e-Commerce Exclusion:
Web Accessibility and the Older User

David Eadie
Business Information Management
Caledonian Business School
Glasgow Caledonian University
Glasgow
Scotland
d.eadie@gcal.ac.uk

Ian Aird
Business Information Management
Caledonian Business School
Glasgow Caledonian University
Glasgow
Scotland
i.aird@gcal.ac.uk

Abstract

The potential exists for an increasing population of older Web users, who tend to have a high disposable income, to become a major factor in the success and profitability of e-Commerce websites. Due to the natural ageing process, this group are subject to a decline in their visual, motor and cognitive abilities. These age-related impairments form the major barriers that adversely affect both Web accessibility and Web usability for the disabled community. As a result, the effect has been to exclude the older Web users from fully benefiting from the e-commerce revolution.

This paper investigates the extent to which e-Commerce websites, in Scotland, comply with a subset of WAI guidelines which are considered to be relevant to the accessibility issues for older Web users who have a visual and/or motor disability. An exploratory review, using the websites of 4 major companies in each of the 3 e-Commerce sectors (Banking, Retail and Supermarket), was conducted to evaluate the accessibility of the websites from the perspective of an older customer. In addition, older Web users evaluated the usability of these e-Commerce websites.

The results indicate that whilst some companies have taken steps to ensure that their websites are accessible to older Web users, the majority of websites reviewed failed to address most of the crucial accessibility issues that prevent the inclusion of older Web users into the e-Commerce revolution. Keyboard accessibility is highlighted as the main barrier to accessibility. In particular, the authors recommend that the priority level for WAI Guideline 9.3 (which relates to the specification of logical event handlers rather than device-dependent event handlers), WAI Guideline 9.4 (which relates to the creation of a logical tab order through links), WAI Guideline 13.6 (which relates to the provision of a bypass mechanism for related links) and WAI Guideline 3.4 (which relates to the use of relative rather than absolute units in markup language attribute values and style sheet property values) be raised.

Keywords: Disability, e-Commerce, Older Web Users, WAI Guidelines, Web Accessibility, Web Usability.

Introduction

“World-wide, the proportion of people age 60 and over is growing faster than any other age group. Between 1970 and 2025, a growth in older populations of some 870 million or 380% is expected. In 2025, there will be a total of about 1.2 billion people over the age of 60.” (World Health Organisation, 2002). Scottish Enterprise (Scotland's main economic development agency, funded by the Scottish Executive) believes that, as a consequence of advances in life expectancy in the 50+ age group, the average age of UK’s population will rise to 41.9 years by 2021 (Brown, 2000).

Research from around the world shows that older users are also the fastest growing group of online shoppers. In the UK, the number of Web users aged 55 and over using the Web has increased by nearly 90% since 2001. A significant 40% of users of banking websites in the United Kingdom are aged 50 and over (NetValue, 2002). In the USA, most Web users in the next 5 years will be older than 35. The report also states that consumers over the age of 50 will account for 30% of new online shoppers from

this year onwards (Juptner, 2002). In Australia, the number of Web users aged 50 and over using the Web has increased by nearly 113% since 2001. The largest group of users of banking websites in Australia are aged between 35 and 49 (Market Intelligence Strategy Centre, 2002). In both Europe and North America, between 1995 and 2025: "those aged 60 and over will make up about one-quarter of the population." (World Health Organisation).

In the United Kingdom the Royal National Institute for the Blind has successfully campaigned to ensure that websites improve accessibility for the 1.7 million visually impaired people in the United Kingdom. Unfortunately the majority of the disabled people in the United Kingdom have to rely on the Law in the form of the Disability Discrimination Act (DDA) to ensure accessibility to websites. One significant group that relies on the DDA to ensure accessibility to websites is the older Web user. The natural process of aging can adversely affect their vision, motor and cognitive abilities. Visual impairments may make the Web page difficult to see (Zajicek, 2001); diminished motor capabilities may prevent the use of a mouse (AgeLight, 2001); cognitive disability may adversely affect the ability to successfully navigate sites and build mental models (Wilkniss et al, 1997). These changes can be subtle and occur in various combinations. For example an older Web user may suffer from arthritis in their hands and have failing eyesight. This older Web user would therefore be dependent on websites providing Web pages that have the capability to have their textual content resized and support keyboard interaction. This paper seeks to shed some light on the question: "Is the Web accessible to the older user?"

The World Wide Web

The World Wide Web (WWW or Web) is possibly the most famous branch of the Internet and was developed in March 1989 by the British physicist Tim Berners-Lee whilst working at the CERN research centre in Switzerland. Since then, the growth of the Web has been phenomenal to the extent that in September 2002 there were estimated to be around 606 million Web users worldwide, of which 190 million were in Europe, and 34 million Web were in Great Britain (NUA Internet Surveys, 2002).

The Web is a network of platform-independent Web servers, each of which hosts a number of Websites. Each website contains its own Web pages and associated resources (images, animations, video etc). Web pages are created using a language known as the Hypertext Markup Language (HTML). The HTML standards are set by the World Wide Web Consortium (WWWC or W3C). A Web browser is a software program that allows you to receive and interact with a Web page.

One of Tim Berners-Lee's goals was to make information universally accessible:
"The power of the Internet is in its universality. Access by everyone regardless of disability is an essential aspect." Having started off as a purely text-based system, universal accessibility was easily achieved. However, as new technologies (images, animations, video etc) have been introduced to HTML, Web accessibility has been compromised.

Web Accessibility

One of the best definitions of Web accessibility comes from Chuck Letourneau, an influential policy maker in website accessibility and co-chair of the working group that developed the W3C's Web Content Accessibility Guidelines (WCAG): "Web accessibility means that anyone using any type of Web browsing technology must be able to visit any Web page and get a full and complete understanding of the information contained there, as well as have the full and complete ability to interact with the Web page." Taken at face value Letourneau's definition suits exponents of ***universal accessibility***, however the authors believe that, at present, this is an unrealistic goal. A simple example to illustrate the current problem with universal accessibility would involve the delivery of web page text in the language that best suited the user; this might be one of the major Web languages e.g. English (in its various forms), Spanish, Chinese, German or it might be one of the minor languages!

The W3C's Web Accessibility Initiative (WAI) was first formed, in March 1997. In January 1998 the WAI adopted the Trace Unified Web Guidelines (version 8) as the basis for their guidelines. The W3C first issued their accessibility guidelines in June 1998. The following accessibility guidelines that were deemed relevant to this study are taken from the latest WAI guidelines (http://www.w3.org/TR/WCAG10/wai-pageauth.html):

- Provide equivalent alternatives to auditory and visual content (WAI guideline #1)
- Don't rely on color alone (WAI guideline #2)
- Use markup and style sheets and do so properly (WAI guideline #3)
- Clarify natural language usage (WAI guideline #4)
- Design for device-independence (WAI guideline #9)
- Use interim solutions (WAI guideline #10)
- Provide clear navigation mechanisms (WAI guideline #13)
- Ensure that documents are clear and simple (WAI guideline #14)

The guidelines designate THREE levels of priority:

- Priority 1: These checkpoints must be satisfied otherwise, one or more user groups will find it impossible to access information in the Web page;
- Priority 2: These checkpoints should be satisfied otherwise, one or more user groups will find it difficult to access information in the Web page;
- Priority 3: These checkpoints may be satisfied otherwise, one or more user groups will find it somewhat difficult to access information in the Web page.

Web Usability

The W3C's WAI Mission statement links accessibility closely with usability: "The World Wide Consortium's (W3C) commitment to lead the Web to its full potential includes promoting a high degree of usability for people with disabilities." In 1998 the International Organisation for Standardisation defined *usability* as the effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments (ISO, 1998).

Murray and Costanzo believe that the discussion as to what constitutes a *usable* Web interface is ongoing. "To a certain degree usability depends upon the purpose and target audience of a particular site. However, there is general agreement that a usable Web interface is one that is accessible, appealing, consistent, clear, simple, navigable and forgiving of user blunders" (Murray, 2002). The authors believe that a website has to be accessible, before it can be usable. While the aim of accessibility is to maximise the website's user population, the aim of usability is to improve the satisfaction, effectiveness, and efficiency of the website's population.

Disability and the Web

Disability covers a wide range of impairments. The definition of a disabled person as given by the Disability Discrimination Act 1995 (DDA) is someone with "a physical or mental impairment, which has a substantial and long-term adverse effect on an individuals ability to carry out normal day-to-activities".

The latest statistic from the Department for Work and Pensions is that there are over 8.6 million disabled people of working age in the UK, accounting for nearly 20% of the working age population. The Disability Rights Commission's Disability Briefing (October 2002) states that the level of disability increases with age: 9% of those aged 16-24 years are disabled, while 34% of those aged 50-65 years are disabled. With people now living longer, older web users are the fastest growing sector of web users. According to Age Concern, 20% of web users in the 50+ age group were using online shopping websites in 2000.

Some Web users who, under the DDA classification, are disabled, experience no disability problems when accessing the Web. For example Web user whose disability means that they are confined to a wheelchair may experience no problems when browsing the Web. Disabilities that adversely affect a Web user's browsing experience include:

- visual, which includes the categories: blind, low-vision and colour-blind
- aural, which includes the categories: deaf and hard-of-hearing
- motor, which includes arthritis, repetitive-strain-injury, hand-paralysis etc.
- cognitive, which includes literacy, learning, dyslexia etc.

- neurological, which includes epilepsy, dementia, multiple sclerosis etc.

The document, 'How People with Disabilities Use the Web', produced by the W3C provides an insight into this problem via several scenarios of disabled Web users with varying disabilities.
These problems can usually be overcome via the use of assistive technologies. For example, it is possible for someone who suffers from some motor disability to use the keyboard or special input device to browse the Web without having to use a mouse. However, as a result of an ignorance of problems encountered by disabled Web users, many Web designers fail to use HTML correctly. The result is a website that is inaccessible to some disabled Web users. These Web designers are not trying to avoid making their websites accessible. They are simply unaware of the problem. This is supported by Julie Howell (Campaigns Officer at the Royal National Institute for the Blind): "Despite the work done by the World Wide Web Consortium, ourselves and other like-minded organisations, the majority of website owners remain ignorant of their responsibilities".

Perhaps the biggest tragedy is that the disabled Web user community has the most to benefit from using the Web. For example, products and services offered by websites in the banking, supermarket and retail sectors could prove invaluable to a housebound web user.

Economic Benefits

Joe Mohen (CEO of Election.com) believes that accessibility gives companies a competitive advantage. An accessible website will result in a larger potential audience for the website thus increasing market share and providing greater commercial opportunities.

In October, 2001, the UK's Minister for Disabled People Maria Eagle said: "This government believes in an inclusive society where everyone has the right to participate fully". She reassured businesses that making the changes to accommodate disabled people makes sense: "There are over 8.5 million disabled people in the UK, with an estimated collective spending power in excess of £45 billion a year". According to the Disability Rights Commission (2003) "It is commercially damaging to ignore the vast market that disabled and older people represent. Inclusive design doesn't just make moral and common sense – it also makes good business sense."

The Disabled Community, who are more likely than most to access services online, have a large disposable income. In a speech to the CBI Annual Conference (November 5, 2001), Bert Massie, Chair of the Disability Rights Commission highlighted the spending power of disabled people: "The spending power for disabled people is estimated to be £40 billion per year. Can your business really afford to not take a share of the market? It is increasingly apparent that we have an ageing population. The astute among you will have, no doubt, identified the foundations of a business argument – it makes good business sense to build in the disability factor."

Other economic advantages of accessible Website design are highlighted by Scottish Enterprise (Scottish Enterprise Network – e-business SMART Guide 21 – Web Accessibility) who point out that the site maintenance costs of accessible Websites are lower; the benefits of good PR are greater; the chance of negative publicity is lower. They also emphasise the advantage of "letting many more users who want to access your information, goods or services do so". This leads to more sales, more opportunity to sell advertising and reduces the cost of public enquiries. Couple this with the claim made by Julie Howell (Campaigns Officer [Internet] at the Royal National Institute for the Blind): "To incorporate accessibility from the outset costs very little, although you need someone who understands the issues and can code properly. However, to convert your website at a later day does cost"

UK companies who wish to expand their scope of interest to Europe and the USA should be aware of the disability statistics for these marketspaces. In June, 2001Anthony Quinn's claimed that 8% of the USA population and 11% of Europe's population are registered disabled. Quinn further claims that "These people control $175 billion in discretionary income". (Quinn, 2002) These economic benefits should be considered in conjunction with the fact that the number of older and disabled web users in the UK, and indeed the world, is growing annually.

Accessibility and the Law in the United Kingdom

The Disability Discrimination Act (DDA) was passed in 1995. The introduction of Part III of the DDA on October 1 1999 was accompanied with a Code of Practice whose primary function is to provide practical guidance on how to prevent discrimination against disabled people in accessing services. This Code of Practice is not an authoritative statement of the law, however there is a requirement that the court must consider any part of the Code of Practice which it deems relevant.
Paragraph 2.17 of the Code of Practice attempts to clarify the law with respect to the accessibility of websites. The paragraph contains the following example "An airline company provides a flight reservation and booking service to the public on its website. This is a provision of a service and is subject to the Act." Hence, the majority of disabilities related with Web accessibility (i.e. visual, motor and cognitive impairments) fall within the scope of the DDA.

According to Martin Sloan, "It could even be argued that someone who has learning difficulties, and therefore struggles to read long and complicated passages of text, may in certain circumstances be offered protection".Sloan suggests that "Level A [of WCAG] would be a realistic and clear standard for the Courts to set as an initial benchmark for DDA compliance" (Sloan, 2002). The authors are unaware of any guidelines or standards that are directly referenced in conjunction with the DDA. Under section 19 of the DDA discrimination occurs if a website cannot justify treating a disabled person less favourably than they would treat a person without that disability. Any person who believes that a website has discriminated against him or her may bring civil proceedings against that website. The Code of Practice states that prior to the commencement of legal proceedings both parties should strive to reach an amicable settlement of the dispute. At the time of writing the authors are unaware of any legal proceedings under the DDA. The Royal National Institute for the Blind have considered bringing a test case on several occasions, however appropriate alterations were made to the websites before proceedings commenced.

However, outwith the UK, there have been several legal actions taken out by disabled users against websites. In 2000, Mr Maguire, a visually impaired Australian won a legal action against the Sydney Organising Committee for the Olympic Games when he claimed that their Olympics.com website was in breach of the Commonwealth Disability Discrimination Act, which is similar to the UK's DDA. In reaching its decision, the Human Rights and Equal Opportunities Commission made reference to the W3C's WAI guidelines as a technical benchmark. In October, 2001, a U.S. District Judge ruled in favour of Southwest Airlines, saying that the Americans with Disabilities Act (ADA) applies only to physical spaces, and not to the Internet! Whilst not experts in American law, the authors believe that the outcome is not within the spirit of the ADA, and that the resultant negative publicity may adversely affect the company.

Strategies for Accessible Websites

The WAI's Web Content Accessibility Guidelines focus on making the website accessible to both enabled and disabled web users. The provision of an alternative accessible website is only to be considered as the last option. Tesco has gone down the route of providing TWO websites. One website (http://www.tesco.com/) is graphically rich for its enabled users. The other website (http://www.tesco.com/access/), which was launched in late May 2002, is a text-only website for its disabled users. According to Nick Lansley (IT & New Technology Manager): "We listened to our customers: blind and otherwise. If they had shared the main site, we would have had to strip out the technology that enables fast execution by sighted customers, slowing down the whole process for everyone. This way, both sites are extremely fast and exactly meet the needs of the different visitor types." Tesco's text-only website became the first website to be awarded the RNIB's 'See It Right' accessible website logo. An example of a company that has embraced the WAI's universal accessibility strategy by creating a website that attempts to be accessible by all users is Somerfield. In November 2002, Somerfield's website (http://www.somerfield.co.uk) became the first UK supermarket to achieve the RNIB's 'See It Right' accessible website logo without creating a separate 'accessible' version.

Accessibility experts fail to agree on the provision of alternative accessible websites. Jim Thatcher believes that having a separate, text-only site is the wrong thing to do. On the other hand, Kynn Bartlett believes that they're a great idea and are necessary for the evolution of the Web and for continued access to content by people with disabilities (Mayfield, 2002). The authors take the view that providing separate websites for disabled and enabled groups flies in the face of the WAI's goal of universal accessibility. A text-only website may be seen as another example of segregation, further emphasising the stigma that is often associated with disability. As web developers, we should strive to treat all users

the same way by creating a single, universally accessible website, rather than creating ad hoc accessible websites! This view is supported by Lisa Sleeman(2002): “Misunderstanding of Web Accessibility has led to a text-only approach towards implementing accessibility, where Web Authors produce allegedly accessible sites by reducing their content to simple text. This practice may remove illustrative marterial, thus reducing the accessibility of the site for the Cognitively Disabled.”

Older Web Users

According to analysts Jupiter MMXI, most Internet users over 55 are financially secure having worked and saved for years. In a recent study by Age Concern (2002), 37% of the UK’s 55 to 64 year olds used the Internet; this equated to 2.3 million web users in the 55 to 64 demographic. Age Concern also found that 11% of the UK’s 65+ demographic used the Internet; this equated to over 1 million 65+ web users.

Internet measurement company NetValue claim that, in the UK, there were over 2 million Web users over 55 in 2001, an increase of nearly 90% from 2001. This accounts for 13% of the total UK online population. This positions the UK third in the silver surfer league in Europe, behind Sweden (17%) and Denmark (16%) respectively. NetValue predict that this group of older Web users will be the largest group online before 2006. Older users account for more than 40% of the UK’s online banking (BBC, 2002).

Compare this with a recent report (2000) by the U.S. Department of Commerce which states that the 50+ group of Internet users were the fastest growing demographic in terms of Web use: a 53% increase from 1998 to 2000. The 65+ group were the fastest growing within the 50+ demographic. According to the International Data Corp “Adults 55 and older are currently the fastest-growing segment of online users across the U.S., and their numbers are predicted to more than triple from 11.1 million in 1999 to 34.1 million in 2004, accounting for 20 percent of all new users (Saliba, 2002). Third Age Media found that Web users in the 50+ group were 30% more likely than their younger counterparts to have ordered goods and services over the Internet (McNamee, 2002).

Older Web Users with Age-related Impairments

The stereotypical older user suffers from age related disabilities e.g. poor vision, reduced mobility (arthritis, RSI etc.), failing memory etc. A recent study by Jakob Nielsen identified that the majority of current websites are not designed for senior citizens with eyesight and mobility problems (Nielsen, 2002). Judy Brewer (2001) states that “Changes in people's functional ability due to aging can include subtle and/or gradual changes in abilities or a combination of abilities including vision, hearing, dexterity and memory.”.

The most common impairment affecting Web users in the 50+ age group is deterioration in their vision. Weale (1961) states that there is a 50% reduction in the amount of perceived light at age 50 compared to age 20, and this reduction increases to 66% at age 60. Because of a general decline in visual acuity, the size of text should be larger for this group of Web users. Thus Web pages should have resizable text which has a high degree of contrast between itself and the background. This is supported by the WAI guidelines. Nielsen (2000) offers the following advice “Use colors with high contrast between the text and the background”.

Echt (2002) found that “Changes in vision that occur with age can make it more difficult to read a computer screen. These include reductions in the amount of light that reaches the retina; the loss of contrast sensitivity; the loss of the ability to detect fine details”. To accommodate Web users who suffer from some deterioration in their vision Neilsen (2000) proposes that “These users typically need large fonts, which is a standard feature of most web browsers. To support these users, never encode information with absolute font sizes, but use relative sizes instead”. Nielsen (2003) places fixed font sizes at number 4 in his Top Ten Web-Design Mistakes of 2002. He claims that you should “Respect the user’s preferences and let them resize text as needed”. This concept of designing for flexibility is supported by the RNIB (2002):

> "Many people with sight problems have some useful vision, and read web pages in exactly the same way as fully sighted people: with their eyes. However the needs of

> people with poor sight vary considerably, depending on how their eye condition affects their vision. Some people require large text, while others can read only smaller letters. Most need a highly contrasting colour scheme, and some have very specific needs, for example yellow text on a black background. To cater for everyone, websites should be flexible in design, enabling individual users to use their own browser to adjust the text and colour settings to suit their own particular needs and circumstances."

The National Institute of Aging (http://www.nlm.nih.gov/pubs/checklist.pdf, 2002) suggest that textual information should be presented in a clear and familiar style, using plain and simple language, to reduce the number of inferences that can be made. Web users generally prefer writing that is concise, easy to scan, and objective (rather than promotional) in style (Morkes and Nielsen, 1998).

Older Web users also suffer a reduction in motor ability, which can adversely affect their interaction with a Web page's navigation and hyperlink components. This can mean that they may have difficulty using a mouse to interact with Web page content. Thus Web pages should be designed to accommodate, in addition to mouse users, alternative input device users e.g. keyboard users. This is supported by the WAI guidelines (Hawthorn, 2000). WebAIM (www.webaim.org/) consider keyboard accessibility to be one of the most important aspects of accessibility for disabled users who find it difficult, or impossible, to use a mouse. The use of the tabindex attribute to specify the tab order for hyperlinks is a critical factor in designing an accessible Web page for keyboard users. Gaine (2002) questions whether skip links should be hidden or visible on a Web page. He considers that skip links would be useful for Web users who cannot easily use a mouse:

> "A navigation bar is often the first thing that is come across on a page. For screen reader users, this usually means having to hear a large number of repeated links on every page before they arrive at any unique content. Providing a link that will skip over these repetitive links and allow the user to start reading at the beginning of the main body of the page provides task and time efficiency for the user. They can now navigate the page effectively and with considerably less tedium."

Exploratory Review

Whilst it is commendable that some companies go to great lengths to ensure that their website is accessible to the disabled community it is disturbing to read the results of surveys that claim that the majority of current websites are inaccessible. A survey of websites in Ireland found that "At least 94% failed to meet even the minimum WCAG-A accessibility standard." Of the websites surveyed 98% used fixed size text, and 68% had inaccessible device restrictions e.g. they were only accessible via a mouse (McMullin, 2003). An American survey found that "At least 75% of the sites tested in a recent survey fail to meet the basic requirements for accessibility" (Lewin, 2002).

Many Web users in the 50+ age group suffer from a range of impairments that, whilst not severe enough to be categorised as disabilities, adversely affect their accessibility to many websites. For example, an older user may require the website to enable them to increase the size of the Web page's text. This may be because they wear glasses and find a larger font size to be easier to read, or they may have forgotten, mislaid or broken their glasses. It would be difficult to argue that their, albeit temporary, disability is not an accessibility issue. Another example would be the temporary disability of an older user when they break a wrist and are unable to browse the Web via the mouse, thus requiring the ability to browse via the keyboard. Neither of these, or other, examples should require the older user to have to access an alternative version of their favourite websites!

Banks, supermarkets and retail stores are prime examples of business sectors that are in a favoured position to provide products and services to older people via websites. For example an older user may prefer to use a supermarket website to conduct their weekly grocery shopping and have it delivered, rather than having to physically go to the supermarket. The authors reviewed 4 websites within the banking, supermarket and retail business sectors, which were randomly selected from companies that have a *bricks and mortar* presence in the West of Scotland. The websites for each business sector under consideration were:

1. Banks: Abbey National (www.abbeynational.co.uk), Alliance & Leicester (www.allianceandleicester.co.uk), HSBC (www.hsbc.co.uk) and NatWest (www.natwest.co.uk)
2. Supermarkets: Safeway (www.safeway.co.uk), Sainsbury (www.sainsbury.co.uk), Somerfield (www.somerfield.co.uk) and Tesco (www.tesco.com).
3. Retail stores: John Lewis (www.johnlewis.com), Debenhams (www.debenhams.co.uk), Marks and Spencer (www.marksandspencer.com) and BHS (www.bhs.co.uk)

It was decided to assess the extent to which these websites complied with the W3C's WAI guidelines that applied to text and navigation. In addition a group of 252 older users, in the 50+ age group who were not registered disabled, were invited to assess the usability of the websites. This group of older users was divided into three equal sized sub-groups. Each sub-group was assigned to a different business sector and asked to assess the four websites that comprise their allocated business sector. Each of the older users reviewed their allocated websites and, for each website, answered the following three questions:

- What level of accessibility has been supported by the website's textual content?
- What level of accessibility has been supported by the website's navigation system?
- What level of accessibility for keyboard interaction has been supported by the website?

Each older user was instructed that their assessment for each website must include a grading for each of the three questions. The grading was to be a value in the range 1 through 5, based on the following:

1. No support
2. Limited support
3. Reasonable support
4. Good support
5. Comprehensive support

Findings

Assessment of Textual Content

All of the websites in each of the three business sectors provided their textual content using simple language, which was presented using an acceptable colour scheme.

Banks

Only the HSBC website offered the ability to resize the text. The NatWest and Alliance & Leicester websites provided partial support for text resizing. The assessment of the textual content by the older users who reviewed the banking websites is shown in Figure 1.

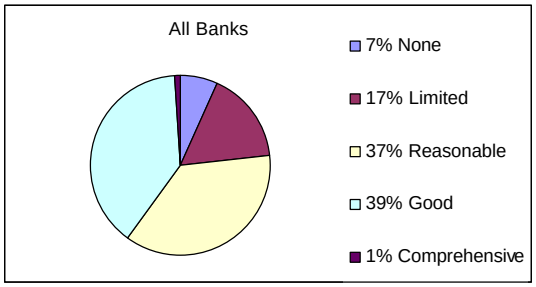

Figure 1

Supermarkets

Somerfield was the only website in this business sector which offered its users the ability to resize Web page text. The assessment of the textual content by the older users who reviewed the supermarket websites is shown in Figure 2.

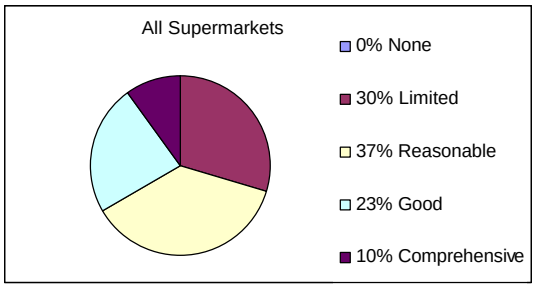

Figure 2

Retail Stores

None of the websites in this business sector offered the ability to resize the text. The assessment of the textual content by the older users who reviewed the retail store websites is shown in Figure 3.

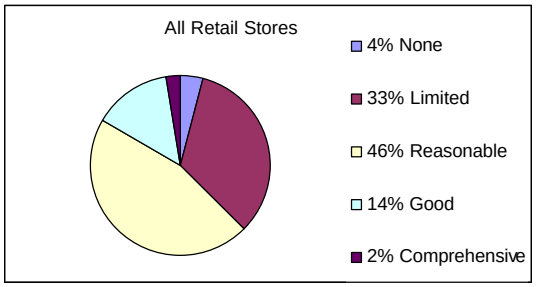

Figure 3

Assessment of Navigation System

All of the websites in each of the three business sectors were found to have navigation systems which were consistent and easy to understand.

Banks

Only the Alliance & Leicester website offered breadcrumb trails. All websites, apart from Alliance & Leicester, provided the user with a search facility. The HSBC and Alliance & Leicester websites were the only websites to offer the user a site map. The assessment of the navigation system by the older users who reviewed the banking websites is shown in Figure 4.

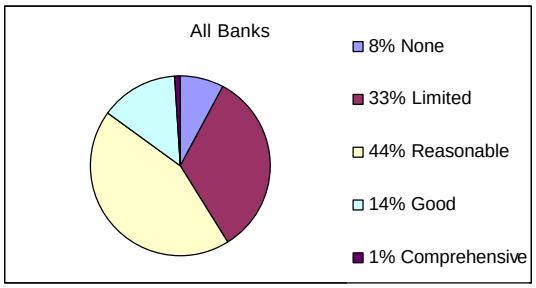

Figure 4

Supermarkets

None of the websites in this business sector offered breadcrumb trails. All websites provided the user with a search facility. The Safeway and Somerfield websites were the only websites to offer the user a site map. The assessment of the navigation system by the older users who reviewed the supermarket websites is shown in Figure 5.

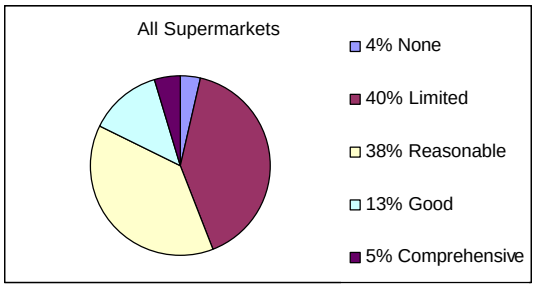

Figure 5

Retail Stores

Only the John Lewis and Debenham's websites in this business sector offered breadcrumb trails. All websites, apart from BHS, provided the user with a search facility. Only the Marks & Spencer website offered the user a site map. The assessment of the navigation system by the older users who reviewed the retail store websites is shown in Figure 6.

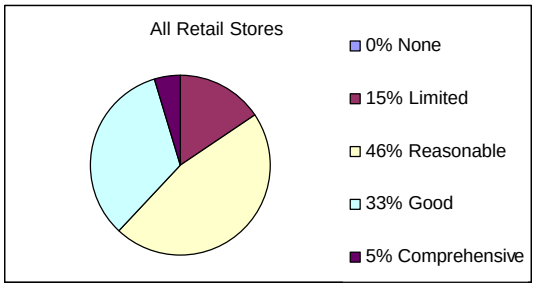

Figure 6

Assessment of Keyboard Support

None of the websites incorporated a planned tabbing order for their hyperlinks.

Banks

The drop-down menu elements in the Abbey National and Alliance & Leicester websites were not available via the keyboard. The assessment of the keyboard support by the older users who reviewed the banking websites is shown in Figure 7.

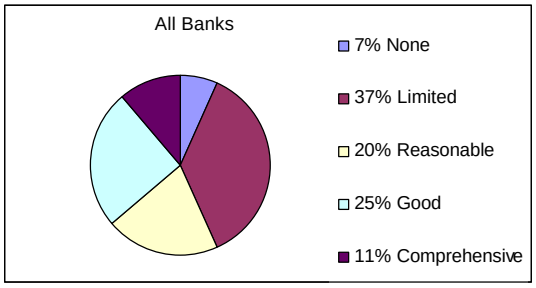

Figure 7

Supermarkets

The primary navigation tabs in the Tesco website was particularly confusing via the keyboard. The assessment of the keyboard support by the older users who reviewed the supermarket websites is shown in Figure 8.

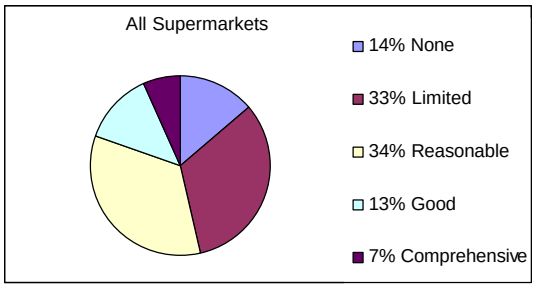

Figure 8

Retail Stores

The focus was particularly difficult to see in the primary navigation tabs in the John Lewis and Marks & Spencer websites. The assessment of the keyboard support by the older users who reviewed the retail store websites is shown in Figure 9.

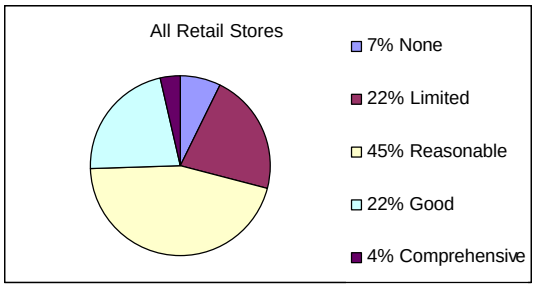

Figure 9

Conclusions

Clearly, problems with website accessibility have a deleterious impact on older Web users and the disabled, by excluding them from the full benefits of the e-commerce revolution. In addition, companies are reducing their potential customer base with obvious financial implications.

Legislation is in place to address website accessibility issues, and has a role to play in ensuring that companies have a legal responsibility to take measures to ensure that their sites do not exclude disabled users. However this is unlikely to provide a wholly satisfactory solution to the problem of e-commerce exclusion. The authors believe that more must be done to raise awareness of the economic benefits which accrue to companies which are prepared to make the effort to ensure that their Web presence is as inclusive as possible. This is likely to be a more successful approach than additional legislation.

The authors have identified that, although some companies have taken steps to ensure that their websites are accessible to older Web users, the majority of websites reviewed failed to address most of the crucial accessibility issues. It is clear that many companies assume that all visitors to their website will interact by using a mouse and therefore fail to adequately design their website to cope with alternative input devices. In particular, the review highlights keyboard accessibility as a major barrier.

While the companies reviewed were large organisations with the resources to employ a team of web designers to implement their Web presence, their efforts in creating accessible websites were not entirely successful. These problems are likely to be magnified amongst those companies who lack the resources, skills, and awareness of the issues to design an accessible website.

The WAI Guidelines promote accessibility and explain how to make Web content accessible. However, the authors believe that the current WAI Guidelines fail to adequately highlight several issues which were prominent in the website review. To address these concerns and since the WAI Guidelines have an important influence on accessible web design, the authors recommend the following:

- WAI Guideline 9.3, which relates to the specification of logical event handlers rather than device-dependent event handlers, should have its priority raised from level 2 to level 1.

- WAI Guideline 9.4, which relates to the creation of a logical tab order through links, should have its priority raised from level 3 to level 2.
- WAI Guideline 13.6, which relates to the provision of a bypass mechanism for related link, should have its priority raised from level 3 to level 2.
- WAI Guideline 3.4, which relates to the use of relative rather than absolute units in markup language attribute values and style sheet property values, should have its priority raised from level 2 to level 1.

Unless the issues associated with e-commerce exclusion are given the importance they are due, a significant proportion of the population will be disadvantaged.

The authors believe that it is the barrier to accessibility that makes an older user disabled, not their particular impairment. Hence, future research should focus on groups of older users with specific disabilities in order to determine a strategy that will ensure e-Commerce inclusion for all older users.

References

Age Concern, “Driving through the barriers to IT for older people”, available at http://www.ageconcern.org.uk/ageconcern/news_423.htm, [accessed October, 2002]

AgeLight (2001) “Interface Design Guidelines for Users of All Ages.”, available at http://agelight.com/webdocs/designguide.pdf, [Accessed: 15/03/02]

BBC, “Silver surfers taking to the net”, available at http://news.bbc.co.uk/1/hi/sci/tech/1899354.stm, [accessed October 23, 2002]

Brewer, J. (2001), “How People with Disabilities Use the Web”, available at http://www.w3.org/WAI/EO/Drafts/PWD-Use-Web/Overview.html, [accessed October 8, 2002]

Brown, R., “Getting Old and Grey?: The Implications of Demographic Change and Population Ageing for the Scottish Labour Market (2000)”

Disability Rights Commission, “Designers ignore consumers worth £200 billion”, available at http://www.drc-gb.org/drc/informationandlegislation/newsrelease_011308.asp, [accessed January 12, 2003]

Echt, K.V., (2002), “Designing web-based health information for older adults: Visual considerations and design directives”, In R. W. Morrell (Ed.), *Older Adults, Health Information, and the World Wide Web.* Lawrence Erlbaum Associates, Mahwah, NJ.

Gaine, F., “Providing ‘Skip Links’”, available at http://infocentre.frontend.com/servlet/Infocentre/Infocentre?page=article&id=150, [accessed December 11, 2002]

Hawthorn, D. (2000). “Possible implication of aging for interface designers”, Interacting with Computers, 12, 507-528

Juptner, O., “Online shoppers getting older”, available at http://www.e-gateway.net/infoarea/news/news.cfm?nid=2226, [accessed November 12, 2002]

Lewin, J., “Site accessibility for the disabled may be required”, available at http://www.itworld.com/nl/ecom_in_act/10162002/?idgnet, [accessed November 10, 2002]

McMullin, B., “Digital Democracy for All? Web Accessibility in Ireland 2002”, available at http://eaccess.rince.ie/white-papers/2002/warp-2002-01/, [accessed January 14, 2003]

McNamee, M., “Where Silver-Haired Surfers Browse”, available at http://www.businessweek.com/1998/29/b3587018.htm, [accessed November 26, 2002]

Market Intelligence Strategy Centre, “Older users drive Net banking growth”, available at http:/au.pfinance.yahoo.com/020711/1/1x2.html, [accessed December 21, 2002]

Mayfield, K., “Amazon Access: How Accessible?”, available at http://www.wired.com/news/ebiz/0,1272,49195,00.html, [accessed October 15, 2002]

Murray. G, Costanzo. T., “Usability and the Web: An Overview”, available at http://www.nlc-bnc.ca/9/1/pl-260-e.html, [accessed December 12, 2002]

Nielsen, J., “Top Ten Web-Design Mistakes of 2002”, available at http://www.useit.com/alertbox/20021223.html, [accessed February 2, 2003]

Nielsen, J., “Usability for Senior Citizens”, available at http://www.useit.com/alertbox/20020428.html, [accessed November 18, 2002]

Neilsen, J., (2000), Designing Web Usability p125

NetValue, "'Silver Surfers' continue to join the Internet revolution", available at http://uk.netvalue.com/presse/cp0084.htm, [accessed November 12, 2002]

NUA Internet Surveys, (2002), "More than 600 million people have Net access", available at http://www.nua.com/surveys/index.cgi?f=VS&art_id=905358518&rel=true, [accessed November 15, 2002]

Quinn. A., "Why People Can't Use e-Learning", available at http://infocentre.frontend.com/servlet/Infocentre?access=no&page=article&rows=5&id=163, [accessed October 22, 2002]

RNIB (2002), "Accessible web design", http://www.rnib.org.uk/digital/hints.htm, [accessed January 14, 2003]

Saliba, S., "U.S. Net Demographics Set To Shift", available at http://www.ecommercetimes.com/perl/story/4155.html, [accessed October 10, 2002]

Sleeman, L., (2002), "Inclusion Of Cognitive Disabilities in the Web Accessibility Movement ", http://www2002.org/CDROM/alternate/689/, [accessed January 22, 2003]

Sloan, M., "Web Accessibility and the DDA", available at http://elj.warwick.ac.uk/jilt/01-2/sloan.html, [accessed December 15, 2002]

Weale, R. (1961). "Retinal illumination and age", Transactions of the Illuminating Engineering Society, 26, 95

Wilkniss, S.M., Jones,M., Korel, D., Gold, P. & Manning, C., (1997), "Age-related differences in an ecologically based study of route learning.", Psychology and Ageing 12(2): 372-375

World Health Organisation, 2002, The Second World Assembly on Ageing, "Health and Ageing: A Discussion Paper": p6,7

Zajicek, M. (2001) "Supporting Older Adults at the Interface." , available at http://brookes.ac.uk/schools/cms/research/speech/publications/95_ING~1.pdf, [Accessed: 12/08/02]