# How to audit web portal accessibility

Massive investment is being made worldwide in developing and rolling-out web-based e-Government services. Because the success of this programme will be measured in terms of its take-up, governments understandably wish us to make the jump from the real world into cyberspace in our dealings with them. But is sufficient attention being paid to the accessibility and usability of e-Government services to make this happen? Are those who aren't using state of the art equipment, who suffer from disabilities or are impaired in some other way to be excluded?

Cláudia Dias of the Brazilian Court of Audit has developed a structured evaluation method for web portals. Its aim is to help ensure that government web sites are accessible to a broad audience, including those with technical and other limitations. The method is intended for use by web designers, content providers and auditors.

## Introduction

The W3C (*World Wide Web Consortium's*)[1] **"Web Content Accessibility Guidelines"** aim to help web designers and content providers offer their audience accessible web portals. Although a number of other resources are available, such as usability heuristics[a] and automatic tools, no single method covers all of the accessibility and usability problems that web site users might face.

The best approach to evaluating web portals is to combine the positive characteristics of different techniques in a method that can be used by web designers, content providers and auditors alike (I will refer to these three types of web evaluators as "auditors" throughout this paper).

> ……it's not enough to be accessible. A web portal must also be effective, efficient and satisfying - in other words, "usable"…..

The method that I propose is divided into the following stages:

- Analysis of the "context of use" of the web portal to be audited;
- Automatic accessibility testing and code validation;
- Analysis based on the "Web Content Accessibility Guidelines";
- Test with graphical and textual browsers;
- Analysis based on corporate portals' usability heuristics;
- Tests with users with different abilities and handicaps;
- Application of user satisfaction questionnaires;
- Analysis of information content;
- Data analysis;
- Preparing the audit report.

The optional stages described here include automatic and manual inspection methods, empirical tests with users and satisfaction surveys. They may be combined to focus not only on web portal accessibility, but also on usability for it's not enough to be accessible. A web portal must also be effective, efficient and satisfying. In other words, it must be "usable" for it to be truly considered a communications media and an information resource to the general public, whether they are handicapped or not.

a Rules used to describe common properties of usable interfaces.

1 W3 CONSORTIUM (W3C). Web content accessibility guidelines 1.0. W3C Recommendation 5 May 1999. 34p. [online], October 2001. http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505/

## Analysing the "context of use" of the web portal to be audited

The business context in which an institution uses its corporate web portal must be understood before a computer is used to access the portal over the Internet or local network. This will require documentary research. Those responsible for designing and maintaining the portal should then be interviewed to obtain more detailed information about its design and content, the computer environment available to its users, typical user profiles and the main tasks that they use the portal to carry out. This information becomes important during the following stages of my method.

Depending on audit objectives, users may be interviewed to ascertain the personal, functional, physical and technological aspects of their environment; the portal pages they access to carry out typical tasks; and their subjective opinions of the portal.

Having identified the portal's technological environment and the tasks it is typically used to carry out, the auditor is then able to test the related web pages. Depending on their number, all pages may be tested, or testing may be confined to a representative sample of those that relate to typical tasks.

## Automatic accessibility testing and code validation

Automatic accessibility testing and code validation is quick and easy, and is the first choice for web page evaluation. There are many automatic tools freely available on the Web that evaluate web page accessibility through static analysis. These tools generate reports with evaluation remarks, and are a useful aid to both website designers and auditors.

Although by no means complete, the list of tools adopted in this method form a useful reference[b]:

- **W3C Validation tools** - http://validator.w3.org/ http://jigsaw.w3.org/css-validator/ - are W3C tools that validate web page code in relation to HyperText Markup Language (HTML), eXtended HyperText Markup Language (XHTML), Cascading Style Sheets (CSS) and W3C recommendations for these techniques. These are "code" rather than "accessibility" evaluation tools, but code validation is important in evaluating accessibility because assistive technologies rely on valid coding to correctly interpret and translate web pages.
- **Bobby** - http://www.cast.org/bobby/ - developed by the Center for Applied Special Technology (CAST), can be used to analyse web pages in relation to the Web Content Accessibility Guidelines version 1.0. Bobby is a popular tool for identifying accessibility problems that can be verified automatically.
- **WAVE** - http://www.temple.edu/inst_disabilities/piat/wave/ - the Web Accessibility Visual Evaluator (WAVE), developed by Kasday[2], helps the auditor judge the accessibility of submitted pages. WAVE inserts icons in the evaluated pages and identifies images with and without alternative text, hypertext mark-ups to emphasise text, titles, subtitles and lists. It also uses numbered arrows to present text cells in the order that a blind person would read them using a screen reader, an order that is especially interesting when testing pages with tables or frames.

Because automatic tools can only detect a limited number of potential accessibility problems, it is advisable to supplement them with manual methods for evaluating accessibility. For example, an automatic tool might detect the existence of text alternatives to graphics, but it would be unable to judge if these alternatives do in fact provide the equivalent information - the auditor needs to check this manually.

Because automatic tools can only detect a limited number of potential problems, complementary manual inspection methods must be adopted to evaluate accessibility.

b A more comprehensive list may be found at W3C - http://www.w3.org/WAI/ER/existingtools.html

2 KASDAY, L. R. A tool to evaluate universal web accessibility. In: Proceedings CUU´00, Arlington, USA, 2000, p. 161-162.

3 DIAS, C. Heurísticas para avaliação de usabilidade de portais corporativos. 2001. 12p. [on-line], January 2002. http://www.geocities.com/claudiaad/heuristicas_web.html

## Analysis using the W3C "Web Content Accessibility Guidelines"

This method uses accessibility inspection techniques based on guidelines or checkpoints to complement the results provided by the automatic tools referred to in the previous stage. Factors that can only be assessed manually include colour contrast and the correlation between a link description and the content it points to.

The most widely known accessibility checklists are those linked to the W3C Web Content Accessibility Guidelines version 1.0, and those developed by International Business Machines (IBM) based on the same guidelines (http://www-3.ibm.com/able/accessweb.html).

During an inspection the auditor selects both the homepage and a representative sample of the portal's web pages that relate to the tasks identified during the analysis of its "context of use". These are then compared with the accessibility checklist derived from the Web Content Accessibility Guidelines, version 1.0 - this contains 65 checkpoints prioritised according to the negative impact they would have on web portal accessibility should they **not** be implemented.

## Testing with graphical and textual browsers

Before users or usability experts are involved, web page accessibility should be tested using different types of web browsers configured in different ways. For example, with images and sounds; without images; without sounds; without frames; without style sheets; without mouse control; and with different video resolutions. These conditions simulate the navigational restrictions placed on users through their use of assistive technologies, older or more modern hardware or software, or because they are handicapped in some way. It is also advisable to test pages with graphical browsers from different suppliers (Internet Explorer, Netscape, Opera) and with textual browsers, such as Lynx Viewer (http://www.delorie.com/web/lynxview.html).

Given the impossibility of testing every web page, as in the previous stage the auditor should select the home page and a representative sample of the portal's web pages that relate to typical tasks. The greater the diversity of simulated situations and the number of browsers that are tested, the greater is the likelihood of detecting the navigational problems that different types of users experience in different environments.

During a web accessibility audit, both the interface and its information contents should be evaluated.

## Analysis based on the corporate portal's usability heuristics

Because usability problems can affect all types of people, my method incorporates an evaluation of usability heuristics.

I previously mentioned that accessibility is not enough. A web portal must satisfy all users, disabled or not, by meeting their information needs effectively and efficiently, and without causing them problems or discomfort during web navigation.

During this stage software engineers (perhaps the portal developers themselves), psychologists, human factors professionals and/or usability experts carry out heuristic evaluations based on the "Heuristics for evaluating corporate portals' usability[3]". I recommend that three to five evaluators are selected to carry out the typical tasks identified during the "context of use" analysis. They should evaluate the homepage, and also the web pages they visit while carrying out their tasks.

## Tests with users of differing abilities and handicaps

The purpose of this stage is to observe how different people actually use the web portal. This includes experienced and inexperienced web users; users equipped with modern and with older hardware and software; handicapped users equipped with different assistive technologies; and adults and children (if relevant).

User tests generally take place in their normal working environment, and with the equipment, accessories and materials that are normally used. However, depending on the evaluation's objective, the type of data to be collected and the desired experimental rigor, it may be necessary to undertake testing in a specially prepared "usability laboratory". This can be equipped with video cameras, audio tape recorders and one-way mirrors. Monitoring software can also be used to register automatically the steps that users follow while interacting with their portals, their errors, what they did right or wrong, and their difficulties.

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## Application of user satisfaction questionnaires

Questionnaires help auditors to ascertain users' experiences, opinions and preferences when dealing with a certain web portal. In this method an on-line satisfaction questionnaire was developed and made available to the participants. An alternative approach would have been to adapt existing satisfaction questionnaires, such as the Software Usability Measurement Inventory (SUMI)[4], Questionnaire for User Interface Satisfaction (QUIS)[5] and the Web Analysis and MeasureMent Inventory (WAMMI)[6].

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## Analysis of information content

Because there are so many information sources available on the Web, there is no reason to use those that are unreliable. It is therefore necessary to evaluate a source of information and its content in the same way that has always applied to printed material. Thus both the interface and its information contents should be evaluated during a web accessibility audit.

### Credibility

Since peoples' decisions are based on information, it is necessary for the information's credibility to be questioned in terms of its authenticity (is it genuine or a forgery?) and reliability (is it complete, accurate and timely?). Due to the Web's informality, most sources of information in this new media fail to provide sufficient data with which to verify credibility.

Credibility may be inferred from the author's credentials, from evidence of quality control and from "meta-information".[c] Although often neglected on the Web, an author's credentials could be made available either on the page that presents the information or in an on-line résumé. They should include biographical data; titles, positions and the institutions where the author has worked; and the author's reputation and experience in the field to which the information contents relate.

Information published in on-line versions of scientific journals usually passes through a process of evaluation by editors and experts. This material, together with information published by well-known and respected organisations, is generally revised by many people before being published, and it should show evidence of quality control.

Indications of a lack of credibility[7] include:

- anonymity: more common in electronic media than in printed media;
- lack of quality control;
- negative meta-information: negative reviews about the content; and…
- text with orthographic and grammatical errors, which demonstrates carelessness or ignorance.

These key quality requirements should be checked during the "information content analysis" stage of a web accessibility audit.

### Information support

"Information support" is an evaluation criterion closely linked to credibility. It refers to:

- references to the sources consulted:: for example, any numbers and statistics presented should state their source;
- corroborating information: provides evidence to support the information content. Corroboration is nothing more than 'testing information with information' - in other words, using a source, fact, or point of view to test another source; and a….
- bibliography: which should be included whenever a subject clearly needs it.

References to the sources and the bibliography consulted in the preparation of any printed or on-line text reinforces its credibility still further by permitting the reader to verify source(s) and accuracy. The web accessibility auditor should therefore check if the audited web portal contains indications of a lack of information support.

### Accuracy

Accuracy aims to ensure that the information presented on the web page is complete, accurate, timely and sufficiently comprehensive for its intended purpose. As with printed media, information obtained on the Internet must be compared with information obtained from other sources to confirm its veracity.

An information source that omits important opposing facts or opinions may denote an author's prejudices - albeit relevant to understanding the subject - thereby compromising the information's accuracy. Depending on a

c Meta-information is information about information. It is found as 'tables of contents' or abstracts that provide some idea of what a certain web page is about, or as recommendations, comments from third parties, and critical reviews that judge the page's contents.

4 KIRAKOWSKI, J. (1994). The use of questionnaire methods for usability assessment. [on-line], September 2000. http://www.ucc.ie/hfrg/questionnaires/sumi/sumiapp.html

5 SHNEIDERMAN, B. (1998). Designing the user interface: strategies for effective human-computer interaction. 3ed. Reading, Mass.: Addison-Wesley. 639p.

6 KIRAKOWSKI, J., CLARIDGE, N., WHITEHAND, R.. Human centered measures of success in web site design. Proceedings og the 4th Conference on Human Factors and the Web. [on-line], June 2000. ftp://ftp.ucc.ie/hfrg/wammi/hfes98Q.rtf

7 HARRIS, R. (1997). Evaluating Internet research sources. VirtualSalt. 17 Nov. 1997. [on-line], October 2001. http://www.virtualsalt.com/evalu8it.htm

web site's context of use, excessively critical points of view expressed about opponents may reveal a conflict of interests.

Lack of accuracy may also be detected in the author's tone or style; lack of, or outdated data; vague generalisations and exaggerated claims; inconsistencies within the text; and, as mentioned, obviously prejudiced points of view. The auditor should detect these accuracy indicators during the analysis of the web portal's information content.

### Timeliness

(Checking if the information is up-to-date)

It is desirable - although unusual on the Internet - to inform users when the information was last created and/or modified.

## Data analysis

The auditor will have gathered a great quantity of textual and numerical data from completing the previous stages. The textual data might be used to provide a narratival analysis of the problems described by evaluators, users and the auditor in order to identify specific problems. Spreadsheets and statistical software might be used to analyse quantitative data.

Data from each stage of the audit can be analysed separately and used to provide interim audit reports as the audit progresses. This staged approach helps web designers to improve their portals, thereby eliminating the most evident failures and accessibility problems rather than exposing users and usability experts to them.

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## Report preparation

The final stage of this method covers preparation of an audit report.

Data derived from the various stages described earlier in this paper are synthesised as recommendations in a report for modifying the audited portal. The detailed accessibility report identifies any problems uncovered on accessibility, usability and the quality of information content. It also summarises users' opinions.

The Accessibility Audit Report should contain:

- the name and version of the audited portal;
- the date, place and person responsible for the audit;
- an "Executive Summary";
- an "Introduction" describing the portal, its context of use, and the audit scope and objectives;
- the audit procedures that constitute the method, including information about participants, configuration of the equipment used during the evaluation, typical tasks, selected accessibility and usability evaluation methods, guidelines to evaluators and other documents used during the audit;
- audit findings listing the problems found grouped - according to their severity - under accessibility, usability and information quality criteria, coverage (degree of recurrence), typical tasks and portal pages in which they were detected. There should also be included the percentage of users and evaluators who managed to complete the typical tasks, average time spent to complete them, average opinion of evaluators and users, comments and suggestions for improving the audited portal.

This audit report should be written in clear (jargon-free) and objective language, highlighting the problems to be solved in their declining order of importance. The report should also describe the positive aspects observed by evaluators and users during the audit, and provide examples of good practice that should continue.

The report should aim to provide web designers with a tool showing what aspects need improvement, as well as those that were found to be adequate according to good practice standards for the accessibility, usability and quality of information held on web portals.

## Conclusion

Since no single evaluation method is able to identify every accessibility issue in a web interface, the audit method described in this paper proposes a collection of evaluation tools, from automatic validation tools to experimental user tests, combining the best of each technique. This method intends to help web designers, content providers and information technology auditors in carrying out effective web accessibility audits.

Other references

1. ROWAN, M. et al. (2000). Evaluating web resources for disability access. In: *Proceedings ASSETS 00*, Arlington, USA, November 2000, p. 80-84.
2. SLOAN, D. et al. (2000). Accessible accessibility. In: *Proceedings ASSETS 00*, Arlington, USA, November 2000, p. 96-101.

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