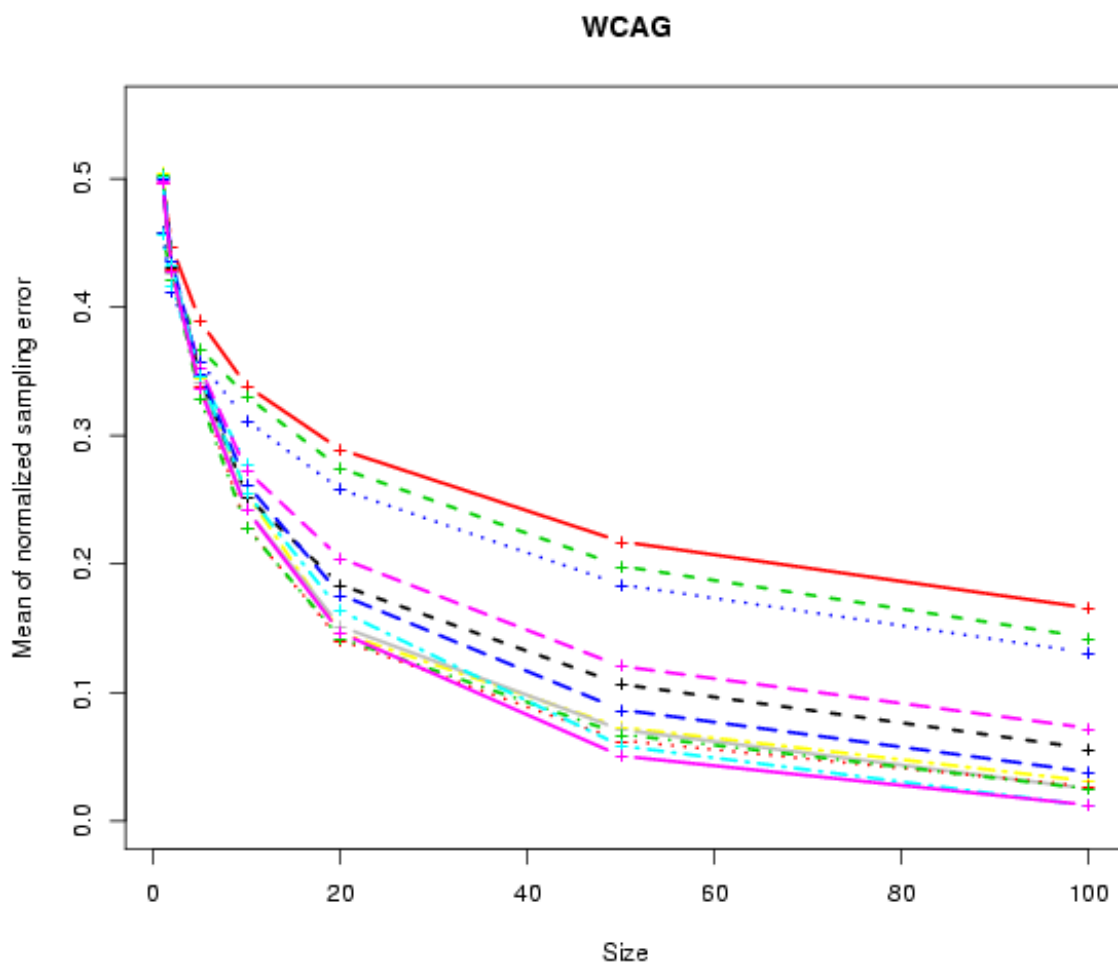
**Comment n. 2: define and stick to concrete and operational procedures.**

Let's now consider each of these three processes, and in particular the pitfalls that they hide.

### **Selection of pages**

Because many interesting web sites have a huge number of pages, and in many cases the content of those pages is likely to change very frequently, and sometimes it is the users who add/change content, when an evaluation is carried out one has to select the pages/content to investigate. There are different ways to do so; one is *ad-hoc*, which suggests to select pages such as the home page, the site map, the contact page, and a representative one for each of the subsites. Other methods discussed in the literature are probabilistic in nature, variations of *random walks* over the links of the site. This kind of methods are used, for example, in some of the automatic accessibility observatories that have to repeatedly scan (part of) a site. Another category of selection methods are based on the *error profile* of pages (the error profile is a vector of the outcome of all accessibility criteria applied to the page) and the idea of clustering profiles that are similar so that *different* pages are considered; these methods are used when using automatic tools to monitor the accessibility status of a website.

In an experiment my students and I did (Brajnik, Mulas, & Pitton, 2007), we found that across 13 different sampling methods (1 *ad-hoc*, 3 *random-walks* and 9 variations of the error profile ones), the error in accessibility when using the worst-behaving method is close to 20%. More specifically, we downloaded 1000 pages from each of the 32 web sites we considered; an accessibility testing tool was then applied to find out the violations of WCAG 1.0 checkpoints in each of these pages and the number of checkpoints that failed on each page was computed (which is our measure of accessibility). Then, for different sample sizes (ranging from 1 to 100), we selected several samples using all 13 sampling methods. Finally, we compared the average accessibility level of the sample against that of the entire site.



*Figure 2: Influence of the sample size on the WCAG 1.0 conformance when using different sampling methods.*

As can be seen in Figure 2, the relative error decreases as the sample size increases, as we all would expect. However, even for size=100, when the wrong method is chosen, the error rate is close to 20% (meaning that 20% of checkpoints are not correctly estimated using the sample). Among the worst-behaving methods were the random-walk and ad-hoc ones.

**Comment n. 3: page selection affects the outcome of the audit significantly.**

Even though in this study we made very strong assumptions (that accessibility errors are exactly those identified by the tool; that 1000 pages are considered the same as the entire web site; that a difference in the number of failed checkpoints bears upon accessibility), the overall conclusion is that the method used to select pages is likely to affect the outcome (even to a large extent) of an accessibility audit, especially in terms of conformance.

## Elicitation of accessibility problems

There are several methods that can be used to elicit accessibility problems: user testing with people with impairments, subjective assessments (asking a panel of people to report back what works and what doesn't), screening techniques (artificially reducing one's sensory or motor capabilities, like when forcing a developer to use a screen reader to navigate in the web site that s/he develops), barrier walkthrough (using descriptions of known barriers mapped to disability types when inspecting pages) or conformance reviews (with respect to guidelines such as WCAG 2.0 or Section 508).

In my view, an elicitation method is a conceptual tool that should help you in predicting which accessibility problems will show up on a site when it will be used by real people for real purposes. Ideally, the best tools are those that help you find almost only true problems (few false positives), almost every true problems (few false negatives), with high reliability.

In a series of experiments, we (Yesilada, Brajnik, & Harper, 2009; Brajnik, 2009; Brajnik, Yesilada, & Harper, 2010) explored these issues for the barrier walkthrough and conformance review methods, figuring out also how much the evaluators' experience accounts for. In two new, soon to be published, journal papers we provide a much deeper analysis of the outcomes, including estimates of the optimal number of judges to employ.

We found out that reliability of conformance review based on WCAG 2.0 is low, even when evaluators are experts in the fields. About half of the success criteria got an agreement among experts that did not exceed 75%; some success criterion never, over the pages we considered, reached a value higher than 75%. See Figure 3.

In terms of validity, the picture is not much better: on average, experts produce 29% of false positives (correctness is 71%) and *simultaneously* 29% of false negatives (sensitivity is 71%, i.e. they missed 29% of the true problems). See Figure 4.

Expertise accounts for a slight increase in reliability (about 6%) and a 20% increase in validity.

Similar results were found for the barrier walkthrough method.

As with any experiment, also in our case the assumptions we made limit how far we can generalize the results. First of all, we recruited 23 experts among our friends and colleagues (most were attendees or authors of ASSETS) and we asked them to evaluate one page each, and fill-in a spreadsheet of success criteria: this is clearly an artificial setting, since they knew no client was waiting for their answers and that their answers would not be used to decide what to do on those pages. We also assumed that the *true problems* were the success criteria whose most frequent rating was *fail* (over all the ratings given by experts on a given page).

**Comment n. 4: conformance to WCAG 2.0 is subjective.**

**Comment n. 5: substantial conformance errors cannot be avoided, not even with experts.**

Thus, even considering the underlying assumptions, I believe we should definitely forget to treat accessibility, but also conformance, as a binary absolute property. First, because it is subjective; second, because we need to cope with error margins.

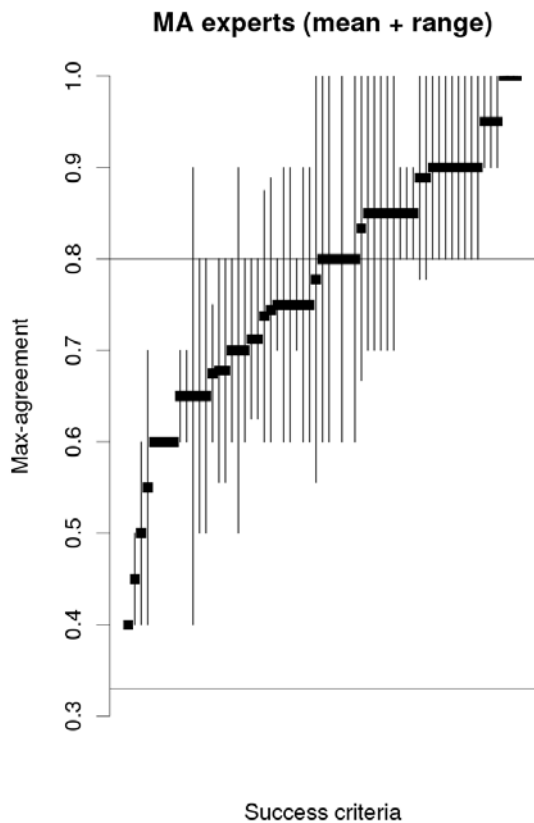


Figure 3: Agreement (relative number of experts that agreed) on the most frequent outcome of each success criterion of WCAG 2.0 over four given pages.

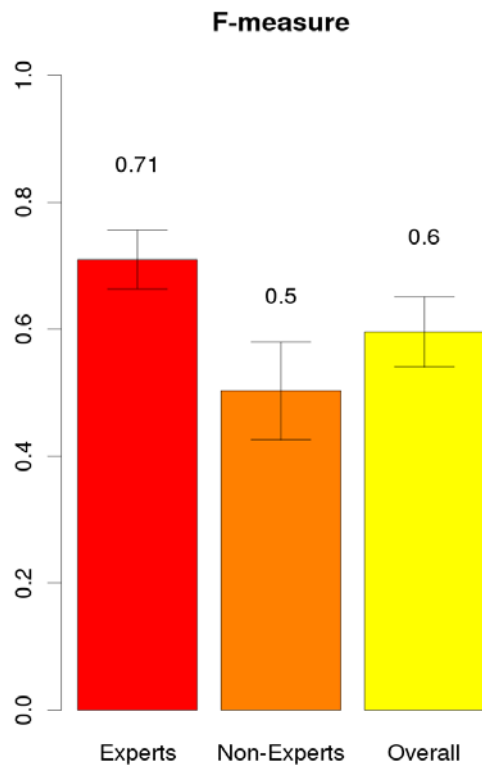


Figure 4: Overall measure of validity (f-measure is the harmonic mean of correctness and of sensitivity).

## Measuring accessibility

In (Vigo & Brajnik, 2011) we explored the issue of automatic accessibility metrics. This issue is important not only when one is implementing an accessibility observatory, or interpreting its data, but also when one is comparing two versions of the same site (as in regression testing), or when one is implementing a personalized user interface which illuminates users on potential accessibility problems, or when a search engine has to rank results also in terms of accessibility. Even when determining conformance levels, one has to count how many success criteria of a certain group fail, and then summarize such counts into values taken from {not-conformant, A, AA, AAA}.

### Comment n. 6: measurements of accessibility occur very often.

We implemented 6 metrics defined in the literature (failure rate, UWEM, WAQM, WAB, PM, A3); they are all based on the results that an accessibility testing tool can provide. We used EvalAccess and applied it to 1500+ pages (15 sites, 100+ pages each), some of which were labeled as “high-” or “low-accessibility” on the basis of a manual inspection we made.

Figure 5 shows the kind of disagreement between metrics that we found (more detailed charts are available in the paper). In addition, we saw that the disagreement is higher for low accessibility sites, and that most metrics do a very poor job in discriminating high-accessibility sites from low-accessibility ones.

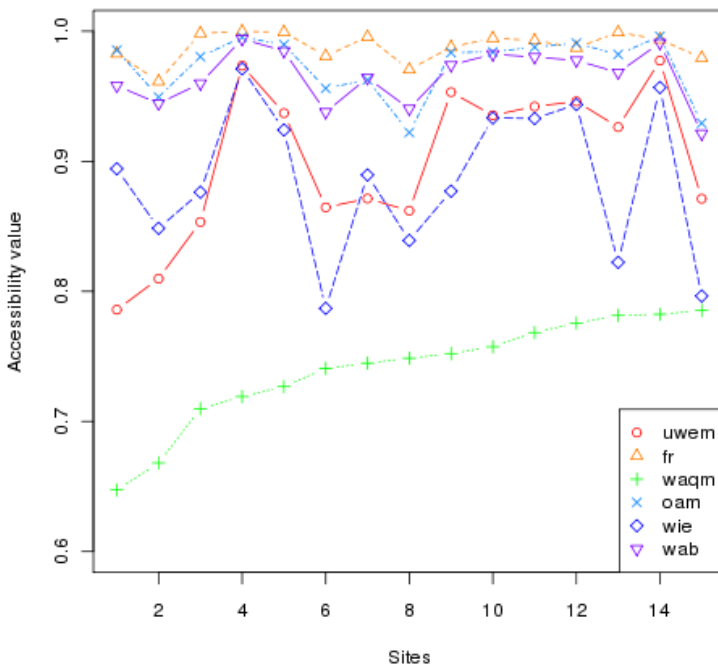


Figure 5: Correlation of different metrics on each site. The scale ranges from 0.6 to 1.0, 1.0 being the highest value of non-accessibility.

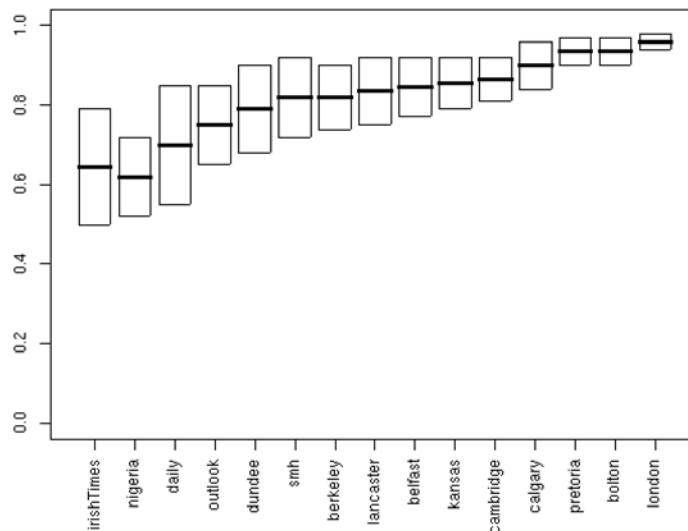
The assumptions underlying this experiment are also strong: we worked with automatic metrics only, used a single tool to elicit potential problems; used a partial gold-standard. Despite this, my conclusion is that while automatic metrics are appealing because easy to use and to interpret, and very efficient, we don't know what they measure. For example, *failure-rate* is defined as the number of failures of a criterion/test (like a form control missing its label tag in a page) over the total number of potential failures (the number of all form controls in that page). Notice that the same failure-rate (e.g. 0.30) for two pages may mean very different numbers of accessibility barriers (if page X has 3/10 and page Y has 6/20, then page Y has 12 barriers of that kind, whereas page X has “only” 6 of them). Failure-rate is thus a measure of how well developers addressed accessibility features, it's not a measure of the impact that the accessibility barriers have.

**Comment n. 7: automatic metrics measure something different than accessibility.**

Because these metrics are based on data produced by automatic means only, no estimation of errors can be made. Another approach would be to “use” human judges to

measure accessibility. This is what judges do when involved by Knowbility Inc. ([www.knowbility.org](http://www.knowbility.org)) in the Accessibility Internet Rallies: they use a spreadsheet with penalty points for sites that fail to implement certain accessibility features. In this way, each judge computes the total number of penalty points, and then together with other judges they smooth out potential disagreements, determining a ranked list of sites.

In the past, we suggested to adopt a hybrid approach, named SAMBA (Brajnik & Lomuscio, 2007): the data produced by a testing tool are sampled and given to one or more judges, which are asked to rate the severity of the sampled problems (and implicitly to say if a problem is a false positive). After a relatively simple statistical computation, the overall index of accessibility for the site can be derived, together with an estimation of the margin error. For example, Figure 6 shows the mean value of accessibility for the 15 web sites we considered in that experiment, along with an estimation of the amount of uncertainty. The uncertainty can be used to determine if site X is more accessible than site Y. For example, the first 5 sites on the left overlap in terms of the confidence intervals: it is safe to assume that we don't know which one is more accessible. However, the leftmost site is definitely less accessible than the four ones on the right (calgary, pretoria, bolton, london), since the intervals do not overlap.



**Figure 6: Accessibility levels for 15 websites along with their 95% confidence intervals.**

A strong assumption underlying SAMBA is that the uncertainty that can be estimated is related to false positives only; false negatives do not enter into the calculations.

Comment n. 8: manual metrics are the best choice but are expensive. Semi-automatic metrics produce “semi-correct” answers.

## Conclusions

My purpose with this quick survey is to convey the message that web accessibility is much more than just checking whether the IMG tag has an ALT attribute, and that this leads to a number of issues. I claimed that:

1. accessibility needs to be contextualized, just like usability;
2. in order to practice a sound accessibility engineering, you need to stick to studied and standardized evaluation procedures;
3. page selection is likely to affect the outcome of an audit;
4. conformance to WCAG 2.0 and barrier walkthrough are subjective;
5. even experts make a relatively large number of errors when determining conformance;
6. even if you are not aware of it, you often measure accessibility;
7. automatic means to measure accessibility are cheap, but not useful;
8. manual metrics are the best choice but they are expensive and face problems 3-4-5 listed above; semi-automatic ones suffer from blindness with respect to false negatives.

I believe that only when these issues are considered and appropriately handled, then we can say that web accessibility is approached with an engineering attitude.

The task ahead of us is clear: we need first to determine how the quality of the accessibility processes (selection of pages, elicitation of problems, measurement, or other ones) can be evaluated; then study evaluation methods, and finally determine how they can be embedded in the development phases and steps. At that point, practitioners could select the best methods for the case at hand, and be relatively sure that results matching a given quality level will ensue, including an accessible web site.

## References

- Brajnik, G. (2008). Beyond Conformance: the role of Accessibility Evaluation Methods. In S. Hartmann, X. Zhou, & M. Kirchberg (Eds.), *WISE 2008: 9th Int. Conference on Web Information Systems Engineering – 2nd International Workshop on Web Usability and Accessibility IWWUA08*, LNCS 5176 (p. 63–80). Auckland, New Zealand: Springer-Verlag.
- Brajnik, G. (2009). Validity and Reliability of Web Accessibility Guidelines. *Proc. of 11th Int. ACM SIGACCESS Conference on Computers and Accessibility – ASSETS 2009* (p. 131–138). Pittsburgh, PA.
- Brajnik, G., & Lomuscio, R. (2007). SAMBA: a semi-automatic method for measuring barriers of accessibility. In S. Trewin & E. Pontelli (Eds.), *9th Int. ACM SIGACCESS Conference on Computers and Accessibility, ASSETS*. Tempe, AZ.
- Brajnik, G., Mulas, A., & Pitton, C. (2007). Effects of sampling methods on web accessibility evaluations. In S. Trewin & E. Pontelli (Eds.), *9th Int. ACM SIGACCESS Conference on Computers and Accessibility, ASSETS*. Tempe, AZ.

- Brajnik, G., Yesilada, Y., & Harper, S. (2010). Testability and Validity of WCAG 2.0: The Expertise Effect. Proc. of the 12th Int. ACM SIGACCESS Conf. on Computers and Accessibility, ASSETS 2010 (p. 43–50). Orlando, Florida, USA: ACM. doi.acm.org/10.1145/1878803.1878813
- De Marco, T. (1982). Controlling software projects. Yourdon Press.
- Kelly, B., Sloan, D., Brown, S., Seale, J., Petrie, H., Lauke, P., & Ball, S. (2007). Accessibility 2.0: people, policies and processes. W4A '07: Proc. of the 2007 International Cross-Disciplinary Conference on Web Accessibility (W4A) (p. 138–147). New York, NY, USA: ACM.
- Petrie, H., & Kheir, O. (2007). The relationship between accessibility and usability of websites. Proc. CHI 2007 (p. 397–406). San Jose, CA, USA.
- Vigo, M., & Brajnik, G. (2011). Automatic web accessibility metrics: where we are and where we can go. *Interacting with Computers*, 23(2), March, (p. 137-155).
- Yesilada, Y., Brajnik, G., & Harper, S. (2009). How Much Does Expertise Matter? A Barrier Walkthrough Study with Experts and Non-Experts. Proc. of 11th Int. ACM SIGACCESS Conference on Computers and Accessibility – ASSETS 2009 (p. 203–210). Pittsburgh, PA.

#### **About the Author:**



Giorgio Brajnik is a computer scientist with an interest in development and evaluation principles for user interfaces of computer systems; he is currently working on accessibility evaluation methods, on evaluation of user experience, and on interaction design tools and methods. He is assistant professor at the Dept. of Mathematics and Informatics of the University of Udine, in Italy, where he teaches “User Centered Web Development” and “User Experience”.

# Planning an Accessible Conference

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with additional input from Vicki Hanson, Jen Mankoff, and Donal Fitzpatrick.

This document contains information for organizers of academic conferences who wish to make their events as accessible as possible, so that people with disabilities can participate fully. It is not intended as an accessibility checklist or requirements document, but offers general ideas and information that conference planners may wish to consider.

These ideas are based on experiences in running the ACM SIGACCESS Conference on Computers and Accessibility (ASSETS). ASSETS is a conference of around 130 people, consisting of technical paper presentations, posters and demonstrations. The conference proceedings are published in the ACM digital library. Most attendees are non-local, and stay in the conference hotel. ASSETS is often attended by people with disabilities. In a typical year, there might be attendees who are blind, have low vision, are deaf or hard of hearing, use a power wheelchair or an electric scooter, have limited dexterity, and limited mobility. ASSETS strives to create an environment in which all attendees can participate and socialize together.

## Location and Hotel Selection

When selecting a location and a specific hotel, consider the following:

- Is there accessible public transport from the airport (or other likely arrival points) to the hotel? How complex is the journey?
- Is the hotel ADA-compliant (or equivalent accessibility regulation for non-US sites)? Even if the hotel claims to meet the appropriate standards, implementation varies widely, so it is still valuable to ask more detailed questions and visit the site in person wherever possible. Hotels in the US should be able to provide an ADA compliance statement indicating how they meet the accessibility requirements of the law.
- Is the hotel willing to reserve the wheelchair accessible rooms and rooms on the ground floor and near elevators for conference attendees to book?
- Is the building wheelchair accessible through the main entrance?
- Large, open public spaces with few landmarks are difficult to navigate without vision.
- Are there at least 2 wheelchair accessible guest rooms? Specific adaptations include easily operable door handles and room keys, lowered spyhole and light switches, and room to maneuver bulky electric wheelchairs.

- If the event is more than one day, is there a wheelchair-adapted room with a roll-in shower?
- Are the elevators accessible? (Ask about tactile buttons, auditory feedback, visual feedback, wheelchair-height controls).
- Does the hotel have Braille labeling, especially in elevators? (For ASSETS, we have even provided adhesive Braille labels for elevators.)
- Does the hotel have alternative emergency devices for Deaf and hard of hearing guests?
- How much walking is required to get between the nearest disabled parking space, the lobby, guest rooms, meeting rooms, nearest restrooms and lunch location? What is the wheelchair route between these locations?
- Are there accessible restrooms near the meeting rooms, on the same level or with an elevator very near? The accessible stall should accommodate a large power wheelchair.
- If there is a raised stage in the meeting room, is there a way for a wheelchair user to get to the podium? Are there railings on steps up to the stage?
- Do the meeting rooms have an induction loop?
- Will there be room to seat wheelchair users in the meeting sessions?
- Obstacle-free environment (free of protruding objects and trip hazards)
- Have the hotel staff had any disability awareness training?
- How willing are the hotel staff to accommodate special requests?

## Budget

- Captioning and sign language translation are expensive. Plan for approximately \$1500 per day in the budget to cover this service, in case it is requested. Sign language interpretation should include coverage of breaks and social events. The choice of whether to provide interpreters or captioning will depend on the requests made by attendees. For conferences where there will be attendees who sign in different sign languages, captioning can be used to accommodate everyone with a single service.
- The audio-visual budget should include microphones for speakers, and for asking questions.
- When deciding how many student volunteers are needed, consider that student volunteer duties might include assisting attendees with accessibility requests, such as guiding people to the restrooms or helping at the buffet.
- Some attendees may require helpers or assistants to accompany them at the conference for care giving and/or language interpreting. These helpers should not have to pay the full conference fee. A suggested alternative is to have them pay for a 'meal-only' fee if they will be eating at the conference.

## Website

- The conference website should meet W3C's WCAG 2.0 accessibility guidelines and be tested for usability when fonts are enlarged, when style sheets are turned off, when images are turned off, and without using a pointing device (keyboard-only access). Testing with a screen reader and screen magnifier is also beneficial.
- The website can provide information about accessibility of the conference hotel, accessibility of transportation to the hotel (including for bulky electric wheelchairs), details of local accessibility information services, and contact people at the conference hotel, and on the organizing committee for accessibility questions.
- The website can offer information on how to create an accessible submission to the technical program.
- Posting details and advance registration for social events on the website can facilitate access for those who are not able to see onsite notices.

## Online Registration

- Include a place for participants to indicate accessibility requirements.
- Include a place to indicate dietary requirements
- Allow registrants to request electronic proceedings, if the default is paper.
- Check that the online registration process is accessible, using the same process as for the website.
- Follow up with registrants to clarify accessibility requests

## Catering

- It is helpful to have a system (e.g. colored stickers on the conference badges) to identify people who have requested special meals, if these meals are served separately by hotel staff
- Ask the hotel to provide labels on buffet dishes listing ingredients or indicating the presence of gluten/meat/dairy products/fish
- Make sure that non-sugar beverage and healthy snack options are available
- Ask the hotel staff to make drinking straws available
- Have student volunteers assist with buffet-style food where needed.

## Local Arrangements

- Gather information on local emergency doctors, hospital facilities, wheelchair repair, physiotherapist and veterinarian.
- Make sure the room seating allows for wheelchair access to the podium and the microphone for asking questions.
- Make sure there are sufficient wheelchair seating places.
- Offer an orientation session before the conference, for attendees and presenters to get to know the meeting room layout and seating arrangements. The room should already be set out as it will be for the meeting.

- Make sure there is a connection into the PA for laptops
- Make student volunteers available to attendees who request assistance.
- If the conference provides an attendee list, have an electronic version available for reference at the registration desk, so that visually impaired attendees can browse the list for people they may wish to talk with. An alternative is to have attendees ask at the registration desk whether specific people are present.
- Communicate with hotel staff about what to expect, and what accessibility requests they may receive from conference attendees. Specifically, staff should be available to show blind attendees to their rooms, and around the inside of their rooms to familiarize them with the layout. They should also be prepared to show attendees how to get to the meeting rooms. Make staff aware that Deaf attendees may communicate in different ways. Some may speak, others may write.

## Conference Sessions

- In advance of the sessions, presenters should be encouraged to prepare as accessible a presentation as possible, including captions for video. If presentations can be made available ahead of time, this is very helpful to attendees with visual impairment, captioners and sign language interpreters.
- The printed session schedule should also be available electronically, in large print, and if possible Braille (1 Braille copy is sufficient).
- At the start of the conference, if there are attendees in the audience with vision impairments, all slides, videos and visual demos will need to be described as part of the spoken presentation.
- Remind the audience to use a microphone to ask questions, so that everyone can hear, and should state their name before speaking, for the benefit of those who cannot see who is speaking.
- If there is an interpreter or captioner present, the lighting should be good enough that they can be easily seen by the deaf attendee(s). Explain to presenters that they should speak with a normal tone and pace, unless asked to slow down by the interpreter. For personal conversations, the attendees should be reminded to speak directly to the person, not to the interpreter.
- A presenter with a visual impairment may request assistance from a student volunteer to advance slides. The session chair, or a volunteer, can also facilitate question asking

## Proceedings

- Work with the proceedings publishers to ensure that the index and table of contents of the electronic proceedings are available in an accessible format. If they are html, the W3C WCAG 2.0 guidelines apply. For pdf documents, the Adobe Acrobat accessibility check applies (see resources below for more information about creating accessible pdf documents).

## Social Activities

The social side of a conference is equally as important as the technical content. Try to avoid events that exclude some attendees. Consider whether:

- Accessible transportation is available to any off-site events
- Offsite venues (e.g. restaurants) are wheelchair accessible with an accessible restroom.
- Sign language interpretation is available for the social event.
- Participants will need to be informed of the walking distance to nearby events, so they can decide how best to get there.
- The event will have broad appeal (e.g not purely visual or auditory)

## More Information and Resources:

Producing accessible pdf files: [http://www.sigaccess.org/assets10/accessible\\_pdfs.html](http://www.sigaccess.org/assets10/accessible_pdfs.html)

Planning and giving an accessible presentation  
<http://www.w3.org/WAI/training/accessible>

Planning Accessible Conferences and Meetings: An ERIC/OSEP Information Brief for Conference Planners: <http://www.hoagiesgifted.org/eric/e735.html>

ADA Requirements checklist: <http://www.access-board.gov/adaag/checklist/a16.html>

W3C Web Content Accessibility Guidelines (WCAG 2.0): <http://www.w3.org/TR/WCAG20/>

Testing Web sites for accessibility: [www.webaim.org](http://www.webaim.org) is a good starting place. The WAVE Firefox plugin is a useful tool.

Adding captions to videos: <http://www.dcmp.org/ciy/>

Some captioning tools: [http://ncam.wgbh.org/invent\\_build/web\\_multimedia/tools-guidelines](http://ncam.wgbh.org/invent_build/web_multimedia/tools-guidelines)

## About the Author:



Shari Trewin is General Chair of the Tenth International ACM SIGACCESS Conference on Computers & Accessibility (ASSETS 2009), and served as Program Chair of the ASSETS 2007 conference. She is a member of the editorial board of ACM Transactions on Accessible Computing and serves as an accessibility reviewer for several international conferences and journals. She is a researcher at the IBM T.J. Watson Research Center with interests in input, cognitive support tools, ageing and technology use, and accessibility in virtual worlds.

# Assistive Technology Commercialization

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Like many people, I never really considered the Assistive Technology sector a big "Market Opportunity". My views changed quickly after tearing my nearly 50-year-old calf muscle piggy backing a 20 year old. Besides feeling like an old fart I also realized that we are all only temporarily able bodied and that we are all going to need varying degrees of support. In fact, there are now an estimated 30 million people with disabilities in the United States, 21 million of working age. By 2013, these people will purchase \$49.3 billion of voice recognition software, eye trackers, sip and puff mice, screen readers, and more. (<http://www.bccresearch.com/report/HLC047B.html>)

I do not want to paint too rosy a picture though as the aging demographics has only had minor impact on most assistive technologies (AT) – of course, the hope is that it will broaden the market as the demand increases.

Aimed at researchers and developers of technology in AT industry, this article will review some of the crucial first steps to move a product from the lab to a paying customer. Subsequent articles will look at issues such as raising funds, creating a business plan etc.

So what can technology developers do to ensure the successful commercialization of their product? To begin, start with the end in mind. Starting with the end in mind involves speaking to the people who will use the product, distribute the product and recommend the product, and of course, who will pay for the product. It sounds so obvious but too often the technology comes out of a lab environment and is simply not ready for distribution. Typical problems we have seen range from products that are prototypes and not designed for manufacturing to installations that require a high level of expertise.

Gary Birch, ED of the Neil Squire Society, developer of the Jouse, an advanced joystick-operated USB mouse controlled with your mouth adds "I would emphasize two points – ideally, be sure to include the end-users in the concept and prototype development stages. Do not leave it to the end as you may end up with a neat piece of technology that no one really wants to use!" Gary goes on further to say "once you have a prototype ready even modest user trials can shed tremendous light on what may need to be adjusted before one moves forward with commercialization."

To understand what a customer will want, the market assessment is a powerful tool. It verifies that your product really solves a problem in the market. For example, I was involved with a product designed to help people with mobility issues access computers. After speaking with distributors, it became obvious our product, while technically advanced, will be too challenging to install. This information early in the process saved thousands of dollars in design costs.

Market assessments will also tell you about the competitors in the market and its size, trends, even funders. These answers help dictate a distribution strategy, possible partnerships, etc. Most importantly, it helps a developer clearly state why their product stands out. Many people can say why a person bought their device, not so many people can truly answer why it was not purchased. Other questions I like to ask include: why did the insurance company choose not to fund a treatment? Why did the physician and/or occupational therapist not recommend a device? Once you understand the why not you can begin to work on how to make it attractive.

Grant Farrell, CEO of Kinetic Muscles ([www.kineticmuscles.com](http://www.kineticmuscles.com)), a suite of products for stroke recovery, states, "Often, even if a product is for home use, the customer will ask the therapist for their input before a purchase" Grant adds, "The therapists input is therefore critical. We spend a great deal of time at a clinical level getting feedback from them on our products effectiveness and ease of use."

Starting with the end in mind also includes applying the concept of universal design. This approach requires the design of products and environments to be as usable as possible by as many people as possible regardless of age or ability. A great one pager, as it applies to the AT world was placed together by the Region of Waterloo, Ontario (<http://www.waterlooregion.org/spc/trends/disabilities/design.html>). Another great example is the Oxo brand of products ([www.oxo.com](http://www.oxo.com)). The idea was to make it easy for the inventor's wife, who had arthritis to hold kitchen utensils. What emerged was a product that makes the experience better for everyone.

A basic approach I use in market assessments includes internet research as well as face-to-face interviews. Some of the questions I like to answer are:

- Clarifying opportunities in the market.
- Validate channel opportunities and highlight partnership opportunities in the market.
- Understanding why some evaluators of the product will or will not buy.
- What stages exist in the buying process and who are the people involved.
- Articulation, in terms of the buyer, how and what (features, packaging, price, installation logistics, after purchase product support) is needed to deliver in order to gain sales.
- What are the channels that best align with the market and the segments buying preferences

While it may seem like a lot of work a little knowledge of how the customer purchases can go a long way in the future success of a product.

#### **About the Author:**



Clay Braziller is a leader, consultant and change agent with twenty diverse years of experience focused on organizational growth, vision setting, innovation, product management and sales. His passion is growing technology-based businesses that can have a social impact. Clay's has leadership experience in the commercialization of implantable medical devices, implantable batteries, computer based assistive technologies, stroke rehab technologies and the application of mobile computing in health care. His customers include Government, health institutions, non-profit and for profit organizations. He is the acting Chair of the Neil Squire Society, a national non-profit in the disability sector that provides computer-based assistive technologies, research and development, and various employment programs.