

Missing the Signs:

Addressing usability issues for web designers when considering
users with visual disabilities.

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Abstract

How people with visual disabilities use the Internet and how they source information is a topic that is not commonly circulated. This may not necessarily be due to lack of caring or consideration, but more so due to a simple lack of awareness of the issues. This research looks at the issues associated with people with visual disabilities accessing web pages and how the design of a web site can affect if and how a blind person can 'read' a webpage. As part of this research, an accessibility study of the top ten New Zealand web sites (based on New Zealand traffic) was conducted. This study used an online web site accessibility assessor known as 'Watchfire's Webxact'. This online tool uses two sets of standards to assess the webpage – Section 508 and W3C Web Content Accessibility Guidelines.

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Introduction

The sheer volume of information that can be accessed by way of the Internet is extraordinary. So much of our communication and information is based on the Internet as a medium. We can buy a car, we can meet a friend, we can find an article, we can communicate with friends overseas, we can find information that would be otherwise impossible to find. Unfortunately for many people with visual disabilities, a lot of this information is 'lost in translation'. People who have visual impairments are just one group of individuals who are often considerably disadvantaged when it comes to accessing information on the Internet.

Due to the poor design of many web sites, most people with visual disabilities find the majority of web sites, especially commercial web sites, completely inaccessible. Back in the earlier days of the World Wide Web, web pages were made up entirely of text – which was very accessible to people with visual disabilities either through the magnification of text or with the aid of screen readers (software that vocalises text on the screen). The ever-increasing popularity with the use of images and graphics, such as customised text as graphics, and animated and moving images to communicate, means that people with visual disabilities are significantly disadvantaged. Unless the web site developer has taken the time to add 'alternate text' to an image, the screen reader will not recognise it as screen readers can only read text. This does not mean that web designers should be discouraged from using images, far from it. The use of images, graphics and movies are all part of what makes the Internet such a great resource. This alternative text may name, and or provide a textual description of the image – which may not be visible on the web page, but is interpreted by the screen reader software. The lack of alternative text leads to incredible frustration for someone using a screen reader as the screen reader software will substitute generic labels such as 'image' or 'button'.

This research looks at the some of aspects of web design which affect people with visual disabilities, their ability to source information and successfully navigate web pages using adaptive technology such as screen readers. As part

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of this research, a study was undertaken in which the top ten New Zealand web sites for the month of May, 2005, based on New Zealand traffic (Nielson//NetRatings, 2005) were assessed for accessibility using an online web site accessibility tool known as ‘Webxact’ (formerly known as ‘Bobby’). This online assessor uses two sets of standards – World Wide Web Consortium’s Web Content Accessibility Guidelines (W3C WCAG), and Section 508 of the US Rehabilitation Act 1973 (revised in 1998, US Congress). All ten companies were contacted after testing their web sites and asked if they would like to review the results.

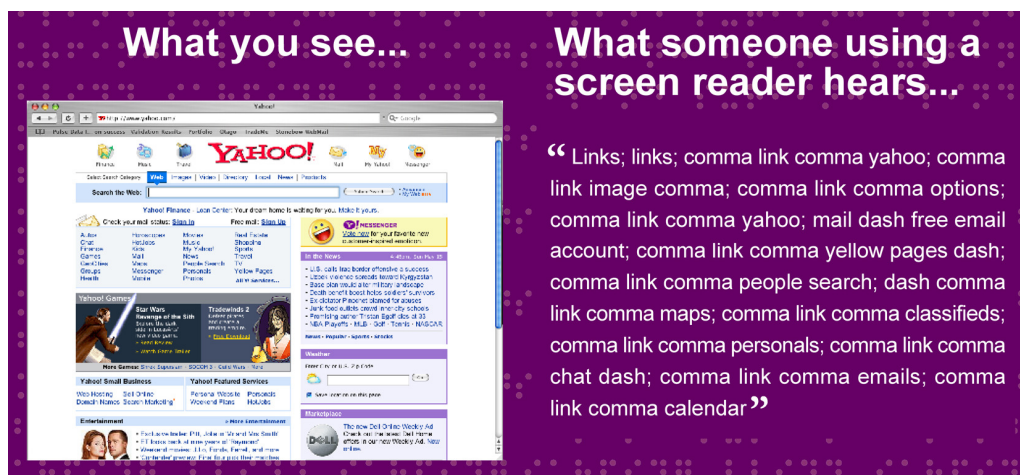


Figure 1. Image taken from corresponding research poster.

This is an excerpt from a research poster for this study, demonstrating the issues with screen readers not being able to read a page properly when the site has no alternative text.



Literature Review

For the purposes of this research and for a basis of recreating a study of usability for the visually impaired using New Zealand web sites, the two most significant studies are that of Jackson-Sanborn, Odess-Harnish, and Warren, '*Web site accessibility: a study of six genres*', 2002; and Optiz, Savenye, and Rowland '*Accessibility of State Department of Education Home Pages and Special Education Pages*', 2003.

The Jackson-Sanborn et al study, 2002, took 550 of the most popular web sites across six different genres of web sites and conducted all testing of usability using 'Bobby'. The concept of taking the most popular web sites (by number of hits, not by vote), is one that this study will recreate, but with New Zealand web sites. It will use the criteria of accessing, and the same pass/fail system ('passing' requires the web page to go through 'Bobby' without any priority one errors – priority one user checks do not count as they cannot be assessed for individual sites).

The Jackson-Sanborn study acquired the names of all the most popular sites from a web site called '100hot' (<http://www.100hot.com>) (Jackson-Sanborn et al, 2002). The twenty most popular New Zealand web sites, as assessed by New Zealand traffic, was obtained from Nielson//NetRatings Market Intelligence. In the Jackson-Sanborn et al study, just fewer than 34% of the web pages tested, passed. The individual genre results were: Government sites, 60%; College sites, 43%; Clothing sites, 40%; International sites, 29%; Job sites, 19%; Overall most popular, 15%. (See Figure 2.)

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Category	Passed without Priority 1 errors		Number failed		Number tested
	n	%	n	%	
Government sites	60	60.0	40	40.0	100
College sites	43	43.0	57	57.0	100
Clothing sites	20	40.0	29	60.0	49
International sites	29	29.0	71	71.0	100
Job sites	19	19.0	81	81.0	100
Overall most popular sites	15	15.0	85	85.0	100
Total	186	33.9	363	66.1	549

Table II Number of Web sites that passed without Priority 1 errors, with and without user check problems (subset of "number (percentage) passed without Priority 1 errors" from Table I)

Category	Number passed with user check problems		Number passed without user check problems	
	n	%	n	%
Government sites	59		1	
College sites	40		3	
Clothing sites	11		9	
International sites	18		11	
Job sites	12		7	
Overall most popular sites	13		2	
Total (percentage out of 549 sites)	153	27.9	33	6.0

Figure 2. Results from the Jackson-Sanborn et al, 2002 study.

In the Jackson-Sanborn study the most common error experienced was ‘Provide alternative text for all images’ – this means there are images on the page that the web developer has neither given a name nor alternative text for, so if a person using a screen reader were to access this page when the screen reader gets to the image it will just read out the word ‘image’ rather than a textual description of what a sighted person would experience.

The Optiz et al study, 2003, is also relevant and was chosen as a model because this too took a number of web sites, in this case the State Department of Education home page and their corresponding special education pages from each state within the United States. Optiz et al use the same method and criteria for pass/fail as the Jackson-Sanborn study as they used Bobby and defined a pass as a web site that was analysed came back with no priority one errors. The Optiz et al study was an interesting cross-section of similar web pages. Of the 50 Department of Education (DOE) home pages tested, 26% passed using the WAI Web Usability Standards, and only 16% passed using the Section 508 Standards. Of the 48 special education pages tested, 51% passed using the WAI

Web Usability Standards, whereas 42% passed using the Section 508 standards. Another finding of this study was that of the priority one errors caused (which resulted in the pages failing) by the DOE home pages, 95% of the errors were ‘omission of alternative text for graphics and graphic image maps’, and for the special education pages, it was 92% (Optiz et al, 2003). Both the Jackson-Sanborn study and the Optiz study had similar results – that the need for use of alternative text is not being recognised.

Erica B. Lilly has published many articles in this area, including ‘*Wired But Not Connected: Accessibility of Academic Library Home Pages.*’, Erica B. Lilly and Connie Van Fleet, 1999; ‘*Measuring the Accessibility of Public Library Home Pages*’, Erica B. Lilly and Connie Van Fleet, 2000; ‘*Creating Accessible Web sites: an introduction*’, Erica B. Lilly, 2001. In the article ‘*Measuring the Accessibility of Public Library Home Pages*’, Lilly and Van Fleet conduct a study in which one hundred United States Public Library home pages are run through ‘Bobby’ and assessed for usability. This study found only 14 out of 74 home pages (19%) were considered accessible. For the purposes of this study, a page was considered accessible if no Priority one errors were detected; Priority one user checks were not counted (Lilly and Van Fleet, 2000).

Another important study is that of Suzanne L. Byerley, and Mary Beth Chambers, ‘*Accessibility and usability of Web-based library databases for non-visual users*’, 2002. In this study, two databases were manually assessed with the aid of two legally blind participants, using the screen readers WindowEyes 4.1 and JAWS for Windows 3.7. This study outlined the difficulties that the two participants experienced and highlighted the problem areas of the databases with respect to accessibility for persons with visual disabilities (Byerley et al, 2002). This was an interesting study as, unlike many studies, it used blind participants, rather than running web pages through a program like ‘Bobby’. This gives a more detailed, qualitative result, which is more suited to assessing just a small number of web sites due to the intrusive nature of user participants in such a study.

Another study that used this approach (using participants who are blind) was '*Access to information on the World Wide Web for blind and visually impaired people*', Charles Oppenheim, and Karen Selby, 1999. In this study, four participants assessed the databases 'Alta Vista', 'Yahoo!', and 'Infoseek'. The four participants had varying severity of visual impairments, three of whom were registered blind, all of whom were mature male students. Although there are no pass/fail results to report, the findings of the study are, none the less, very interesting. For example, whilst subject three was using a page on the 'Yahoo!' search engine; he received the following verbal output from the screen reader, which serves as a good example of inaccessible web design:

Links; links; comma link comma yahoo; comma link image comma;
comma link comma options; comma link comma yahoo; mail dash free
email account; comma link comma yellow pages dash; comma link
comma people search; dash comma link comma maps; comma link
comma classifieds; comma link comma personals; comma link comma
chat dash; comma link comma emails; comma link comma calendar.

(Oppenheim et al, 1999).

Tim Spindler conducted a study '*The Accessibility of Web Pages for Mid-Sized College and University Libraries*', 2002, in which he attempted to assess all the home pages of college and university libraries in the United States with a student population between five and ten thousand. Only 188 out of the possible 190 in this category could be assessed. The study concluded that only 79 (42%) of the home pages were able to be approved by 'Bobby' (Spindler, 2002).

Robert Axtell and Judith M. Dixon conducted an interesting study on the online public access catalogue - Voyager2000, by Endeavor. The article was of importance as the purpose of the study was to manually test the catalogue against the standards set out in Section 508 of the Rehabilitation Act of 1973, as revised in 1998. This study is one of few that opt to assess a web page or online catalogue manually, rather than using any automated tools (Axtell et al, 2002).

In general, we had a positive impression of WebVoyage and think that, with some effort, it can be successfully navigated by experienced users of assistive technology. Nevertheless, both Endeavor and its customers can take specific actions to improve the accessibility of WebVoyage.

(Axtell et al, 2002)

Suzanne L. Byerley and Mary Beth Chambers conducted an email survey to get the vendors (of online databases) perspective, resulting in the article '*Accessibility of Web-based library databases: the vendor's perspective*' Byerley et al, 2003. The purpose of this email survey was to find out where the producers of online databases stood when it came to the issue of accessibility for persons with disabilities. Of the fourteen companies contacted, eleven responded. The companies were asked a series of questions relating to how they rate the current version of their product for accessibility, how important accessibility is to the company, and what are their plans/goals for improving accessibility in the future, and what current modes of testing for accessibility the company has in place.

We know that accessibility does not necessarily equate to usability. Yet, based on our study, companies tend not to conduct usability studies with people who have disabilities... We learned that sales representatives typically are not trained to handle accessibility questions. We believe companies must train their sales representatives to be knowledgeable of accessibility matters if they are to adequately address the accessibility concerns of their customers.

(Byerley et al, 2003)

There are many guides and articles that go through the basics of how to design a web page that meets the requirements of such documents as the W3C WAI Web Usability Standards, and Section 508 of the Rehabilitation Act, 1973. Erica B. Lilly wrote a useful article '*Creating accessible Web sites: an introduction*' where she states that 'it has been estimated that 95 percent of commercial Web sites are inaccessible to persons with visual or hearing disabilities' (Gignac, 2000). Lilly goes on to explain how and why good web

design – inclusive design is important, and how to accomplish this. Lilly is very educated and experienced on the topic, and gives a good outline of the rules and standards (Lilly, 2001).

An article with a difference is that of Valerie Lewis – a blind librarian. Lewis gives firsthand examples of the difficulties she, and other blind patrons of the library face due to inaccessible design. In her article '*[Image] [Image] [Image] [Link] [Link] [Link]: inaccessible Web design from the perspective of a blind librarian*', 2002, Lewis cites eight different experiences she and other library patrons, staff and students have had with online databases, web sites and other online resources.

The last article found to be of importance is '*Web accessibility and the law: recommendations for implementation*' Holly Yu, 2002. This article addresses the legal side of accessible web design. It outlines Legal requirements, including Section 508 of the Rehabilitation Act of 1973, as well as discussing legal settlements on the matter. Yu also cites the implementation of these standards, primarily in the case of California Community Colleges, and reports results from a 'Bobby' assessment (Yu, 2002).



Usability

Usability of a web site is an important issue for designers. Unfortunately, it is not always a priority when one is extending the term 'usable' to include all persons, not just the fully able-bodied. The issue of web site usability for the visually disabled and screen readers, is most often over-looked.

Usability Standards

The United States has been the world leader in Web Usability Standards. With the implementation of the Web Content Accessibility Guidelines issued by the World Wide Web Consortium (W3C), and Section 508 standards, building accessible web sites is now mandatory for all United States government web sites (<http://www.section508.gov>). These two documents now form most web sites accessibility standards. 'Bobby', an online web site which evaluates accessibility, uses these two sets of standards.

The types of web sites that have been tested in different web site evaluation studies varies greatly. While many focused on a broader range of web sites, one in particular that took the most visited web sites over six different genres (clothing, international, jobs, colleges, government, and overall most popular) Jackson-Sanborn, Odess-Harnish, Warren, '*Web site accessibility: a study of six genres*', 2002. The majority focused on library homepages, special education pages, and academic databases. These were the following studies: (Byerley, Chambers, 2002); (Oppenheim, Selby, 1999); (Lilly, Van Fleet, 2000); (Axtell, Dixon, 2002); (Optiz, Savenye, and Rowland, 2003); and (Spindler, 2002).

Section 508 Standards

Section 508 is part of the United States Rehabilitation Act of 1973, which was revisited in 1998 as a result of the World Wide Web.

In 1998, Congress amended the Rehabilitation Act to require Federal agencies to make their electronic and information technology accessible to people with disabilities. Inaccessible technology interferes with an individual's ability to obtain and use information quickly and easily. Section 508 was enacted to eliminate barriers in information technology,

to make available new opportunities for people with disabilities, and to encourage development of technologies that will help achieve these goals. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology.

(<http://www.section508.gov/index.cfm?FuseAction=Content&ID=3>, 2005)

It requires that, among other things,

...individuals with disabilities, who are members of the public seeking information or services from a [US] Federal agency, have access to and use of information and data that is comparable to that provided to the public who are not individuals with disabilities, unless an undue burden would be imposed on the agency.

(<http://www.section508.gov>, 2005).

It should be noted that these standards are compulsory only for federally funded web sites in the United States. While it is good practise and also good for business for all web sites to abide by these standards, non-federally funded web sites, for example, commercial web sites are not legally obligated to abide by these standards.

W3C Web Content Accessibility Guidelines

W3C has a division called the Web Accessibility Initiative (WAI). This division has produced many resources, including the W3C Web Content Accessibility Guidelines. 'WAI, in coordination with organizations around the world, pursues accessibility of the Web through five primary areas of work: technology, guidelines, tools, education and outreach, and research and development' (<http://www.w3.org/WAI/>). The Web Content Accessibility Guidelines, unlike the above: Section 508, is not part of the law in the United States, but is a set of recommendations often referenced by studies in this area.

These guidelines explain how to make web content more accessible to people with disabilities...The primary goal of these guidelines is to promote accessibility. However, following them will also make web content more available to all users...Following these guidelines will also help people find information on the web more quickly. These guidelines do not discourage content developers from using images, video, etc., but

rather explain how to make multimedia content more accessible to a wide audience...

(<http://www.w3.org/TR/WCAG10>, 2005)

New Zealand Government Web Guidelines

The New Zealand Government has a document outlining the guidelines in which all New Zealand public sector web sites should adhere to. This document includes a wide range of guidelines relating to the design, implementation, and maintenance of these web sites. Section 6, of this 9-part document, 'Delivering Content', addresses the issue of web usability and accessibility:

This section covers both the standards-based approach to delivering government web site content in an accessible way and how to apply those standards in practise to deliver equitably.

(New Zealand Government Web Guidelines, pg.30)

This section outlines standards to which all public sector web sites should adhere to, including the role of W3C: 'Use of W3C recommendations provides government organisations with a stable, common point of reference.' (New Zealand Government Web Guidelines, pg.31) It is also stated in this document that 'Content on New Zealand government web sites *must* be developed and presented in accordance with the WAI guidelines.'(New Zealand Government Web Guidelines, pg.31) All of the checkpoints in the WAI guidelines have a priority level: 1, 2, or 3 (1 being the most critical, and 3 being the least).

Content developers

- *must* satisfy priority 1 checkpoints
- *should* satisfy priority 2 checkpoints
- *may* satisfy priority 3 checkpoints

of the WAI Web Content Accessibility Guidelines 1.0.'

(New Zealand Government Web Guidelines, pg.31)

The New Zealand Government Web Guidelines also recommends that web developers use 'Bobby' to test their web sites.

Testing for Usability

There are a number of ways designers can test for usability based on the WAI Web Usability Standards and the Section 508 standards, rather than going through the documents by hand and determining if the web developer has covered everything. Studies conducted on the matter of usability for the visually impaired have varied greatly in their methodology. Some studies have run chosen web sites through 'Bobby' (Jackson-Sanborn, Odess-Harnish, Warren, 2002); (Lilly, Van Fleet, 2000); (Optiz, Savenye, and Rowland, 2003). Some studies use participants who are blind themselves (Byerley, Chambers, 2002); (Oppenheim, Selby, 1999). Other studies manually check the web sites using standards such as Section 508 (Axtell, Dixon, 2002).

Adaptive Technology

Persons with minor visual disabilities will often use a screen magnifier when using a computer to enlarge the area of the screen that they wish to look at. In the case of more severe visual disabilities, persons may use screen reader software. A screen reader vocalises information on the screen using a synthesised voice. There are a number of different brands of screen reader software available such as JAWS for Windows, Window-Eyes, and Outspoken. A study conducted in the United States (Byerley et al, 2002) tested the usability of the databases 'First Search' and 'InfoTrac Expanded Academic' (Academic Databases available upon subscription) using the screen readers Window Eyes and JAWS. The study was conducted with two subjects – both legally blind. This study was useful as it outlined firsthand, some of the frustrations and difficulties of relying on screen readers when accessing web sites, (Byerley et al, 2002).

JAWS for Windows

JAWS (Job Access with Speech) for Windows is probably the most commonly used screen reader. It can be used in conjunction with all Microsoft software, including Internet Explorer. JAWS, like other screen readers, reads everything on the screen and repeats it back to the user using a synthesised voice. The

most common problem that people come across when using programs like JAWS when using the Internet, is poorly designed web sites that don't have alternative text for images and graphics – resulting in the screen reader outputting 'image' rather than a meaningful description of the image that a sighted person would experience. Many web sites don't take their visually disabled users into account. The majority of problems encountered could be easily fixed, if designers were aware of screen reader accessibility (Optiz et al, 2003).



Methodology

Sampling

The homepages tested were the top ten New Zealand web sites for the month of May 2005, based on hits from New Zealand traffic – see Figure 3. (Nielsen//Net Ratings, 2005).

Evaluation Software

The web sites were all tested using the online version of Watchfire's 'Webxact'. This online software scans a web page using specific guidelines as chosen by the user. In this study, the homepages were testing for both Section 508 Guidelines, and W3C Web Content Accessibility Guidelines (W3C WCAG).

Nielsen//NetRatings NEW ZEALAND		
TOP SITES NZ Users, May 2005		
1	xtramsn.co.nz	1,974,325
2	trademe.co.nz	1,942,280
3	xtra.co.nz	703,915
4	nzherald.co.nz	511,720
5	whitepages.co.nz	429,545
6	stuff.co.nz	412,216
7	airnewzealand.co.nz	401,576
8	westpac.co.nz	391,665
9	yellowpages.co.nz	374,636
10	asbbank.co.nz	356,497

Source Nielsen//NetRatings Market Intelligence
May 2005
Domestic Traffic
Unique Browsers

Figure 3. The top ten New Zealand web sites and number of unique hits.

In previous studies, and therefore in the Literature Review of this research, the evaluation software used has been referred to as 'Bobby' by CAST. During the period of this research project the application named Bobby has been re-named and re-branded, it is now known as 'Webxact' by Watchfire.

Guidelines Used

Two tests were run on each of the ten homepages – first test using the Section 508 Guidelines, and the second using W3C Web Content Accessibility Guidelines. For each test, the results list the number of errors received, and the number of instances of said errors. The W3C Web Content Accessibility Guidelines errors are divided by Priority – 1, 2, 3, Priority 1 being the most critical, Priority 3 being the least critical.

Evaluation Criteria

As in many other studies, the criteria for a pass/fail is all pages with any Priority 1 errors fail. With the Web Content Accessibility Guidelines, the errors

are all divided into 3 levels of importance – Priority 1, 2, and 3. Priority 1 being the most severe – for example ‘no alternative text for an image’, Priority 3 being the least – for example ‘Identify the language of the text’ such as English or French. If a site has only Priority 2 or 3 errors, it passes. Of the Priority 1, 2, and 3 errors, there are what are known as ‘manual’ or ‘user check’ errors which require the web designer to go through the site and check for these manually, as they cannot be assessed through the evaluation software. These checks do not count in the analysis of the homepages – if a site receives a Priority 1 user check, it does not necessarily fail. There are around seventeen different Priority 1 errors, thirty Priority 2, and twenty Priority 3.

Contacting Companies

All webmasters for the ten web sites tested were contacted via email asking if they were interested in how their web sites tested. The companies were asked to respond within two weeks for inclusion in this study. They were also sent reminder emails closer to the deadline. In some cases, when the webmaster email was not displayed on the web site, the customer service centre was emailed, and in most cases, forwarded onto the webmaster.



Results

Of the ten web sites tested, all received errors from Priority 1 of the W3C Web Content Accessibility Guidelines, and Section 508 Guidelines, and therefore did not pass. Although none of the web sites passed, the errors received should be relatively easy to rectify. The majority of the errors were lack of alternative text for images, image maps and other graphics.

Web site	Section 508			W3C Web Content Accessibility Guidelines								
	P/F	Err.	Inst.	P1	Err.	Inst.	P2	Err.	Inst.	P3	Err.	Inst.
XtraMSN	F	3	20	F	2	17	F	5	54	F	3	66
TradeMe	F	3	105	F	2	100	F	6	102	F	4	88
Xtra	F	3	20	F	2	17	F	5	54	F	3	66
NZ Herald	F	3	10	F	2	9	F	4	43	F	3	103
WhitePages	F	2	6	F	1	3	F	4	37	F	4	15
Stuff NZ	F	3	171	F	2	170	F	5	183	F	3	106
Air NZ	F	3	117	F	2	108	F	4	72	F	3	35
Westpac	F	1	51	F	1	51	F	4	94	F	3	46
YellowPages	F	3	51	F	2	47	F	5	58	F	4	87
ASB	F	5	119	F	3	117	F	6	232	F	4	165

Table 1. Results from the testing of the Top Ten New Zealand Web sites using Section 508 and W3C Web Accessibility Guidelines.

P/F	Pass/Fail
Err.	Number of Errors
Inst.	Number of Instances
P1	Priority 1 Type Error
P2	Priority 2 Type Error
P3	Priority 3 Type Error

There were only five different errors that were received over all ten web sites. This includes errors from both the W3C Web Content Accessibility Guidelines and Section 508 Guidelines. They were ‘Provide alternative text for all images’, ‘Provide alternative text for all image-type buttons in forms’, ‘Provide alternative text for all image map hot-spots (AREAs)’, ‘Explicitly associate form controls and their labels with the LABEL element’ – this is to do with the HTML code of the web site - and one web site received ‘Make sure there is a link to download accessible plug-ins’ for example Adobe Acrobat Reader.

<u>Priority 1 Error Type</u>	<u>Web sites with that error</u>
Provide alternative text for all images (Section 508, WCAG)	10
Provide alternative text for all image map hot spots (Section 508, WCAG)	1
Provide alternative text for all image-type buttons in forms (Section 508, WCAG)	8
Explicitly associate form controls and their labels with the LABEL element (Section 508)	9
Make sure there is a link to download accessible plug-ins (Section 508)	1

Table 2. The five different errors received by the web sites tested.

Although the ‘pass’ criteria for this research is obtained when a web site passes Section 508 and Priority 1 of the Web Content Accessibility Guidelines, the above graph (Figure 4.) shows the results of each web site from all errors of Section 508, WCAG Priority 1, 2, and 3.

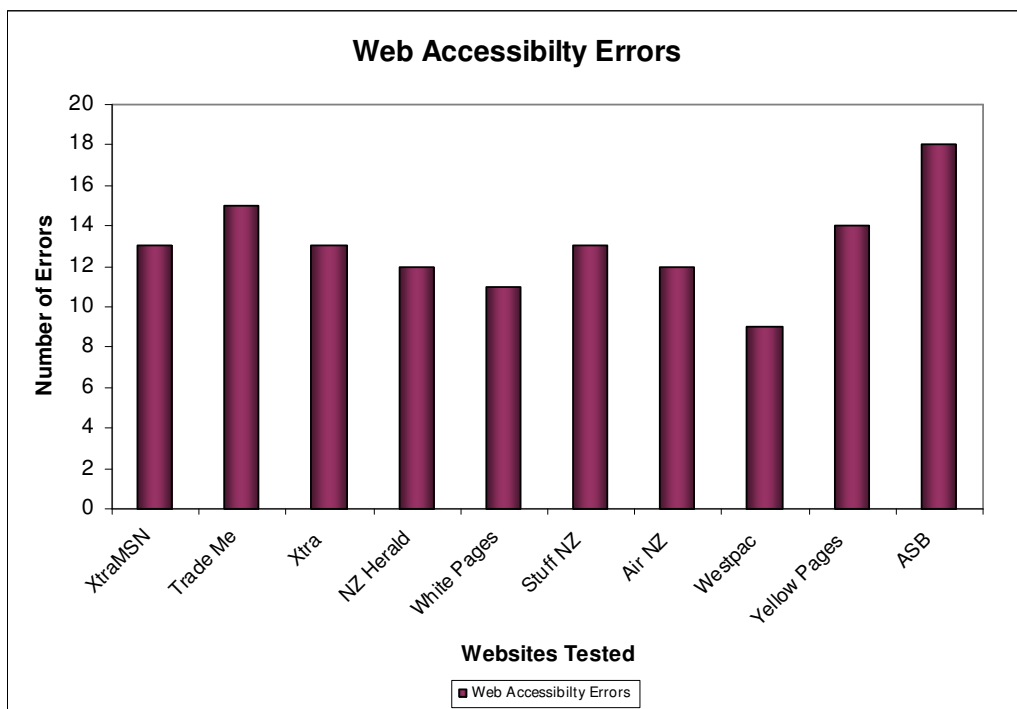


Figure 4. Errors received from the testing of Top Ten New Zealand Web sites using Section 508 and W3C Web Content Accessibility Guidelines – Priority 1,2, and 3.

Webmasters for all ten web sites were contacted (see appendix for email) and told about this research. They were also asked if they were interested in the test results for their web site. Initial customer service emails were received from seven out of the ten (for example “thank you for your email, we have passed it onto the appropriate person and they will get back to you ASAP”). Only three out of the ten companies responded in full – responses from appropriate people, with regards to addressing the issues brought up. The three companies that responded – Air New Zealand, ASB, and WhitePages were very eager to work towards fixing the problems, and making sure their web sites were as accessible to visually disabled people as possible.

• • •

Analysis + Discussion

At first glance, the results are very disappointing – all ten web sites tested for two sets of guidelines failed. All of the web sites had a combination of the same 5 errors, which seem to be easily fixed.

For a web site like TradeMe, an online auction web site there is the issue of members or users of the web site uploading images to be displayed on the web site (rather than the webmaster uploading the images). It could be argued that due to this issue, it could be understandable that TradeMe does not abide by the ‘use alternative text for all images’ rule, as it is not TradeMe themselves who put most of the images up on the web site. However, all of these images are for auctions in which the member or user is wishing to sell an item, and for each auction, a title is required to describe what it is in fact they are trying to sell. So it is entirely possible to write it into the code of the site that any images uploaded by a member automatically assumes the title of the auction as the alternative text, for example ‘Red Bike for sale’. In the case of more than one image for any particular auction, a simple number before or after the text, for example ‘Red Bike for Sale1’, ‘Red Bike for Sale2’. In most other cases, there is really no other reason why an image can be without alternative text.

Only three out of ten companies replied to the email to receive valuable information and feedback that could cost the company thousands of dollars – if they were to get a web accessibility analysis from a private company. Four out of ten companies said they would respond in the future, but they did not, and three out of the ten did not reply at all.

The three companies that responded were very helpful and co-operative with this research and improving their online service to people with visual disabilities. The three companies that responded were ASB, WhitePages, and Air New Zealand.

Air New Zealand, which ranked 7th in the top ten, responded to the email and was very interested in how their web site tested. They were also very interested

in how they can better improve their web site for people with visual disabilities.

“We have been engaged in a project over the last couple of months, which among other changes includes altering much of our online content to be more compliant with accessibility guidelines.”

- Mathew Sanders
E-commerce Development Specialist
Air New Zealand

WhitePages were also very interested in how their web site tested. They were ranked 5th by New Zealand Internet traffic. WhitePages were very aware of accessibility issues and were eager to improve on the accessibility of the web site.

“I will also ensure that our design agency is aware of the rationale so they can ensure they address these issues when they are in production.”

“...we will try to make the site as user friendly as possible to all types of users.”

- Terri Williams
Product Innovation Manager
WhitePages

ASB were ranked 10th in the top ten of New Zealand traffic, and responded to the email. They also said they would discuss it further at their monthly technical meeting.

“ASB takes accessibility and usability very seriously ... work that our online technical team have done recently is directly related to improving our site with [web site accessibility] in mind.”

- Tui Fleming
Product Manager
Online Marketing
ASB Bank Limited

Difficulties of assessing non-respondents

The initial email was sent to all companies with a deadline three weeks later, a reminder email was sent a week out from the deadline. For those that sent an initial email, they also were sent an extra reminder if they only replied to the second email.

One can only speculate as to why they did not respond, but it does seem odd that they would pass up the opportunity to get (free) advice on how they can improve their web site – even if it purely a matter of curiosity as to how their company's web site tested. Perhaps it is simply a matter of time – no time to respond to an email that does not have any immediate effect (positive or negative) on the company.

Or perhaps it was simply a matter of not deeming it as important. It is also a possibility that the company was of the opinion that no good advice is free advice. In other words academic research has no place in real business practice. Had they received an email from a reputable business stating that for 'X' amount of money, this company/agency could assess their web site for web accessibility issues and issue a full report, then perhaps the owner of the web site would take more notice.

Another issue is the fact that replying to the email may give the implication that they have the time/resources to rectify whatever might need fixing on the web site. Their thinking may have been, 'if I don't reply, then I am under no obligation to fix it'. If the company was in the midst of design/redesigning their web site, or perhaps if the company regularly re-designs for example WhitePages, or YellowPages, then perhaps they might have been more likely to reply, as they are in that process anyway.

The most cynical reason that they might not have replied was simply that they did not care. They did not care whether or not their web site was accessible to people with visual disabilities or not. They did not care that they did not pass these standards, and they had no desire to waste time and money to bring the web site up to code. As is the case sometimes in the business world, if there is no direct impact on the business itself, then why change the status quo.

As previously stated, this is all simple speculation and there is no way of determining why any of those seven companies did not actually reply to the email.

Discussion of Findings

It will be interesting to see if these results have any impact on the web sites of these three companies. A follow up analysis of these web sites in a period of, perhaps, six months, will see if they have improved at all in their testing. All three companies were very keen to keep in touch and if there were any more developments, to let them know. As for the other companies, it will also be interesting to re-test these other web sites in time and compare them with the web sites of those that responded – will there be a difference? Will this research have assisted popular company web sites to address usability issues for the visually impaired? Two examples of good, accessible web design are that of Provoke Solutions, based in Wellington – www.provoke.co.nz, and Dunedin Restaurant, Bell Pepper Blues – www.bellpepperblues.co.nz. Both of these web sites are not only well designed with a clean, attractive aesthetic, they are also accessible – passing Priority 1 of the W3C WCAG, and Section 508 Standards.

One of the main problems that this research has found is simply that web designers/developers are unaware of the issues relating to people with visual disabilities accessing their web sites. To try and combat this, and to complement this research, a web site has been built as a resource for both those studying, and in the business of designing web sites. This site has links to many important, useful sites, and great resources on the topic of web design for those with visual disabilities. The site has information about the two sets of industry standards – Section 508 and W3C Web Content Accessibility Guidelines, and about the New Zealand Web Guidelines. The site has a clean, clear design, and adheres to both Section 508 and Priority 1 of the W3C WCAG – and in some cases Priority 2 and 3 as well. The purpose of this site is not only to provide valuable information and resources, but also to show that good design does not have to come at the price of accessibility.

Even if this research has just increased awareness of web accessibility issues for people with visual disabilities, it will have succeeded. The fact that all of the ten web sites failed both tests – with the W3C WCAG, and Section 508, does not automatically indicate a lack of consideration or caring for those with disabilities, but more so a lack of knowledge and awareness of the issues. This is one of the main objectives set out by this research – to assess and increase awareness of the issues of web design for people with visual disabilities.

As a summary of findings, the following Quick Tips (from W3C web site) and web site <http://studentpages.design.otago.ac.nz/~leime239/usability/home.html> has been developed and published as a poster and website. This web site and quick tips will be emailed to all design schools in New Zealand that teach web design to try and improve awareness among future web designers.

W3C's Quick Tips to Make Accessible Web Sites

1. **Images & animations:** Use the **alt** attribute to describe the function of each visual.
2. **Image maps.** Use the client-side **map** and text for hotspots.
3. **Multimedia.** Provide captioning and transcripts of audio, and descriptions of video.
4. **Hypertext links.** Use text that makes sense when read out of context. For example, avoid "click here."
5. **Page organization.** Use headings, lists, and consistent structure. Use **CSS** for layout and style where possible.
6. **Graphs & charts.** Summarize or use the **longdesc** attribute.
7. **Scripts, applets, & plug-ins.** Provide alternative content in case active features are inaccessible or unsupported.
8. **Frames.** Use the **noframes** element and meaningful titles.
9. **Tables.** Make line-by-line reading sensible. Summarize.
10. **Check your work.** Validate. Use tools, checklist, and guidelines at <http://www.w3.org/TR/WCAG>

From the W3C WAI web site (<http://www.w3.org/WAI/>)



Conclusion

The impact web design has on people with visual disabilities is not necessarily the first thing that a web designer considers when setting out to design / re-design a web site. It should, however, be a definite consideration in the early process and throughout the design process – making the web site as accessible to as many as possible. Both the studies of Jackson-Sanborn, Odess-Harnish, and Warren, 2002; and Optiz, Savenye, and Rowland, 2003, were key to this study as they set the scene for this research, and they were the grounds for the criteria of pass/fail in this study. The results of this study were a little disappointing – none of the ten web sites tested, passed. The main issues raised by the tests were lack of alternative text for images, graphics and images maps on web pages – so when a screen reader reaches an image without alternative text, instead of the computer reading out a informative description of the image, the user hears ‘image’ – which is not particularly helpful. Of the 10 web sites tested, all 10 had errors from both Section 508 and from W3C Web Content Accessibility Guidelines Priority 1, 2, and 3 – Priority 1 being the most severe, Priority 3 being the least. There was, however, a great and positive response from 3 out of the 10 companies. These 3 companies showed a strong commitment to making their web sites as accessible as possible, and were making plans to rectify the issues brought up by these tests. One can only speculate as to why only 3 out of the 10 companies tested responded, but from the 3 that did, it provided a very positive outcome. One of the main outcomes of this study is to increase awareness of the issues associated with web design for people with visual disabilities. The results and proposed solutions have consequently been designed and published on the web as a resource for web designers, with tips and suggestions, to help the design of more accessible sites for people with visual disabilities.



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Quick Reference Guidelines

National Federation for the Blind

Provide screen access software with the ASCII text it needs to produce speech or Braille.

Make it possible for blind web surfers who explore your web page by tabbing from link to link to determine the meaning and purpose of all hypertext links on the page.

Enable screen access software to provide information to the blind web surfer about purely graphical objects on the page

Ensure that the use of tables and multi-column text on your web site does not preclude the ability of screen access software to render your pages in an intelligible and useful manner

Make it possible for the blind web surfer to fill out web-based forms in an efficient manner.

Provide an alternative way to access your site which does not compel the blind web surfer to use a java applet or plug-in that is inaccessible to screen access software

Provide a means for blind web surfers to avoid redundant links on a web page

Provide a means for blind web surfers to avoid splash screens or other displays that are updated on a timed basis

From the National Federation for the Blind web site (www.nfb.com)

Email sent to Companies tested

Dear Webmaster,

I am a Postgraduate Design student at the University of Otago, and I am writing a research paper on web design for people with visual disabilities. As part of the research for this, I have conducted a test using the top 10 New Zealand web sites' homepages, based on New Zealand traffic (Neilson//NetRatings, May 2005).

The next stage in the research project is to develop some design guidelines to help with web site usability for the visually disabled, whilst not compromising the design and effectiveness of a web site.

Your web site <web site name> was placed <rank> and therefore included in this study. The homepage <web site URL> was tested using both W3C Web Content Accessibility Guidelines <http://www.w3.org/TR/WCAG10/> and Section 508 Guidelines <http://www.section508.gov/> using the online web site accessibility evaluator Watchfire's Webxact <http://webxact.watchfire.com/>.

I would appreciate hearing about your company's views and policies on usability issues for people with disabilities such as visual impairment. Also, if you would like to know how the homepage <web site URL> tested and some suggestions to make the web page more inclusive please contact me.

Any information, insight, or opinions you can give us would be greatly appreciated and help in this research. In order to facilitate using your response within my study I would appreciate your reply by the 31st of July.

If you have any further questions please do not hesitate to contact me. Thank you for your time.

Kind Regards,
Megan Leith

Error Information sent to Companies

Provide alternative text for all images

All images should contain a short alternative text description that represents the function of the graphic. This includes images used as image maps, spacers, bullets in lists, graphical buttons, links, and images used to present math equations. When creating alternative text, use a functional label based on the context in which the image is used, rather than a visual description.

A good test to determine if alternative text is useful is to imagine reading the document aloud over the telephone. What would you say, upon encountering this image, to make the page comprehensible to the listener?

Most authoring tools provide a space for you to enter this information, or you can add alternative text with the "alt" attribute of the IMG element. For example:

```
<IMG SRC="sailboats.gif" ALT="Our newest model sailboats">
```

If descriptive text is already provided above or below the image, an empty description, called "null alt text" (alt=""), may be used in the IMG tag. Providing null alt text, instead of not alt attribute, signals that the image needs no alt text. In other situations where alternative text is unnecessary or distracting, such as images used as spacers, bullets in lists, and links that also contain text, alt="" should still be included so that non-graphical browsers know that they can ignore the image. It is important, however, not to use this technique if the image is in a link or is important to understanding the page.

Rationale

Computers cannot interpret images and present them in a meaningful alternate format; alternative text gives the computer something to present to the user. This is important for users who have turned off image-loading in their web browsers, those using text-based browsers like Lynx, and people who are visually impaired and require the use of a screen reader to read the contents of the screen.

Provide alternative text for all image-type buttons in forms

All HTML image buttons in forms, such as <INPUT TYPE="image" ...>, should contain a short alternative text description that represents the function of the graphic. Null alt text (alt="") or blank alt text (alt=" ") is not a sufficient description for buttons.

When creating alternative text, use a functional label based on the context in which the button is used, rather than a visual description. A good test to determine if alternative text is useful is to imagine reading the document aloud over the telephone. What would you say, upon encountering this image, to make the page comprehensible to the listener?

For example:

```
<FORM ACTION="http://www.foo.com" METHOD="get">  
  <INPUT TYPE="image" SRC="bobbylogo.gif" ALT="The Bobby logo"  
  WIDTH=200 HEIGHT=200>  
  ...  
</FORM>
```

Rationale

Computers cannot interpret images and present them in a meaningful alternate format; alternative text gives the computer something to present to the user. Image buttons require that the user know the purpose of the button to decide whether to activate it. This is important for users who have turned off image-loading in their web browsers, those using text-based browsers like Lynx, and people who are visually impaired and require the use of a screen reader to read the contents of the screen for them.

Provide alternative text for all image map hot-spots (AREAs)

Current major browsers support client-side image maps. Image maps are images in which regions of the image contain "hot-spots" where a person can click to follow a link. Client-side image maps should always be used in place of or in addition to the older server-side image maps, except for a few specific cases in which the region shapes cannot be duplicated (like geographic maps). All AREA tags, which define clickable regions, should have an alt attribute. For example:

```
<MAP NAME="csmap">  
  <AREA SHAPE="RECT" COORDS="5,5,100,40" HREF="jim.html"  
  ALT="Jim's Home Page">  
  <AREA          SHAPE="RECT"          COORDS="150,1,195,140"  
  HREF="alice.html"  
  ALT="Alice's Home Page">  
</MAP>  
<A HREF="/cgi-bin/serverside.map">  
  <IMG SRC="homepages.GIF" ALT="Map to select homepages" ISMAP  
  USEMAP="#csmap" HEIGHT=200 WIDTH=200>  
</A>
```

Rationale

This is important for users who have turned off image-loading in their web browsers, those using text-based browsers like Lynx, and people who have visual or cognitive disabilities and require the use of a screen reader to read the contents of the screen.

Explicitly associate form controls and their labels with the LABEL element

For each FORM control, place its label in a LABEL element. A LABEL is attached to a specific form control through the use of the "for" attribute. The value of the "for" attribute must be the same as the value of the "id" attribute of the form control.

For example:

```
<FORM action="http://somesite.com/foo" method="get">
  <LABEL for="name">Name:</LABEL>
  <INPUT type="text" id="name" SIZE="50"> <BR>
  <FIELDSET>
    <LEGEND>Sex</LEGEND>
    <INPUT TYPE="radio" name="sex" id="male">
    <LABEL FOR="male">Male</LABEL>
    <INPUT TYPE="radio" name="sex" id="female">
    <LABEL FOR="female">Female</LABEL>
  </FIELDSET> <BR>
  <LABEL FOR="tcar">Type of car:</LABEL>
  <SELECT NAME="car" id="tcar">
    <OPTION>Honda Civic</OPTION>
    <OPTION>Ford Taurus</OPTION>
    <OPTION>Saturn</OPTION>
  </SELECT> <BR>
  <LABEL FOR="pwd">Password</LABEL>
  <INPUT TYPE="password" SIZE=10 ID="pwd"> <BR>
  <LABEL FOR="com">Comments:</LABEL>
  <TEXTAREA ROWS=10 COLS=30 ID="com"></TEXTAREA> <BR>
  <INPUT TYPE="submit"> <INPUT TYPE="reset">
</FORM>
```

"Reset", "Submit" and image buttons do not need labels associated with them since they have labels implicitly associated; the "value" attribute or the "alt" text for image buttons.

Rationale

An HTML LABEL specifically associates the label's text with the form control. This allows the browser to tell the user definitively which label applies to the given control. Usually, clicking on the label positions the cursor in the form field, or toggles the value of radio buttons or check boxes. This is intuitive for many users and provides a larger target for the mouse.

Make sure there is a link to download accessible plug-ins

There are several ways to link to accessible plug-ins, such as Acrobat Reader for .pdf files or Macromedia Flash. The most compatible method is to use a simple hyperlink located near the plug-in object that points to a page with download information.

Rationale

Plug-in content, by definition, requires a browser plug-in for it to be viewed. If the user has not encountered a particular content type before, they may not have the appropriate plug-in, or know where to get it. Provide a link to download an accessible plug-in. It is important to link to an accessible plug-in. An inaccessible plug-in, while it may render content to average users, may not render content to users with disabilities. Also, it is necessary to actively use the accessibility features of the plug-in to result in accessible content.