

# **An investigation into web accessibility standards as a practical study with older and disabled citizens**

*Thomas Bevan and Amr Ahmed*

Department of Computing and Informatics, University of Lincoln, U.K.

thomas.bevan@bcs.org.uk and aahmed@lincoln.ac.uk

To coincide with the growth of online services, website standards are progressing to evolve to maintain levels of consistency and usability amongst all web design. Another important aspect is also to include as many users and user groups as possible, especially older and disabled users, given the high potential benefits for those users from the online information, advices, and services. The changes brought about by standardising web design can be both large and small. Ideally the changes will be small enough to go unnoticed by users, but our aim was to see whether even the small changes can make reasonable differences for test users.

Early last year, a disabled relative of the first author approached him asking for assistance in getting online and to show him the fundamentals of web navigation. This person suffered heavily from Parkinson's disease, and the process of learning was, for him, both stressful and fraught with complications. This led to a decision to investigate ways in which web standards may assist this user, and those who suffer similar impairments within a similar age bracket. Through investigation and research we derived enough information to create an example website, based on certain criteria and ranking of users' needs, which was used to test certain principles and analyse their real-world effectiveness.

In this short article we describe the creation of a ranked table of needs, which reflect the needs of not only our target users but users who suffer different disabilities, and the results from a limited user-centred tests followed by a conclusion to our findings, including a discussion about the practicalities of standardisation and its effectiveness/usefulness.

## **Assisting web designers - Developing a set of prioritised users' needs and requirements**

Due to the nature of web accessibility, it is improbable that designers can attain designs which adhere to all users issues. With the user-centred approach, it is suggested to rank the user needs and adapting designs to this accordingly. By following this methodology it is expected that the most common user requirements, of the largest number of users, will be addressed.

Table 1 depicts the table of needs of the most common groups within our target users. These groups and needs have been derived based on existing literature, and more importantly ranked in priority to assist the designers to reach the largest number of potential users. This ranking may serve as a reference of major concerns which we believe that they should be addressed in a website, especially to include older and disabled users. It worth mentioning that these ranks serve the needs of most web sites, but content specific design decisions may change the order of these rankings in a real life scenario (e.g. Multimedia streaming websites, or sites targeting/serving a specific group which becomes the highest priority).

There are many different ways to accomplish each need and most of these will be specific to the goal of the site. Many web standards (primarily the DDA, WIA and PAS 78) suggest ways that a web developer can implement usable environments relating to issues in Table 1. For

our design it was attempted to address issues 1-5 through a set of objectives described below.

**Table 1 – Prioritised table of needs**

Priority	Issue	Background
#1	Designing to standards and specifications	Prioritised highest because of its overall importance and impact towards usability and accessibility.
#2	Visual Impairment and Blindness	Loo et al. states visually impaired persons are not able to obtain the full benefits of Internet [6]. Ranks highly due to the large number of users that could be assisted by improving these principles.
#3	Partial and Poor Vision	Similar to Visual Impairment, Partial and Poor Vision requires less specific visual adaptations but remains of high importance for users that need moderate levels of assistance.
#4	Restricted Mobility	Primarily for disabled users who may require additional hardware for navigation
#5	Colour Blindness	Research suggests that red-green colour impairments affect 6-10% of boys and 0.4-0.7% of girls [7]. Improvements in this area can improve the website experience for many users.
#6	Audio	The delivery of audio is important in media driven web design. There are alternative or different ways of using audio more efficiently. Prioritised low due to the lack of audio in common site navigation.
#7	Epilepsy	Photo sensitive epilepsy can trigger seizures if poorly designed multimedia content is provided. Lowest in priority due to the rare nature of this condition.

Web site design is being directed toward, and in some cases legally bound to design principles which aid accessibility to disabled users. These standards are becoming highly respected, and adhering to them demonstrates a level of professional social responsibility, and equity of access to information and services. The most influential guidelines are listed below with their unique properties, each of which was referenced during this project's development.

**UK DDA:** The UK Disability Discrimination Act 1995 [1]. The legal duties imposed by the DDA have come into force gradually and web site owners have had these obligations since 1999 when Section 21 was rectified to include web design.

**WAI:** The Website Accessibility Initiative (WAI) [2] is one of the earlier standards, first surfacing in 1994 just as the dawn of browser based Internet browsing was introduced to the mainstream. It was derived by the World Wide Web Consortium (W3C) who is also responsible for the design of protocols that ensure interoperability within the web.

**PAS 78:** The PAS 78 guidelines of 2006 [3] suggest a comprehensive list of principles for web designers to make sites accessible. There is a call from some to make the PAS 78 guidelines a legal document, and this may occur with future iterations of the existing document or become part of the Disability Discrimination Act of 1995.

The first stage towards creating an accessible website is to take note if these standards are appropriately format and control the content as per their specifications. From here the site's content falls into an accessible template. This template is the designer's largest undertaking, and although there is no right or wrong visual style, certain layouts provide more usability benefits than others. We can see this demonstrated in current existing work within the accessible website domain. Nomensa [4] is a good example (Figure 1), and a particular place of common reference for this project, which shows many accessible principles as a working website model. The effective use of colour to separate navigation from content, the clean and un-cluttered tabular (CSS driven) layout, and introducing imagery to the main navigation links, are reinforcing the accessibility considerations (for those with Visual Impairment). Also, navigation is appropriately positioned at the head of the page and retains its positioning on every subsequent section. This design promotes accessibility in many ways; however it is not without its own shortcomings. Ideally, there is a desire for users to be able to customize their experiences [5]. Some sites also assume that their users have fast Internet connections (as demonstrated by heavy image usage), and this is something that should be carefully considered. We can also identify the importance of using appropriate colours to compliment navigation systems.

After research and analysis, the following objectives were set to improve web design for accessibility:

1. Produce a website which features appropriate assistance to aid users who have visual impairment or are blind, through striking visuals and simple navigation.
2. Produce a website which outputs correctly on screen readers.
3. Allow the user to customise the colour scheme of the site, and save this as a cookie on the user's browser.
4. Keep multimedia use to a minimum.
5. Design should be kept simple, with a navigation bar viewable on all pages, and labels so that the user can always return to the home page.
6. Including a FAQ and Site Map on every page.
7. Content is relevant, prose is concise.
8. Cross browser compatibility.
9. Develop a website which passes W3C validation tests for XHTML and CSS.

## **Observations of users using a test website**

After carefully considering the accessible approach to web design and the above set objectives, a test website was designed and developed as shown in figure 2 (a copy of which is online at <http://tbevan.co.uk/WebAccessibility/>). This site adhered to the previously assigned objectives, including its use on screen readers. Besides the large navigation buttons, with imagery, the left navigation links, are always available at this position for all pages. Moreover, at the lower half of this navigation menu, there are "viewing options" (as highlighted in figure 2), which address many of the users' requirements to customise the viewing of the site. For comparison we also found a traditionally designed website which had similar content.

As a test method for this style of web design we decided to actively compare our website to that traditionally designed website. To assist this comparison, two volunteers – one a 78 year old male with Parkinson's disease the other a 73 year old female – performed a number of common quantitative and qualitative tests for both sites. The results of the quantitative test are shown below as they offer statistical comparison for simple evaluation. Qualitative tests are assistive during evolutionary development of the site to improve its design.



Figure 1 – Nomensa.com

For quantitative evaluation, the volunteers were given few tasks to complete, using both sites, our site and the traditionally designed one. By totalling the times it took to complete these tasks (as depicted in table 2), it was established that the site with improved design principles gauged from standardised design and ranked accessibility principles were more successful at decreasing the time (and therefore improving the efficiency) of the users' experience. It can be argued that the total performance improvement is relatively marginal. However, especially for the case of Person A, there are other factors that affects/contributes to the improvement for such a case. This includes any specialized interfacing hardware that compensate for the severe medical/health condition of such cases. It is also expected that the value of the improvement would be more noticeable and beneficial with larger and longer tasks and testing procedures. We should also remember that timing is one quantitative measure/criteria. However, there are other qualitative factors supporting the design. Through observation and speaking to volunteers, they repeatedly expressed their reasonable comfort and feeling of improvement (easier accessibility) in our sample site design. Hence, they seem more satisfied (even morally). This is in fact an important factor that could make a difference between users using the service/site and others who may go away from it (which is a common problem for older and disabled users).

## Conclusion

In this article, a user-centred web design, implementation, and testing has been presented. First, different levels and forms of disabilities and/or user requirements have been identified, analyzed, and prioritized. This aimed at maximizing the web accessibility for the widest

number of users as possible. Then, common web design principles have been identified and attempts to develop solutions have been successfully achieved. This has been demonstrated by a sample website model that has been designed and implemented based on the above user-requirement analysis and the identified design flaws. The quantitative measures for testing these implementations were based on timing the observation of disabled and older users using the sites to accomplish given tasks. It was decided that the quicker the user achieved a task the more efficient the site proved to be. What is pleasing is that even in a small test we can see implementation principles having an advantageous effect, and proving that relatively basic implementations can be effective.

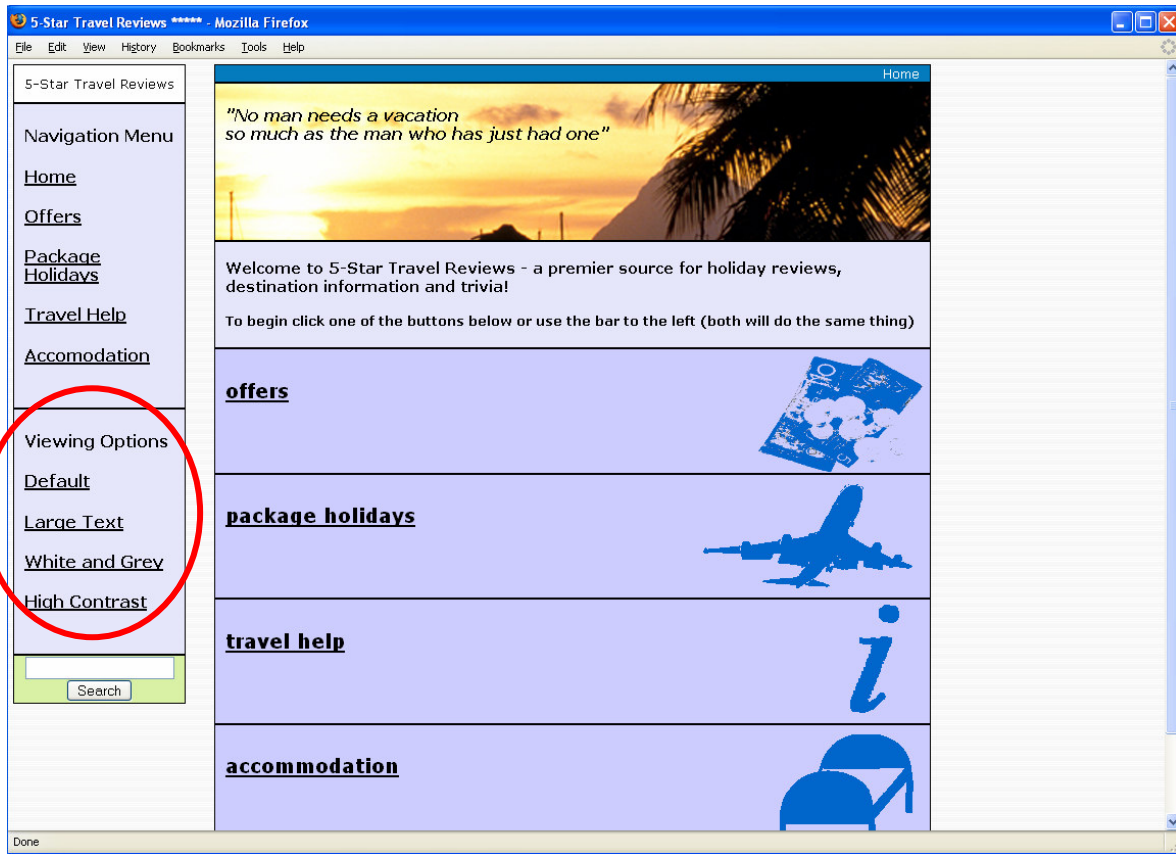


Figure 2 – Our sample website

Table 2 – Quantitative Test Results (s=seconds, m=minutes)

Task	Site A: Badly Designed		Site B: Improved Design	
	Person A	Person B	Person A	Person B
Navigate to a link on the menu and click it	30s	10s	25s	10s
Use a search mechanism to query the site	60+s	30s	50s	20s
Find and navigate to the FAQ	30s	10s	30s	8s
Return to the home page	20s	10s	15s	5s
<b>Totals</b>	<b>2 m 20 s</b>	<b>1 m 0 s</b>	<b>2 m 0 s</b>	<b>43 s</b>

The described experiment proved to be a success, and provided a feeling of confidence that ranked accessibility principles assisted the design process. But to provide more definite conclusion, more exhaustive tests and evaluations need to be conducted on a larger scale. This would benefit from the involvement of organizations that have interest and/or care of the targeted user groups, as this would be difficult to achieve without their support.

Following observations we state that even though one may follow guidelines and standards, the immense deviation in people's conditions makes it difficult to create a design that satisfies everyone. These findings may begin to highlight a reason why we are not adapting to standardized web design sooner than we perhaps should have. As such the devised table of needs, which provides benefits to designers, goes some way to assisting with accessible approaches to their sites, and this study has proven to increase the efficiency of our two volunteers browsing experiences.

## The Future

The future of web design must adapt to a standardised approach in time. This may be slow at present, but is increasing as the benefits of good web design become prevalent. The distinct reality is that our dependence on the Internet, or more specifically the Web, is exponentially increasing. This is highlighted by the older person (with Parkinson's disease) who felt it necessary to use the web even in their disabled state. To cope with these increases, we need more appropriate regulations to govern its use and facilitate better accessibility and usability for most (if not all) users. What is also proven is that adapting a website to be more accessible and usable is beneficial for all users, not only the disabled and/or the older users.

As a suggested continuation of research in this area, it would be useful to conduct more exhaustive user tests to find a definitive set of requirements from a larger census of the demographic. From here it might be suggested to develop examples which meet these requirements with larger sets of volunteers, using similar methodologies and test strategies as demonstrated here.

## References

1. <http://www.opsi.gov.uk/ACTS/acts2005/20050013.htm> - The UK Disability Discrimination Act 2005.
2. <http://www.w3.org/WAI/> - The homepage for the WAI, including standards and guidelines.
3. <http://www.isolani.co.uk/blog/access/Pas78Launch> - The key aspects from the launch of the PAS 78.
4. <http://www.nomensa.com> - Nomensa's homepage. Accessible web designers for professionals.
5. <http://db.tidbits.com/article/06348> - article on 'Surfing the Web Blind'
6. Loo, A & Lu, M & Bloor, C 2003. 'Internet surfing for the blind: a prototype', *The Electronic Library*, vol. 21, no. 6, pp. 576-586.
7. Gordon, N, 1998, 'Colour Blindness', *Public Health*, Volume 112, Issue 2, pp 81-84.



*Tom Bevan* recently graduated from The University of Lincoln attaining a Bsc Honours Degree in Games Computing. Current interests include pervasive and social computing, and accessibility as a viable and commonplace principle. He currently seeks employment in software development.

*Amr Ahmed* received his BSc and MSc in Computer & Systems Engineering from Ain Shams University (Egypt), and his PhD in 3D Computer Graphics & Animation from the University of Surrey (UK). Currently, Amr is a Senior Lecturer at the Dept of Computing & Informatics, University of Lincoln (UK).

