

# Tension, what tension? Website accessibility and visual design

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## ABSTRACT

There appears to be a widespread belief within the web design community – and possibly amongst website commissioners – that accessible sites cannot be visually pleasing. We present the results of accessibility testing of 100 websites with 51 disabled users that should dispel this belief. While there are aspects of accessibility that do affect visual design, such as visual structure, colour contrast and text size, these are aspects of design that can affect all users, not only disabled users. These design concerns must be considered if both the users' experience and business objectives are to be met.

## General Terms

Information interfaces and presentation: User interfaces: Screen design. Computers and Society: Social Issues.

## H5.2 [Information interfaces and presentation]:

User interfaces – *screen design, graphical user interfaces (GUI), evaluation/methodology.*

## Keywords

Accessibility, Visual design.

## 1. INTRODUCTION

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It is a widespread belief amongst web designers and implementers that sites that are accessible to users with disabilities must by necessity be uninteresting and simple, particularly visually uninteresting – plain, vanilla sites. It is understandable that such sites do not pose interesting challenges to web designers and implementers. However, it is our contention that this belief is profoundly misguided. Certainly, a very plain, visually simple site is quite likely to be accessible (although this is not guaranteed). However, the opposite is not necessarily the case – sites can be visually interesting and sophisticated and still highly accessible. Visual and interesting web design is largely complementary to accessibility and these two factors should not be seen as being in opposition to each other. Accessibility should rather be viewed as another challenge to designers and implementers, along with creating a site that is usable, interesting and appealing to mainstream users.

To elaborate on this argument we will draw evidence from the evaluation of 100 websites for accessibility. The evaluations were conducted using both automated and manual checking against the Web Accessibility Initiative (WAI) Guidelines [1] and user-based testing with a User Panel of 51 people with a range of disabilities.

Surveys of website accessibility have been conducted before. However, these have all relied on automated and manual testing against the WAI Guidelines, rather than user testing. For example, Sullivan and Matson [2] compared the 50 most popular websites in terms of their usability and content accessibility, showing a marginal correlation ( $r=0.23$ ) between manually analysed content accessibility and overall automated usability as measured by LIFT [3]. More recently, Kelly [4] conducted an accessibility audit on the entry pages of UK Universities using Bobby, and

Romano [5] conducted an evaluation of Fortune 100 business websites. In general, these and other similar studies have shown low levels of accessibility. However, none have conducted user-testing with disabled users to establish practical levels of accessibility and usability.

In the next section we will outline the methodology of our user-based evaluation study. In section 3 we then present the key results of the evaluations. We then examine the 3 of the 10 most accessible websites from the evaluations as case studies, investigating their visual design and relating that to their accessibility. We will see that visual design and accessibility are not in conflict.

## 2. METHODOLOGY

The evaluation study started with automated accessibility testing of the home pages of 1000 sites for technical compliance with the WAI Guidelines (or specifically the 65 checkpoints) using the accessibility module of WebXM™ developed by Watchfire [6]. The home pages were selected to be representative of 5 sectors:

- government and public information;
- business;
- e-commerce, e-recruitment, e-finance, *etc*;
- entertainment and leisure;
- web services, such as search engines, discussion boards, portals and internet service providers.

WebXM™ and other automated tools cannot check the conformance of a website against all 65 WAI checkpoints, since some require human judgement. For example, while tools can check that each image on a website has associated ALT text (which provides descriptive text for visually impaired users as an alternative to an image) by checking the site's HTML code, they cannot verify that such text is appropriate or helpful. In such cases, automated tools give "warnings" highlighting those issues that should be checked manually. The 1000 home pages were audited against those checkpoints that WebXM™ could automatically check – we did not conduct manual inspections of those pages. (Manual inspections were conducted on a subset of websites, but this is not relevant to the argument at hand.)

Based on the results of this automated testing of the 1000 home pages, a representative sample of 100 of these sites was selected for detailed user-based

evaluation by a User Panel of 51 people with a variety of disabilities that are relevant to Web accessibility. The 'representative' sample comprised sites from all 5 sectors mentioned above, sites with varying levels of WAI WCAG 1.0 compliance, sites of varying number of pages, and sites of varying popularity (as measured by the Alexa tool [7]).

The User Panel comprised:

- 10 totally blind people using assistive technologies such as JAWS, Window Eyes and SuperNova.
- 9 partially sighted participants using magnification software such as ZoomText.
- 12 dyslexic participants some of whom used screen readers such as ReadPlease;
- 11 people with profound deafness or a lesser hearing impairment, including people who are Sign Language users;
- 9 people with physical impairments that affect access to the Web, such as lack of control of arms and hands, tremor, lack of dexterity in hands and fingers.

The members of the Panel represented both sexes, a range of ages, levels of experience with computers and the Web.

Each User Panel member was asked to evaluate 10 sites and complete two tasks per site. The tasks chosen for each website were representative. For example, on a banking site, users were asked to find out the current interest rates for a particular bank account. The User Panel members completed 22% of these tasks at City University while being observed by experts, and 78% of these tasks were attempted at home with the members using their own equipment and software. For the tasks completed at home, Panel members returned their completed protocols by email. Together at City University and at home, a total of 913 tasks, over the 100 sites, were attempted.

The key measures from these evaluation sessions included:

- Whether the Panel members succeeded or failed in their tasks;
- How easy the Panel members found it to perform the tasks, irrespective of whether or not they succeeded (measured on a scale of 1 to 7);

- Problems encountered in using websites, as articulated by the Panel members or observed by the experts;
- The extent to which the Panel members believed each site took their impairment into account.

For the tasks performed at City University, the experts could observe whether users succeeded or failed. At home, however, users could not always be certain that they had succeeded or failed in their tasks. Users were therefore asked to state how confident they were that they had succeeded (on a scale of 1 to 7) on each task. The analysis of data on success rates considered only tasks where users were sure whether they had succeeded or failed, and so disregarded tasks with confidence rated 3 to 5. This reduced the sample to 769 tasks.

### 3. OVERALL RESULTS

In aggregate at City University and at home, the Panel members succeeded in 76% of the attempted tasks and failed in 24% of them. However, this distribution was not equal across all impairment groups. As Table 1 shows, blind participants had significantly more difficulty in using the websites, succeeding in only 53% of their tasks, compared to other impairment groups whose average was 82%. Moreover, the low success rates amongst the blind users were not due to a minority of people failing their tasks; the pattern was uniform throughout the group.

**Table 1: Task success rates by impairment group.**

Impairment group	Tasks succeeded
Blind	53%
Partially sighted	76%
Dyslexic	83%
Physically impaired	85%
Hearing impaired	85%
<b>All impairments</b>	<b>76%</b>

Participants in different impairment groups also varied in how easy they found it to complete their tasks. Those with dexterity problems found the tasks

most easy to perform (with a mean rating of 6.8 on a scale of 1 = very difficult to 7 = very easy). This compares with blind users who gave a mean rating of 4.2 (neither easy nor difficult). As Table 2 illustrates, there is a similar pattern on the “ease of task rating” and the success rates (Table 1) in terms of the user groups most affected.

**Table 2: Ease of task ratings by impairment group.**

Impairment group	Mean ease of task rating (1 = very difficult to 7 = very easy)
Blind	4.2
Partially sighted	5.1
Dyslexic	5.6
Hearing impaired	5.8
Physically impaired	6.8

The experts also observed the problems that the 50 participants encountered when evaluating the websites. In total we collected 585 problems (not necessarily unique). It is worth noting that 55% of these problems related to WAI checkpoints, but 45% were not a violation of any checkpoint and could therefore have been present on any WAI-conformant site irrespective of rating. Violations of just 8 checkpoints accounted for 82% of the reported problems that *were* covered by the checkpoints (see Table 3) and 45% of the total number of problems encountered by users.

Overall, the most common problems amongst all the user groups – irrespective of whether the problems were covered by the WAI checkpoints or not – were:

- Cluttered and complex page layouts (i.e. pages that are difficult to visually parse). [124 instances]
- Confusing and disorienting navigation mechanisms. [96 instances]
- Poor contrast between content and background. [59 instances]
- An incompatibility between screen-reading software and pages e.g. the assistive technologies not detecting some links, or it proving impossible to highlight some text using text-to-speech software. [45 instances]

- Text and graphics that are too small to read. [44 instances]

**Table 3: Checkpoints accounting for most reported problems**

Checkpoint		Priorit y
1.1	Provide text equivalents for every non-text element.	1
2.2	Ensure that foreground and background colour combinations provide sufficient contrast when viewed by someone having colour deficits or when viewed on a black and white screen.	2 / 3
6.3	Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page.	1
7.3	Until user agents allow users to freeze moving content, avoid movement in pages.	2
10.1	Until user agents allow users to turn off spawned windows, do not cause pop-ups or other windows to appear and do not change the current window without informing the user.	2
12.3	Divide large blocks of information into more manageable groups where natural and appropriate.	2
13.1	Clearly identify the target of each link.	2
14.1	Use the clearest and simplest language appropriate for a site's content.	1

From these results we can draw 3 main conclusions.

1. Accessibility is a genuine problem, particularly for blind people.

2. Adhering to the WAI guidelines and checkpoints is necessary but not sufficient to make websites practically accessible.
3. “Good” visual design is concordant with accessibility in particular and usability in general.

In addressing the question of whether there is a tension between visual design and accessibility, the assumption appears to be that accessible websites must be ‘boring’. This is a naive position. The three key problems, in terms of visual design, that our disabled User Panel faced were (a) cluttered and complex page layouts, (b) poor contrast between background and content, (c) text size too small. We would suggest these are problems that can be encountered by all users, impaired or not (with the exception of blind people who are by definition completely unaffected by contrast issues and text sizes). Therefore, these are general usability issues rather than technical accessibility issues.

In terms of accessibility issues, as defined by the WAI checkpoints, we would suggest that none of the checkpoints that affected the disabled participants most in Table 3 significantly constrain the visual design of websites. Again, checkpoint 2.2, relating to sufficient colour contrast, should not be seen as constraining good visual design. Indeed it is a prerequisite for good design from users’, customers’ and thus website owners’ point of view. If users cannot read the text on websites, or pages lack a clear visual structure, or the contrast is poor, then the visual design is, with respect to the user experience and business objectives, by definition poor.

“Tension” can only be meaningfully discussed with respect to given criteria. We would argue that criteria such as the users’ experience (as measured by task success rates, subjective ratings and so on) are important criteria, both to users and to website owners. Given that clear visual structure, clear contrast, and appropriate text sizes generally enhance the users’ experience and promote business objectives, then it is only by violating these design principles that tension arises between accessibility and visual design – perhaps mainly in the form of tense users!

If such user-focused and business-focused criteria are ignored, then it is much easier to claim that there is a tension between visual design and accessibility. In this context-free vacuum creative freedom becomes the main criterion – and it becomes much easier to

argue that clear visual structures, good contrast and appropriate text sizes constrain *that* freedom, i.e. *that* criterion. However, most commercial website design does not happen in a vacuum. Moreover, as we illustrate in the following section, complex and pleasing visual design is absolutely achievable without compromising accessibility.

#### 4. CASE STUDIES

We now examine three exemplar websites that not only have high levels of accessibility, but also have complex visual designs. In all of these sites, the task success rates over all impairment groups are in excess of 85% - these are amongst the most accessible websites (as determined by extensive user testing with real disabled users) in our sample of 100.

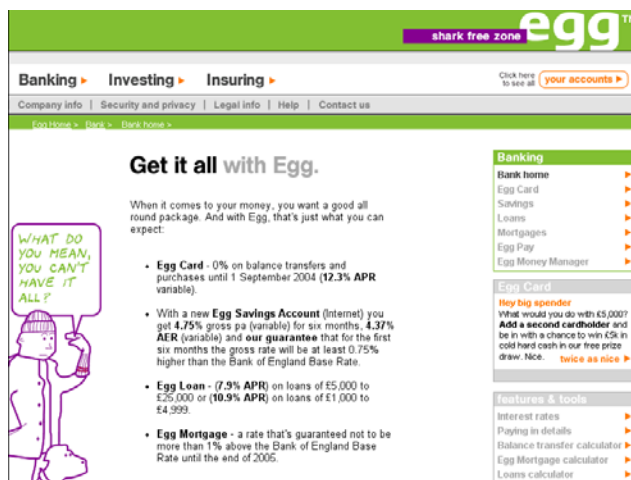


Figure 1: A page from *www.egg.com*

*egg.com* is an online UK bank, offering products and services to the general public. The website benefits from a clear main navigation system that remains consistent throughout the site. The main navigation sections (*Banking*, *Investing*, and *Insuring*) are constantly available and secondary navigation items are in less salient text beneath the main navigation. Contextual links are consistently positioned on the right-hand side of this screen. Overall, the pages have a consistent layout with a consistent visual language. Subjectively, people did not consider the pages to be “cluttered”. In general, the contrast is high, certainly

for the main text. While some text is graphical images (for example the main navigation items), they have appropriate ALT tags and most of the text can be enlarged through the browser settings.



Figure 2: A page from *www.ebay.co.uk*

The *ebay.co.uk* site benefits from a flat information architecture with meaningful categories that invite users to browse. The blue-on-white text provides for a reasonable contrast. A downside of *ebay.co.uk* is that many of the pages have a cluttered feel to them, and it could be argued that some pages have no clear focal point. Nonetheless, with a 100% task success rate amongst our disabled participants, the site does demonstrate that complex visual layouts are possible without compromising accessibility.



Figure 3: A page from *www.oxfam.org.uk*

The *oxfam.org.uk* website has a complex visual layout, bold colour scheme, and professional

photography. Although some text, for example the main navigation uses graphical text, it does have appropriate ALT tags. This website had a task success rate of 88% and users gave a median ease of task rating of 7 (very easy) on a scale of 1 to 7, and considered that the site took their impairment completely into account.

These three sites – *egg.co.uk*, *ebay.co.uk*, and *oxfam.org.uk* – achieve complex and even pleasing visual design without seriously compromising practical accessibility and usability.

## 5. CONCLUSIONS

We have demonstrated that accessibility does not constrain visual design. From an evaluation of 100 websites by 51 disabled users, with a range of impairments, some of the most accessible websites had complex visual designs encompassing graphics, complex layouts, and photographs. A tension only exists between accessibility and visual design if creative freedom is the only – or the main – criterion of a website's success. However, we would suggest that maximizing the users' experience and meeting business objectives are more common criteria by which websites are judged. In these cases, successful visual designs are those that help meet these objectives. Therefore, accessibility should be viewed as another challenge to designers and implementers rather than as a constraint.

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