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# Auditing the accessibility of electronic resources

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## INTRODUCTION

This paper describes a project undertaken by the University of Bradford library to assess systematically the accessibility of our electronic resources, and gives recommendations for others wishing to do the same with their collections.

Since the 2001 Special Educational Needs and Disability Act (SENDA), academic libraries in the UK have had a legal duty to provide all students with information in a form accessible to them, an obligation strengthened by the 2010 Equality Act (c. 15) to include all kinds of impairments, not just visual.

The change in information sources from print to electronic has raised further challenges to providing access to information for all library users. Electronic resources have the potential to address many of the accessibility needs of our readers, but concerns have been growing in the higher education sector that the way in which e-resources are delivered can make them less accessible.

Conditions that can cause print impairment include not only visual impairment but also dyslexic spectrum disorders, motor and tactile disorders, fatigue syndromes and multiple sclerosis. This list is by no means exhaustive but reflects the range of needs encountered by our library staff.

University of Bradford Library staff awareness of the spectrum of print impairment has been raised by the introduction of Learner Support Profiles (LSPs). These are personalised statements prepared by the University Disability Office with each student with a disability, detailing the type and level of support or individual adjustments required to create equality of learning opportunity, whether in lectures, assessments or library services. Subject librarians receive LSPs for the students they support, thus raising our awareness of the range of invisible impairments and giving us a broader appreciation of the barriers encountered by our students.

Accessing resources electronically has the potential to address accessibility needs. Some of the features of electronic access to resources that could help our students include:

- zooming font size – for students with visual impairments
- changing font and background colours – for visual impairment but also for students with dyslexia (Figs 1 & 2)
- reflow of text to prevent the need for horizontal scrolling – as an ease of use for all (Fig. 4 vs Fig. 5)
- ‘read aloud’ features in many software packages and Adobe PDF documents

Revenues produced by electronic games today represent one of the most important items on the income statement (e.g., television, sports, etc.). Leveraging on the wide popularity of video games among all segments of the population, professionals have exploited in the past, and keep exploiting today, the use of computer games to create a whole new domain of games, termed serious games, that use technologies and other innovations to stimulate serious purposes, for example, the acquisition of good principles (e.g., solidarity, diversity, training (e.g., for leisure or as a therapy), or the construction of a solid education foundation (e.g., Leung and Chen 2005).

However, a wealth of research carried out in the past few years by many prominent medical practitioners may be considered serious. Any game, in fact, besides being entertaining, also hides one or multiple purposes. In such a sense, games are playing the important role of educating, rather than solely entertaining. In an individual relationship with their players, providing their benefits on a single-player basis, thus usually through and pervasive computing, more can be done that can be beneficial for society as a whole [Weiser et al. 2005]. Teamwork among players could produce results that are more significant than those that would be achieved by individual players.

Fig. 1 HTML full text showing background colour change using ATbar

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Fig. 2 HTML full text showing background and font colour change using ATbar

impairment, so covers a huge range of needs for an enormous number of individuals. Libraries have put a huge amount of time and effort into providing documents in accessible format (alt-format) but obviously it is preferable for both libraries and readers if the documents are accessible as supplied from the publisher. Electronic resources have the potential to address many of the accessibility needs of our readers, but concerns have been growing in the HE sector (see, for instance, JISCTechdis 2013) that the way in which e-resources are delivered actually renders them less accessible in some cases. This paper describes a project undertaken by the University of Bradford library to systematically

Fig. 3 PDF before reflow

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Fig. 5 PDF zoomed to 400%, with reflow

#### Dyslexic spectrum disorders

Numbers of students with dyslexic spectrum disorders have hugely increased in recent years, and now constitute the largest single group of print-impaired readers (Fig. 6). This is partly due to improved diagnosis and recognition: the University of Bradford screens all new students for dyslexic disorders, with many receiving the diagnosis for the first time.

Working with our disability services, many readers discover that they read best with a particular font or combination of font and background colours. The latter can be achieved by coloured overlays or photocopying onto coloured paper, but electronic resources have the potential to allow far more control over font type and colour variation.

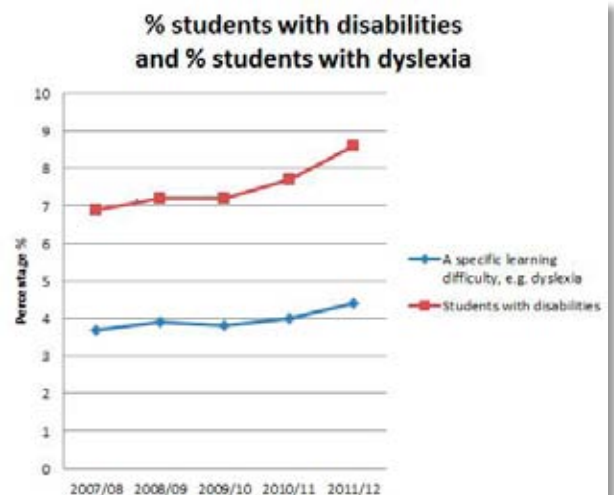


Fig. 6 Number of students with dyslexia as a proportion of all disabled students at the University of Bradford, 2007–12

#### Other disabilities which impair users ability to manage print

Other reasons why users may find print hard to use come with the sheer weight and bulk of printed material.

- Readers with motor impairments often complain of the difficulty of handling and manipulating printed material.
- Those with fatigue disorders or multiple sclerosis can find that the effort of carrying library books is a significant obstacle to using them (Mann, 2013).
- Readers with mobility impairments can find the effort of moving around a large university library and reaching books from high shelves to be a major barrier (Mann, 2013).



All these difficulties can potentially be solved by accessing resources electronically.

We are increasingly finding that students arrive at university with coping mechanisms already in place: they have their own hardware with specialised software and personalised settings. If electronic resources work on the students' own devices then they are able to access them entirely independently, just as any other student would, whereas they may need significant assistance with printed material.

#### PROBLEMS WITH ELECTRONIC RESOURCES

There is obviously great potential for electronic resources to address a huge range of accessibility needs, but unfortunately this potential is often not realised. Some factors that make electronic resources less accessible include:

- **Digital rights management (DRM)** is employed by publishers to prevent unauthorised copying and dissemination of their copyright material, by preventing saving a PDF or limiting the percentage of a work that can be printed or copied. Unfortunately, it is well documented (Kramer, 2007; Turro, 2008) that these legitimate concerns often interfere with inbuilt accessibility features or specialist software, for instance preventing read out loud from working on PDFs.
- **Corporate styling** may prevent colour or font changes. If the styling on an ebook prevents background colour change, and only 10% can be printed onto coloured paper, then a dyslexic student may only be able to read that 10%, whereas a non-dyslexic student can read the whole work online.
- **Enhanced multimedia** aspects of electronic journals, such as animated gifs and videos, whilst welcomed by many readers, can cause problems for others. So these should be easy to turn on / off.
- **Advertisements**, especially with animation, can cause an unwelcome distraction to readers with a whole range of conditions from attention deficit hyperactivity disorder to autistic spectrum disorders and obsessive-compulsive disorder. These readers find it more difficult to ignore irrelevant content (Winn, 2008).

#### BACKGROUND TO THE ACCESSIBILITY AUDIT

Concerns about the accessibility of electronic resources raised in the literature (for instance,

JISC Techdis, 2013) led the University of Bradford library to set up a systematic accessibility audit of our electronic resources. The Open Rose Group, a network of accessibility champions in university libraries in Yorkshire, was also consulted.

Each one of a list of thirty accessibility features in our most used databases was tested: on the home page and in the navigation of the resource, on full text of articles, on HTML format and on the PDF full text, both as read online and downloaded. The exercise was repeated for four browsers: Internet Explorer, Google Chrome, Mozilla Firefox and Webbie (<http://www.webbie.org.uk/index.htm>), a text-only browser. The results were recorded on a spreadsheet, with one sheet for each resource.

We tested accessibility using only free software, mainly the inbuilt accessibility features of the PDFs, and the ATbar Lite (<https://www.atbar.org/about>). We also tested the high contrast plugin in Google Chrome (<https://chrome.google.com/webstore/detail/high-contrast/djcfndcoe1nlbdjfhinnjlhdjlikmph?hl=en>), which provides changes aimed mostly at visually impaired users (high contrast, yellow on black, greyscale) rather than those with dyslexia. We wanted our results to be fully reproducible by students wherever they were located, so programmes such as Texthelp or JAWS were not used.

#### INITIAL FINDINGS OF THE PROJECT

Our initial findings are:

- Most notably, as we feared, **the accessibility features in PDFs are often disabled**. Many downloaded PDFs lack the menu bar, which prevents use of accessibility features (Fig. 7).

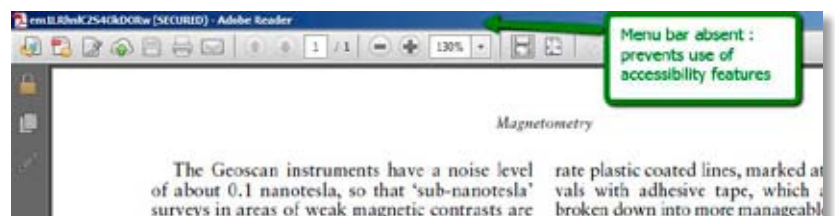


Fig. 7 Downloaded PDF lacking menu bar

- However, **this can often be circumvented** if the PDF reader has been opened previously in the session and accessibility settings changed. These changes will usually carry over to the downloaded PDFs (Fig. 8).

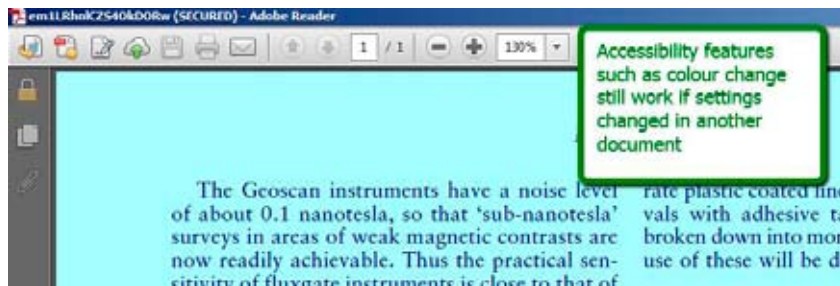


Fig. 8 PDF reflecting changes made in another document

- **Reflow of the text** works in very few cases, with Nature being the only major publisher examined where it works consistently. Often when the reflow option is chosen, all the spaces between the words are eliminated, rendering the document unreadable (Fig. 9); in extreme cases, using reflow blanks the entire document.

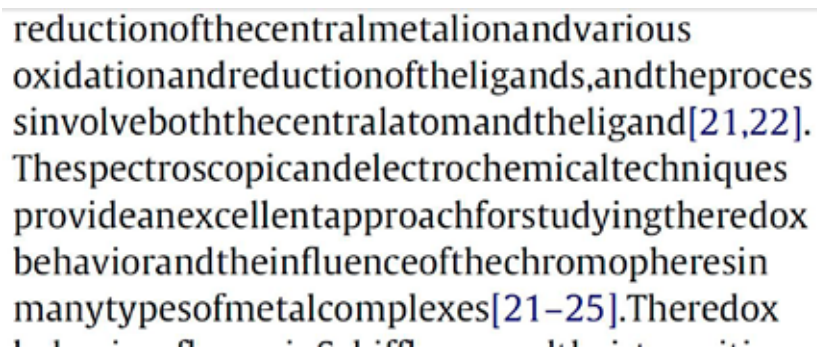


Fig. 9 Reflow eliminating spaces between words

- **PDF is a page image** (usually in older digitisations) rather than scanned as text. In these cases no accessibility features will work apart from the zoom (Torro, 2008). We can only assume that these cases are not malicious but are historical and show a lack of awareness of accessibility issues.
- **ATbar is often disabled** once you reach the HTML full text (presumably by DRM), so you can then not change the font or background colour.
- **Google Chrome was the most successful browser** in maintaining the usability of the ATbar. Even when the ATbar colour change was not disabled, it sometimes had a major impact on the structure of the page, resulting in the full text content disappearing off the bottom of the page (Fig. 10 vs Fig. 11). The Chrome high contrast plugin gave similar results to the ATbar, with the changes imposed disappearing once the full text was reached.

- **Colour change disabled scrolling** of the mouse in several cases, so the content had disappeared off the bottom of the screen and the key method of accessing it no longer worked (Fig. 11).

As noted above, colour

change is particularly crucial for a large number of readers with dyslexic spectrum disorders, yet none of the resources tested had their own colour change mechanism.

- **Read aloud** functions exist in a small number of resources, but usually for only a small proportion of the database content.

Late in the initial project we became aware of software that provides a **coloured overlay** rather than trying to change the colours of the

web page (such as **T-Bar**

<http://www.fx-software.co.uk/tbar.htm> and the

most recent release of

the ATbar). On the small

number of resources

tested, this worked where

changing the colour of the

web pages had failed, but

as one is allowed only to

change the background

and not the text colour, there is less ability to suit

the needs of the individual user than with full

colour change.

In 2014, this work has been followed by a small study focusing on our e-books, broadening the scope of the audit to include download and printing limits and usability on different devices, as well as accessibility issues. This will be published on an open webpage as a quick-reference guide for students.

#### WHAT NEXT?

So far we have done a scoping exercise rather than a comprehensive review, but this has raised some serious concerns for libraries and publishers.

In parallel with the work we have undertaken on the accessibility audit, we carried out a survey to gather qualitative feedback from library users with disabilities to investigate how much the accessibility of e-resources matters to them. This proved to be the second most important criterion, after quiet study space (Mann, 2013).



Fig. 10 Full text HTML before colour change

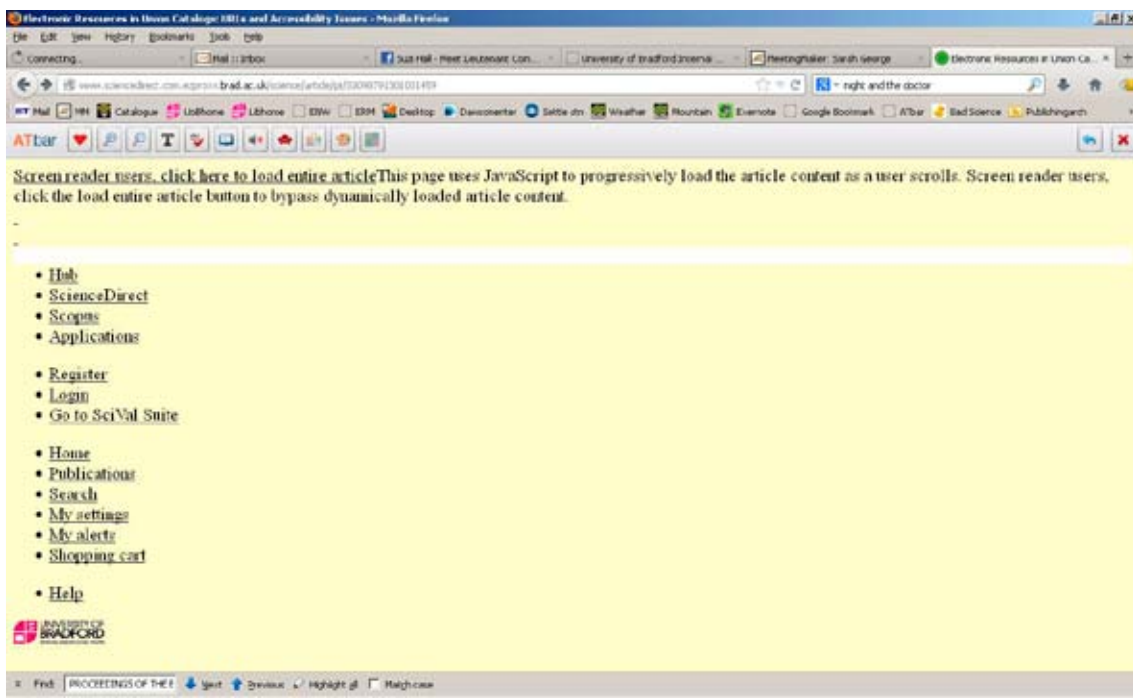


Fig. 11 Full text HTML after colour change. Full text has disappeared from screen; mouse scroll no longer works. The screen reader link takes the reader back to the original document.

- We are convinced that publishers are unaware of the range of problems with their resources, so we feel that the primary duty of libraries is to raise publishers' awareness of specific issues with their products.
- We will produce 'report cards' for each publisher tested, outlining the accessibility problems found with their products and asking them to suggest alternatives or improvements.
- The work will also help us produce recommendations for students; for example, we have found that Google Chrome browser works better for the accessibility testing we have completed so far.
- Where we know there are issues, we shall take accessibility into account when making acquisition of content on book platforms.

There is considerable scope for expansion on this project. In summer 2014 we introduced accessibility audits as a 'background' task for our customer services staff during quiet periods. They have enhanced and expanded on the pilot reported here. We will report on this in a future paper.

The audit described in this paper is a very simple, if time-consuming process, and we would urge other institutions to repeat and build on this work. If we work together to gather a body of shared evidence we are more likely to convince publishers to change their services for all users.

### CONCLUSIONS

Alistair McNaught from Techdis starkly lays out the challenge to library staff in a post on his blog:

Library staff have been pretty passive about this up to now but I suspect it's going to change sometime soon – it only takes one learner to sue one institution for one inaccessible ebook platform and there will be a scramble for platforms with decent guidance on their accessibility features. (McNaught, 2013)

We feel that with increasing reliance on and complexity of electronic resources, this issue is likely to increase in prominence. Students paying a higher fee are more likely to demand that resources be fully accessible 'out of the box', without them having to make alternative format requests for every item they want to read. As librarians we need to stop being passive and open the conversation on accessibility with all our suppliers. Libraries and publishers will need to work together to address or preferably anticipate these needs before they arise.

### ACKNOWLEDGEMENTS

We thank Alistair McNaught, senior advisor at JISC Techdis, for his permission to quote his blog post. Also for pointing us towards the Google Chrome high-contrast plugin, and other free accessibility software.

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### APPENDIX: CRITERIA TESTED

Each of these criteria is tested for the database home page, then for the full text content in HTML, online and downloaded PDFs (subject to availability in each database). The tests are first run in Internet Explorer, then repeated in Mozilla Firefox, Google Chrome and Webbie.

	Database home		HTML		PDF (online)		PDF (download)	
	Yes/ No/ N/A	Comments	Yes/ No/ N/A	Comments	Yes/ No/ N/A	Comments	Yes/ No/ N/A	Comments
<b>Internet Explorer</b>								
Ease of use								
Is it easy to find								
Is it easy to find the main search box								
Are links visible and identifiable as such?								
Keyboard navigation								
Can you navigate using just the keyboard?								
Navigation								
Are the navigation tools consistent?								
Are the menu bars in the same place in all screens?								
Do the menu bars have the same options in all screens?								
Read out loud								
Is there a built-in read-out-loud function?								
Does the ATBar read out loud work?								
Does the reading order make sense?								
Images								
Are there descriptions attached?								
Are the descriptions useful?								
Are the images described in the text?								
Can the images be switched off?								
Multimedia								
Is multi-media content captioned?								
Are there transcriptions of the content?								



Animations								
Are there animations on the site?								
Is there advertising on the site?								
Can animations be switched off?								
Font								
Can font size be changed?								
Can font be changed to Arial, Calibri, Comic Sans?								
Can text colour be changed?								
Colours								
Can background colour be changed?								
Is there sufficient contrast?								
Are link colours clear?								
PDF functions								
Is the text readable or is it an image?								
Does the read out loud function work?								
Does reflow work?								
Resolution								
Change the resolution to 640x480 and 16-bit colour: Do the main functions still work?								
Change the resolution to 1024x768 and 24-bit colour: Do the main functions still work?								