

IDIA International Development Informatics Association

Proceedings of the 3rd International IDIA Development Informatics Conference
28-30 October 2009

Berg-en-Dal
Kruger National Park
South Africa
ISBN 978-0-620-45037-9

ACCESSIBILITY OF A HEI PORTAL FOR USERS WITH DISABILITIES

Van Greunen, D¹

School of ICT, Faculty of Engineering and the Built Environment, Nelson Mandela
Metropolitan University, Port Elizabeth
Darelle.vanGreunen@nmmu.ac.za

Herselman, ME

Meraka Institute, CSIR, South Africa and School of ICT, Faculty of Engineering and the
Built Environment, Nelson Mandela Metropolitan University, Port Elizabeth
mherselman@csir.co.za

ABSTRACT

People with disabilities have the potential of making considerable contributions to the Web. Websites have to be designed with accessibility in mind. Accessibility is closely related to usability as well as Web design. This research investigated the NMMU portal from the point of view of designing an accessible portal in South Africa. Firstly, the various disabilities that affect Web accessibility, the legal requirements and the factors that affect user acceptance of the Web were determined. The guidelines and standards with regards to Web design, usability and accessibility were then analysed. This was followed by evaluations and recommendations.

Disabilities that affect Web accessibility are audio, cognitive, motor and visual. These disabilities affect the use of media and content on sites that wish to comply with accessibility guidelines and standards. Designers have to ensure that alternatives to images, sounds and movie clips are available in order to convey the same message to all users regardless of the user agent used.

KEYWORDS: Evaluating websites, usability, accessibility, website design, disabilities, HEI

¹ Corresponding author

1. INTRODUCTION

Web portals are playing an ever-increasing role in supporting organisational processes and a number of success factors play a role. These factors include the usability of the portal in line with internationally recognised standards and guidelines, user acceptance and accessibility for disabled users. These factors must be considered when designing and implementing such a portal. This research will investigate these success factors within the academic environment. The Nelson Mandela Metropolitan University's (NMMU's) staff portal will be used as a case study to support the research undertaken.

Usability refers to the ease of use of a website. Usability evaluations, with the focus on accessibility and how it relates to the acceptance of a portal, is a relatively new concept in portal design. An accessible website is one which can be used by all people, without discrimination and regardless of their ability or disability. An accessible site should accommodate the widest possible range of users and remove barriers that could exclude certain groups of users (Vosloo, 2002). To date, web-site evaluation studies have highlighted the importance of the "usability" or "workability" of the website, yet the volatile nature of the Web itself makes having firm standards for usability difficult. (Mundle, Zhao & Bangalore, 2004, pp. 48-58). Various standards and guidelines exist which can assist the designer in ensuring the usability and accessibility of websites. These include the World Wide Web Consortium's (W3C's) Web Content Accessibility Guidelines and Nielsen's usability principles (Nielsen, 2005). Whilst difficult, it is imperative that these usability and accessibility standards and guidelines are implemented in ways that maximise outcomes for all users.

Web pages with high apparent usability can contribute to the users' acceptance of the site (Fu & Salvendy, 2002). Compliance to usability standards and guidelines could, therefore, protect the NMMU's investment in its portal. Currently, there are no legal requirements regarding Web accessibility in South Africa. The Employment Equity (EE) Act in South Africa makes mention of equal access to all people but not with respect to the Web specifically. America and the United Kingdom both have acts that accommodate Web accessibility and future amendments in South African acts could possibly include these too. A lack of user acceptance of the portal, however, could lead to it becoming obsolete.

Higher Education Institutions (HEI) such as the NMMU are increasingly using its portals for internal processes and communications. These internal processes and communications include online application and request forms, the staff newsletter and other corporate communications like news, events and announcements.

Often websites and tools are dispersed over a number of servers. Portals aim to group together such sites and tools logically for ease of use and quick access to relevant academic material and information. In this way, it provides employees with a single point of entry to university-related and other relevant links. A major concern, however, is that accessibility issues could be preventing users with disabilities from accessing the portal effectively. It is essential that the Web be accessible in order to provide equal access and equal opportunity to all users, regardless of their disabilities. In addition, an accessible web can also assist people with disabilities to participate more actively in society (Web Accessibility Initiative, 2005). Complying with standards and guidelines with the focus on

accessibility, such as the one offered by the W3C, is a demanding task but with substantial benefits.

This research will consider and analyse the factors affecting the usability and accessibility of the NMMU staff portal. The aim is to establish current user acceptance with a specific focus on users with disabilities.

template is a set of styles and page layout settings that determine the appearance of a document. This template matches the printer settings that will be used in the proceeding and the CD-Rom. Use of the template is mandatory.

2. WEBSITES AND USERS WITH DISABILITIES

Enabling a website to meet the needs of individuals with disabilities is a concern for all organizations. The Web enables people with disabilities to work in a vast array of new fields. This is made possible by assistive technologies such as voice activations, visual enhancers and auditory aids (Deitel, Deitel & Goldberg, 2004, pp 1032-1035). For these technologies to work effectively on websites, international standards and guidelines like the World Wide Web Consortium's (W3C's) Web Content Accessibility Guidelines and Nielsen's usability principles (Nielsen, 2005) need to be implemented. These internationally recognised standards and guidelines applicable to Web design, usability and accessibility all play a role in enabling websites for users with disabilities.

Web accessibility means that people with disabilities can interact with and contribute to the Web. Disabilities include visual, auditory, physical, speech, cognitive, and neurological disabilities. Web-accessibility barriers make it difficult or impossible for many people with disabilities to use the Web. These accessibility barriers include images without appropriate text equivalents, text disappearing when the font size is increased, ambiguous link texts and items such as lists, headings and tables that are not coded properly. As more accessible websites and software become available, people with disabilities are able to use and contribute to the Web more effectively (Web Accessibility Initiative, 2005).

Various components play a role when developing more accessible websites. These components of Web development and interaction need to work together in order for the Web to be accessible to people with disabilities. They include (Web Accessibility Initiative, 2006):

- Content is the information on a webpage and includes text, images, sounds and code;
- Web browsers, media players, and other user agents used to access the Web;
- Assistive technology including screen readers, alternative keyboards, switches, scanning software;
- User knowledge, experiences, and in some cases, adaptive strategies using the Web;
- Developers, which include designers, coders, authors, developers with disabilities and users who contribute content;
- Authoring tools, for example FrontPage, used to create websites;
- Accessibility and code-evaluation tools.

From the abovementioned components, Web developers will usually use Web authoring and evaluation tools to create the content for web pages (Web Accessibility Initiative, 2006). Users use browsers, media players and other user agents to interact with the content.

These components need to work together to ensure an accessible website (Web Accessibility Initiative, 2006). These interdependencies can be illustrated through the implementation of the alternate text (ALT) tag:

- Technical specifications, for example, HTML that address the ALT tag;
- Web Accessibility Initiative (WAI) guidelines that suggest the use of the ALT tag for use with images to aid accessibility;
- Developers provide the appropriate alternative text wording;
- Authoring tools enable, facilitate, and promote providing alternative text in a webpage;
- Evaluation tools are used to help check that alternative text exists;
- User agents provide human and machine interface to the alternative text;
- Assistive technologies provide human interface to the alternative text;
- Users know how to get the alternative text from their user agent and/or assistive technology as needed.

If user agents support an accessibility feature, users are more likely to demand it and developers are more likely to implement it in their content. When developers want to implement an accessibility feature in their content, they are more likely to demand that their authoring tool makes it easy to implement. When authoring tools make a feature easy to implement, developers are more likely to implement it in their content. When an accessibility feature is implemented in most content, developers and users are more likely to demand that user agents support it (Web Accessibility Initiative, 2006).

To enable people with disabilities to access this wealth of available information, it is essential that sites comply with international accessibility standards and guidelines. The WAI developed such accessibility standards and guidelines. The guidelines provided by the WAI aim at both assisting the developer in developing an accessible site, as well as in the development of software tools used during website development (Web Accessibility Initiative, 2005).

3. WEB USABILITY STANDARDS AND GUIDELINES

Usability refers to an attribute that assesses how easy user interfaces are to use. Nielsen states that usability may be defined by five quality components (Nielsen, 2003b):

- **Learnability:** How easy is it for users to accomplish basic tasks the first time they encounter the design?
- **Efficiency:** Once users have learned the design, how quickly can they perform tasks?
- **Memorability:** When users return to the design after a period of not using it, how easily can they re-establish proficiency?
- **Errors:** How many errors do users make, how severe are these errors, and how easily can they recover from the errors?

- **Satisfaction:** How pleasant is it to use the design?

Another important factor in usability is utility. Utility refers to how well the site performs what the user needs. According to Nielsen, it does not matter if a site is easy to use when it does not do what the user wants (Nielsen, 2003b).

Usability is important as it forms the survival condition of a site. If a site is not usable, does not answer the user's key questions or allows the user to get lost, the user will leave. The user's first line of defence against usability difficulties is to leave the site (Nielsen, 2003b).

For intranets, usability is a matter of employee productivity. Time wasted by users being lost on an intranet or pondering difficult instructions is money wasted by paying them to be at work without getting work done. For internal design projects, it is possible to think of doubling usability as cutting training budgets in half and doubling the number of transactions employees perform per hour (Nielsen, 2003b).

Nielsen suggests the following ten general principles for interface design (Nielsen, 2005):

- **Visibility of system status** - The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
- **Match between system and the real world** - The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
- **User control and freedom** - Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
- **Consistency and standards** - Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
- **Error prevention** - Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
- **Recognition rather than recall** - Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
- **Flexibility and efficiency of use** - Accelerators, unseen by the novice user, may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
- **Aesthetic and minimalist design** - Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
- **Help users recognise, diagnose and recover from errors** - Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

- **Help and documentation** - Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

Furthermore, Microsoft Network (MSN) Usability Research provided Web usability guidelines to aid in designing a site that provides a high-quality user experience and that appeals to users. Appeal refers to whether people enjoy and become engaged in an experience. Appeal should translate directly into repeat website visits. MSN theorise that there are five main attributes of appeal that increase site use (Keeker, 1997):

- Provide relevant, high-quality content;
- Make it easy to use;
- Promote effectively, both on the site and in other media;
- Make the experience unique to the medium;
- Evoke emotion.

Finally to assist developers in implementing an accessible website, the WAI suggests the following implementation plan (Web Accessibility Initiative, 2002):

- **Establish responsibilities** - Establish a coordination team with a communication plan. This team should include members from key departments like Web development and marketing. In decentralised organisations, members from different regions should be included. A team member to track new techniques for accessibility should be defined, as well as a high-level spokesperson for accessibility.
- **Conduct initial assessment** - Find out whether the organisation is subject to external requirements regarding Web accessibility. Check requirements early in the process. A quick initial assessment of the website can provide information about the potential extent of the problems. An assessment of current awareness of the need for Web accessibility by survey or interviews within the organisation should be done. Estimate resources required to address the needs identified in the initial assessment.
- **Develop organisational policy** – Determine whether or not the organisation has an existing policy on website design and technologies. If not, establish an organisational policy on Web accessibility based on accessibility standards and guidelines. Develop initial and ongoing promotion plans to increase awareness of the organisation's policy, internally and externally. The new organisational policy should be announced through briefing and other organisational communications.
- **Select software** – Authoring software most conformant to that accessibility guidelines and standards should be selected. Software should be installed using recommended configurations which support production of accessible content. Select software for evaluating and repairing Web accessibility and develop a Web publishing process to counter any shortcomings of selected software.
- **Provide training** - Plan a range of training options to meet the needs of people with different roles in the organisation. Offer repeated training opportunities as staff and responsibilities change.

- **Develop an accessible website** - Make accessibility a priority throughout the development process and provide the development team with tools to ensure accessibility.
- **Promote organisational awareness** – Include the Web accessibility policy into key documents where appropriate and regularly reinforce the organisation's policy on Web accessibility.
- **Monitor website accessibility** - Specify the evaluation process to be used for website accessibility, and ensure quality of the process. Conduct ongoing monitoring of the organisation's website. Invite and respond to user feedback on the organisation's website. Periodically review all aspects of implementation plan for effectiveness.

4. EVALUATION

In order to improve usability, the most basic method is user testing. According to Nielsen, this method has three components (Nielsen, 2003b):

- Get hold of some representative users, such as customers for an e-commerce site or employees for an intranet (in the latter case, they should work outside your department);
- Ask the users to perform representative tasks with the design;
- Observe what the users do, where they succeed, and where they have difficulties with the user interface. Let the users do the talking.

To identify a design's most important usability problems, testing five users is typically enough. Rather than run a big, expensive study, it is a better use of resources to run many small tests and revise the design between each one so the usability flaws can be fixed as they are identified. Iterative design is the best way to increase the quality of user experience. The more versions and interface ideas tested with users, the better (Nielsen, 2003b).

After usability and accessibility principles and guidelines have been implemented, the user interface should be evaluated according to Nielsen (1994). This user-interface evaluation is called a heuristic evaluation. Heuristic evaluation is a usability engineering method for finding the usability problems in a user-interface design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge its compliance with recognised usability principles (Nielsen, 1994).

5. THE NELSON MANDELA METROPOLITAN UNIVERSITY STAFF PORTAL

5.1 The NMMU users

The NMMU has a fixed term staff complement of 1406. The staff compliment is made up of academic and administrative staff. Both these groups access the staff portal and use various tools on it. A total of 1.77% have recognised disabilities. Disabilities at the university include (Saunders, 2007):

- Visual disabilities – 8%
- Auditory disabilities – 12%
- Motor disabilities – 40%
- Other – 40%

The NMMU staff portal needed to be evaluated in order to determine its compliance to guidelines and standards and to make recommendations based on the evaluation outcome. Therefore a specific process was followed to determine the usability and accessibility of the NMMU staff portal. The process comprised the following steps:

1. The first step was to validate the staff portal's HTML. The W3C's HTML validator tool was used for this evaluation. Proper, standards-based HTML lends itself toward accessibility. Assistive technologies rely on proper HTML more so than most Web browsers. Valid HTML has many other benefits as well, including a decreased likelihood for cross-browser differences or incompatibilities and better support for emerging technologies (Smith & Bohman, 2004).
2. Various browsers (Internet Explorer and Mozilla Firefox) as well as a text-only browser have been used during portal evaluations. Mozilla Firefox's accessibility add-on will be used as the text-only browser in this paper. The Mozilla/Firefox Accessibility Extension makes it easier for people with a disability to view and navigate Web content. Developers can use the toolbar to check their structural markup to make sure it matches the page content (Mozilla Firefox Accessibility Extension, 2007).
3. Preliminary review: A semi-automated tool from Watchfire called WebXACT has been used to evaluate the NMMU staff portal. WebXACT is an online service that allows testing of single pages of Web content for quality, accessibility, and privacy issues (Watchfire, 2007). This step will be combined with some manual checking of the portal including keyboard accessibility.
4. The portal has to be evaluated manually for Web design, accessibility and usability against the standards and guidelines in the mentioned three areas.
5. Furthermore, the use of existing research questionnaires available in ICT have will determined disabled users' feedback on the portal with regards to usability and accessibility.

6. FINDINGS AND RESULTS

The results from the above steps will now be highlighted.

6.1 Results from validating the staff portal's HTML

The W3C's HTML validator tool (Markup Validation Service, 2007) was used to evaluate the staff portal's homepage. This validator checks the markup validity of Web documents. It makes sure that all the syntax rules of the language (HTML) are followed. The validator itself is a script that basically fetches the document at the provided link, passes it through the parser, and post-processes the resulting error list for easier reading.

6.2 Results from portal evaluation (various browsers and text-only)

The HTML validator tool issued several errors and warnings. The usage of "&" instead of "&#amp;" caused the most cascading errors. It is recommended that the common special entity HTML codes be used to prevent HTML validity errors for example use "&#amp;" instead of "&" for the ampersand special character. It is also of importance that all attributes are defined for a specific element like JavaScript used by the designers.

The Mozilla/Firefox Accessibility Extension makes it easier for people with a disability to view and navigate Web content. Developers can use the toolbar to check their structural markup to make sure it matches the page content (Mozilla Firefox Accessibility Extension, 2007). It was used to disable images as well as CSS on the portal to determine whether it was still usable.

6.3 Preliminary review results

The semi-automated tool that was used to assess the staff portal, is an online service called WebXACT provided by Watchfire. The tool uses WCAG which is an international set of guidelines produced by the W3C. The guidelines are divided into three levels of priority (Watchfire, 2007):

- Priority 1 guidelines represent a base level of accessibility and include problems that seriously affect the web page's usability by people with disabilities;
- Priority 2 guidelines include problems that, although not as vital as Priority 1, are important for access and should be corrected;
- Priority 3 guidelines include issues that should also be considered for correcting.

The staff portal did not have any Priority 1 guideline errors. It had some warnings on document language, the use of alternatives for certain items and the use of natural language.

The result returned one Priority 2 guideline error. This was use of a public text identifier in a DOCTYPE statement. A document type declaration (DTD) at the beginning of a portal's homepage will resolve this error. Priority warnings included element grouping and navigation. All aimed at making it easier for the user to navigate and to find information logically.

The only Priority 3 error returned was that the language of the text must be identified. This could be corrected by ensuring that the HTML element at the beginning of each page should use the HTML 4.0 "lang" attribute to help specify the main language of the text on the page, such as English.

7. MANUAL EVALUATIONS AGAINST WEB DESIGN, ACCESSIBILITY AND USABILITY STANDARDS AND GUIDELINES

7.1 Web design

In an effort to improve the user's browsing experience, designers should aim at avoiding the ten, most common Web design mistakes, as defined by Nielsen (Nielsen, 2007b). The

NMMU staff portal was compared to these common mistakes in order to find out if any were made and to what extent.

The evaluation of the NMMU staff portal with regards to Web design guidelines proved that the portal conforms to most of the said guidelines. The designers should perhaps look at the portal's search engine. Although it effectively searches the portal databases, there is no spellchecking built into the search. There are many PDF documents used throughout the portal. The documents are basically an online version of official documents. No-site related information is stored in documents. A further evaluation of the portal against accessibility standards and guidelines (Web Accessibility Initiative, 1999) will determine the portal's conformance with regards to accessibility.

7.2 Accessibility

The accessibility evaluation, following the WAI checkpoints. The NMMU staff portal claims to conform to the WAI accessibility guidelines and standards. The portal performs well in some of the guidelines and checkpoints. The portal designers should concentrate on getting more keyboard navigation functionality to the site. The designers should also look at alternatives, like divisions and style sheets, to the tables used in the homepage's content layout.

7.3 Usability

A manual evaluation of the staff portal against usability guidelines and standards, as defined on the MSN (Keeker, 1997). The findings from the evaluation indicate that staff portal does well in complying with the usability guidelines set out on the MSN. The portal designers could possibly increase the feeling of community on the portal through the use of forums and portal-based chat rooms for staff and students.

7.4 User satisfaction feedback

A questionnaire was used to measure the disabled users' satisfaction with the portal. The questionnaire is based on the Questionnaire for User Interaction Satisfaction (QUIS), developed by a multi-disciplinary team of researchers in the Human-Computer Interaction Lab (HCIL) at the University of Maryland at College Park. The questionnaire was sent out to all staff requesting that those with disabilities complete it. Users were given specific tasks to perform and task completion was measured on the users giving the answers to the questions for each task. The users completed the tasks anonymously as this was a requirement of the Ethics committee to ensure that participants did not feel as if they were being discriminated against. The goal of these tasks was to evaluate and explore the accessibility features of the NMMU portal. The three tasks were:

Task 1

- Use your mouse pointer to find the alternative text to the pictures on the portal's homepage (hover over the pictures with your pointer - any pictures). Read the text to interpret the pictures.
- Reasons for this task: User agents designed to assist people with disabilities make use of alternative text to interpret images. It is, therefore, important that the alternative text exists first of all, and that it is descriptive enough so that one would know what the image was if one could not see it.

Task 2

- Using the "Official Stuff" menu, determine whether Ms Thelma Louw from Pretoria is a member of the NMMU council.
- Is she a member of council? *Yes No*
- Reasons for this task: This task requires for the menu to expand a further level from its initial expansion. This was done in order to determine whether it is necessary for the users to scroll in order to see the expanded menu options.

Task 3

- Using the "Toolbox" menu, find a link to the Walter Sisulu University.
- Could you find the link? *Yes No*
- Reasons for this task: This task was given in order to determine whether the language used in the menu system was natural and descriptive enough in order for users to find links.

7.5 Participant Profile

The participant profile generated from the biographical section of the questionnaire is indicated in Table 1. Eight users participated and indicated varying types of disabilities.

Table 1 Questionnaire participant profile

Biographical detail	Selection	Number of responses (8 in total)
Age group	Over 50	1
	41- 50	1
	32 – 40	4
	26 – 31	2
Computer usage	Daily	8
Portal usage	Daily	6
	Weekly	1
	Monthly	1
Functionalities used	Online Forms	5
	News	4
	Searches	7
	Events	2
	Adverts	4
	Official communication	4
	Finding work-related information	7
Position	Academic	2
	Administrative	6
Disability	Auditory	1

	Cognitive	0
	Motor	5
	Visual	2
Specific needs		
	<ul style="list-style-type: none"> • Difficulties with drag and drop functionalities as well as elaborate menu expansions. • Difficulties reading small fonts. • Others mentioned that they have no special needs in order to use the portal. 	

8. RESULTS AND RECOMMENDATIONS FROM QUESTIONNAIRE

The user satisfaction questionnaire was divided into seven parts consisting of sections relating to the site to be rated, overall user reactions, webpage, terminology and site information, learning to use the portal. Table 2 includes the results of Parts 2, 3, 4, 5 and 6 of the questionnaire and is ordered as in the questionnaire. The ranking maximum was 5.00.

Table 2 Questionnaire results

	Mean	Standard Deviation
2.1 Overall reactions to the site:	4.13	0.64
2.2 How effective is the portal as a work tool?	4.50	0.53
2.3 Describe the portal	4.00	0.76
2.4 How does the portal cater for your disability?	4.14	0.69
3.1 Characters/font in the content	4.13	1.24
3.2 Does the text of each link efficiently describe where the link goes?	4.00	0.76
3.3 Is natural language used throughout the portal?	4.50	0.53
3.4 Menu groupings on the portal	3.70	0.89
3.5 Use of colours and fonts	4.17	0.75
3.6 Would you know what the corresponding pictures would be if you had to read the alternative text only (Task 1)?	3.00	1.31
3.7 Did the menu wording help with Tasks 2 and 3?	4.38	0.92
3.8 Do you ever have to scroll vertically or horizontally while using the menus?	3.38	1.06

4.1 Use of terms throughout the portal	4.13	0.83
4.2 Can you understand the instructions	4.38	0.74
4.3 Error messages	2.88	0.99
4.4 Is the information on the portal relevant to the institution?	4.71	0.49
5.1 Learning to use the portal is?	4.00	1.07
5.2 Can you remember where to find tools on the portal?	4.00	0.76
5.3 Can you follow the instructions easily?	4.13	0.64
5.4 Is the navigation consistent?	4.00	0.76
6.1 Portal speed	3.25	1.04
6.2 If the portal supported your disability more effectively, would you use it more?	4.40	0.89

The participants were generally satisfied, as indicated by the majority of the questions having a mean of 4.00 and higher with 5.00 being the maximum. The staff portal designers should focus at more descriptive error messages as indicated by question 4.3 with a mean of 2.88. Participants did not find the staff portal to give adequate error messages indicating how to correct problems.

Furthermore, designers should consider alternative implementations or improvements on the questions with means close to 3.00. Although participants are still satisfied, this area could be improved to assure higher user-satisfaction levels. Question 3.6, with a mean of 3.00, could be improved by making sure that alternative text is descriptive and natural, easy-to-understand language is used. An alternative menu system that perhaps supports keyboard navigation could be considered in an effort to improve question 3.8's mean of 3.38. Question 6.1, with a mean of 3.25, indicates that the portal's response speed could be better. Designers could make sure that all best practices for data storage and retrieval are implemented in order to improve performance. Finally, menu groupings and the wording used in them should be re-evaluated to perhaps improve question 3.4's mean of 3.7.

Comments from the questionnaire which could assist the designers in further improving the portal included:

- “The portal provides access to information that is often needed when wanting to do a quick search. Being deaf, it at least provides for both social and academic information that is at times difficult to 'hear' when attending meetings. There is still too much information coming through on e-mails, and such documentation can be stored for later 'screening' on the portal.”

- “The portal has a lot of links which may appear cluttered at first but one gets used to it.”
- “I do not have difficulty using the portal. I work with it daily and even though I do not have the technical training and background, I navigate quite easily.”

Overall, the majority of responses to the questionnaire were positive.

9. CONCLUSION

The case for ensuring that Web sites are usable by people with disabilities is strong in light of the World Wide Web's ubiquity as an essential interface for most organizations, the considerable role of people with disabilities, and a growing number of accessibility regulations being applied to Web interfaces.

Analysing the guidelines and standards with regard to Web design, usability and accessibility highlighted the close relationship between these disciplines. Usability, for example, can be increased by ensuring consistent Web element behaviour (Web design) and that the site can be used by various user agents (accessibility). Compliance to guidelines and standards will lead to people with disabilities interacting with and contributing to the Web. Compliance to guidelines and standards is also important in not losing customers on commercial sites and preventing the reduction of productivity on portal sites.

Acceptance of a website can be increased by ensuring that the site is easy to use, that the user learns something from it, that there is a consistency in Web design, personalisation, effective searches and insights into user behaviour and needs. Annoyances, on the other hand, will lead to a decrease in acceptance.

Users with disabilities responded favourably towards the NMMU staff portal through the user-satisfaction questionnaire. For an even more favourable response, designers should look at implementing meaningful error messages, descriptive alternative text, keyboard navigation, logical menu grouping and faster portal response times.

The next step would be to implement these recommendations on the NMMU staff portal. Post-implementation evaluations must be done to determine any improvements in compliance.

ACKNOWLEDGEMENT

The authors acknowledge Mr Shaun Meyer of the ICT services at NMMU.

REFERENCES

Deitel, H.M., Deitel, P.J. & Goldberg, A.B. (2004). *Internet & World Wide Web How To Program* (pp. 1032-1035). New Jersey: Pearson Education, Inc.

Fu, L & Salvendy, G. (2002). The contribution of apparent and inherent usability to a user's satisfaction in a searching and browsing task on the Web. *Ergonomics*, 48 (6), 415+. Retrieved April 3, 2007 from EBSCOhost database.

Keeker, K. (1997). *Improving Web-Site Usability and Appeal: Guidelines Compiled by MSN Usability Research*. [Online]. Available: <http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnsiteplan/html/improvingsiteusa.asp> [June 2007]

Markup Validation Service. (2007). *Validate by URI*. [Online]. Available: <http://validator.w3.org/> [September 2007]

Mundle, K., Zhao, L. & Bangalore, N. (2004). Evaluative study of catalog department web pages. *Library Resources & Technical Services*, 48 (1), 48+. Retrieved April 3, 2007 from EBSCOhost database.

Mozilla Firefox Accessibility Extension. (2007). *Firefox Add-ons*. [Online]. Available: <http://addons.mozilla.org/en-US/firefox/addon/1891> [October 2007]

Nielsen, J. (2003a). *Intranet Portals: A Tool Metaphor for Corporate Information*. [Online]. Available: <http://www.useit.com/alertbox/20030331.html> [June 2007]

Nielsen, J. (2003b). *Usability 101: Introduction to Usability*. [Online]. Available: <http://www.useit.com/alertbox/20030825.html> [May 2007]

Nielsen, J. (2004). *Current Issues in Web Usability*. [Online]. Available: <http://www.useit.com/alertbox/20040913.html> [April 2007]

Nielsen, J. (2005). *Ten Usability Heuristics*. [Online]. Available: http://www.useit.com/papers/heuristic/heuristic_list.html [June 2007]

Nielsen, J. (2007a). *Does User Annoyance Matter?*. [Online]. Available: <http://www.useit.com/alertbox/annoyances.html> [June 2007]

Nielsen, J. (2007b). *Top Ten Mistakes in Web Design*. [Online]. Available: <http://www.useit.com/alertbox/9605.html> [April 2007]

Smith, H. & Fingar, P. (2003). *Business Process Management* (pp. 66 -67). Florida: Megahan-Kiffer Press.

SOUTH AFRICA. 1995. *The Disability Discrimination Act (DDA)*. [Online]. Available: http://www.direct.gov.uk/en/DisabledPeople/RightsAndObligations/DisabilityRights/DG_4001068 [August 2007]

SOUTH AFRICA. 1998. *Employment Equity Act, 1998*. [Online]. Available: http://www.labour.gov.za/legislation/original_act.jsp?legislationDetail_id=5954 [April 2007]

UNITED STATES OF AMERICA. 2007. *508 Law*. [Online]. Available: <http://www.section508.gov/index.cfm?FuseAction=Content&ID=3> [August 2007]

Vosloo, S. (2002). *Introduction to web accessibility*. [Online]. Available: <http://cooltech.iafrica.com/features/183928.htm> [April 2007]

Watchfire. (2007). *WebXACT*. [Online]. Available: <http://webxact.watchfire.com/> [November 2007]

Web Accessibility Initiative. (1999). *Web Content Accessibility Guidelines 1.0*. [Online]. Available: <http://www.w3.org/TR/WCAG10/#Guidelines> [April 2007]

Web Accessibility Initiative. (2002). *Implementation Plan for Web Accessibility*. [Online]. Available: <http://www.w3.org/WAI/impl/Overview> [May 2007]

Web Accessibility Initiative. (2005). *Introduction to Web Accessibility*. [Online]. Available: <http://www.w3.org/WAI/intro/accessibility.php> [April 2007]

Web Accessibility Initiative. (2006). *Essential Components of Web Accessibility*. [Online]. Available: <http://www.w3.org/WAI/intro/components> [April 2007]