User Evaluation of Age-Centred Web Design Guidelines

Panayiotis Zaphiris[1], Ulrike Pfeil[2], and Dorian Xhixho[2]

[1] Department of Multimedia & Graphic Arts, Cyprus University of Technology
pzaphiri@gmail.com
[2] Centre for HCI Design, City University London
{zaphiri,U.Pfeil-1,d.xhixho}@soi.city.ac.uk

Abstract. We report an evaluation of a set of age-centred web design guidelines (SilverWeb guidelines) with older web users. We invited 24 older web users and used a cooperative evaluation to validate the guidelines and collect any additional problems. As a result of the experiment, 36 out of the original 37 guidelines were accepted, 1 guideline was disagreed with, and 5 new issues that were not covered by the guidelines were identified by users. Our findings show that input from users is a valuable contribution to the development process of web design guidelines and is essential in order to ensure a user-centred design approach.

Keywords: Ageing, guidelines, web, user evaluation.

1 Introduction

As the number of older internet users is increasing, it is important that web designers adopt age-centred guidelines in developing websites for universal access. Many guidelines are available for web developers to follow (e.g. [19]), but severe usability and accessibility problems are still commonly found on websites [3]. This shows that there is still much work to do, both in developing accessibility guidelines that capture the needs of the user population more accurately and in raising awareness for accessibility on the side of web developers.

There are many issues which designers should consider carefully when using web design guidelines. According to Nicolle and Abascal [10], using guidelines is fairly difficult and working with them is not an easy matter. They can be ambiguous, contradictory or only partially true. They are not always clear and can have many interpretations. Thus, there is a need for a systematic and careful process in developing and validating such web design guidelines.

Most of the existing sets of web design guidelines that address the needs of older people are derived from literature reviews or are rules of thumb based on experience. But are these age-centred web design guidelines in line with the preferences of the users? Do they cover all their needs and do users actually agree with them? How can we improve existing accessibility guidelines in a way that they capture more accurately the users' needs and preferences?

In order to address these questions, we evaluated the SilverWeb guidelines [20], a set of age-centred web design guidelines, with older web users. As reported elsewhere [20], the development process of the SilverWeb guidelines includes a review of gerontology and HCI literature, expert evaluations, and comparisons with other existing

age-centred web design guidelines. We believe that an evaluation of this set of guide-lines with users will give us insight into the level of acceptance of the SilverWeb guidelines and will show whether the guidelines cover the needs and preferences of the users accurately and sufficiently. We break this aim down into the following ob-jectives:

− For each guideline, evaluate whether it is accepted by the users.
− For each guideline, assess its importance as rated by the users.
− Investigate whether the set of guidelines is complete or whether there are important issues that are not yet covered by the guidelines.

Firstly, we will give some background information about the limitations that come with age and their impact on web usage. We will then give an overview over inclusive design guidelines, in which we will also elaborate on the development process of the SilverWeb guidelines so far. Furthermore, the methods section will describe the pro-cedure that we followed in order to evaluate the SilverWeb guidelines with older people. The results will be stated in the results section and interpreted in the discus-sion section. We summarize our findings and give suggestions for practitioners and researchers in the conclusion section.

2   Background Information

2.1   Older People and the Web

According to the Office for National Statistics [14], the population aged 65 and older in the UK has increased from 7.4 (in 1971) to 9.5 million (in 2004) and is estimated to increase to 15.3 million in 2031. The statistics also reveal that the 'oldest old', people aged 85 and older are the fastest growing group in Britain, with their numbers increas-ing by 84 per cent between 1984 and 2004, to over 1.1 million [14]. Hayslip and Panek [8] state that more people will be reaching their seventies and eighties, because of an improved healthcare, better nutrition, lower mortality associated with serious illness, and perhaps an increased awareness of taking care of one's health.

In addition, more and more older people are accessing the internet. According to the Guardian [7], the Forrester Research's Consumer Technographics survey of 2004 indicated that there are 20.7 million internet users in Europe who are over 55, and 25% of European seniors go online. A 2004 Pew Internet and American Life Project study found that the percentage of American seniors who went online between 2000 and 2004 had increased by 47% [15].

There are many reasons why older people are drawn to the internet and persist in using it. SeniorNet surveyed 2,084 people in the US aged 50 and older and deter-mined that 94 per cent of older people use the internet to communicate with friends and family, followed by browsing news, searching for health information, online shopping, playing games, etc [16]. Older people are also very interested in tracing back their family history. Over 55's are four times more likely to visit ancestry and genealogy sites than the average internet users [1].

The challenge of designing websites for the older population is in thinking about how to accommodate for limitations that older people are likely to experience.

Hayslip and Panek [8] highlight that vision, including sensitivity to glare, depth perception, and colour and flicker sensitivity, start to decline in the late 50's and early 60's. Tinker [18] shows evidence of greater incidence of both acute and chronic health conditions among older people. Dooghe [5] argues that at old age, the perceptual functions gradually regress, which is manifested in hearing impairments, visual effects and deterioration of speech.

Hayslip and Panek [8] argue that ageing is affected by many biological, psychological, social, and cultural factors. Hence, not all older people suffer from impairments or are necessarily disabled. For that reason, when it comes to older people interacting with the web, it is often not an individual functional impairment that leads to a noticeable difference in their user experience. However, if all limitations are taken together, they may have a cumulative effect that makes Web interaction more difficult for older people. In one of his studies, Nielsen [11] concluded that websites are twice as hard to use for seniors as they are for non-seniors.

It is very positive news that there has been a shift in attitude in recent years, away from treating older people as special cases requiring special solutions towards integrating them in the mainstream of everyday life through an inclusive design approach [4]. Nevertheless, unless the internet is designed for universal access, older people may struggle to keep up, or at worse they might give up using the internet and feel alienated.

Even from governments, there is still much to be desired when it comes to improving internet access for older people. A report released by UK EU presidency in 2005 pointed out that the vast majority of public service websites in Europe are failing to meet international e-accessibility standards. The report shows that only a mere 3 per cent of the EU public service websites comply with the minimum accessibility requirements of the World Wide Web Consortium (W3C) guidelines [19].

2.2   Inclusive Design Guidelines

Inclusive design, also known as universal design or design for all is about designing products or services to be accessible to as many people as possible. In order to be inclusive for most people, products, systems, and environments need to be accessible especially to older and disabled people. Colman [4] argues that the unprecedented growing number of older people is challenging common assumptions about the way products and services should be designed, if they are to meet the needs of the majority.

The mismatch between the designed world and the changed capabilities of older people has a significant impact on their independence. Nicolle and Abascal [10] supports this, by stressing that older people may lag behind the advances in information and communication technology, unless technologies are designed with their functional impairments and requirements in mind.

One of the cheap and effective ways that designers and developers use in order to match the design of their products with users' needs is through the use of design guidelines. In the context of HCI, Dumas and Redish [6] describe guidelines as specific goals that HCI specialists and designers distil from the design principles for different users, environments, and technologies. According to Nicolle and Abascal [10], inclusive design guidelines are simplifications that must be general enough to be applicable to a wide range of products and services, usually drawn from best available

practice. Inclusive design guidelines are expected to make the design process easier and to help maintain coherence with previously taken decisions.

Nicolle and Abascal [10] further argue that the use of inclusive design guidelines contributes not only towards an inclusive design philosophy leading to more usable systems for all, but also facilitates the storage of knowledge and transmission of successful experiences among designers. In assessing the longevity of a 1986 usability report, Nielsen [13] concluded that its guidelines endured the time and the majority of them were still found to be valid, because they depend on human behaviour, which changes very slowly.

2.3 SilverWeb Guidelines

The SilverWeb guidelines were initially based on a literature review of over 100 peer-reviewed papers from the area of Human-Computer Interaction, web design and ageing. Out of the reviewed papers, an initial set of 52 guidelines was extracted, and the results of this process were reported in a CHI 2005 paper and an ASSETS 2005 paper [9], [21]. Card sorting was then applied in order to improve their categorisation, and a Focus Group with HCI experts reviewed the guidelines to further improve them. This process resulted in a new smaller set of 38 guidelines that were sorted into 11 categories. The results of this part of the work are reported in a UAIS Journal paper [20]. In order to validate the new smaller set of guidelines, a Heuristic Evaluation was performed with both sets of guidelines and the guidelines were then evaluated in a controlled experiment with 16 older web users.

The SilverWeb guidelines were then compared to seven other sets of web design guidelines for older and/or disabled people. Discrepancies between the set of guidelines were identified, and a Focus Group was conducted in order to discuss changes to the existing guidelines. This process resulted in a revised set of 37 SilverWeb guidelines.

The aim of the work reported in this paper was to further validate the success and acceptance of this final set of the SilverWeb design guidelines (also listed in Table 1) with older web users and to identify any remaining usability problems not surfaced so far. We believe that a complete and user-centred methodology in the development of the SilverWeb guidelines is necessary to ensure clarity and accuracy of the guidelines. After a literature review, expert evaluations, an experiment with users, and comparisons with other guidelines, we think that a final evaluation of the guidelines with older web users completes the development cycle of the SilverWeb guidelines. Furthermore, the inclusion of users in the guideline development might lead to an easier acceptance and increased use of them by web developers.

3 Methods

The study was conducted in the form of a cooperative evaluation with 24 older web users who helped us validate the acceptance of the SilverWeb guidelines and identify any additional problems. The result comprised the accepted guidelines, disagreed guidelines and new problems identified from user feedback. The following sections outline the procedure that we followed.

Before each session, we had an informal chat with the users, introducing them briefly to past research and the procedure we intended to follow. Right after the briefing, the users were asked to sign a consent form. The evaluation was run with one user at a time and lasted between one and two hours per user.

A simple and easy to use website was developed in HTML, where each guideline was allocated a page with a good and a bad example. The number of guidelines was 37, which meant that at least 74 examples had to be developed, a pair for each guideline. Some of the examples would point to a particular website, whereas some others were built onto the page itself.

A pre-evaluation questionnaire was designed to collect background information about the participants, concerning their age, information about any experienced impairments, and about their experience, training and skill level in using computers, and especially the internet. We were also interested in the activities of the participants on the internet: what they use the internet mostly for, their likes and dislikes about the internet, and how simple and easy to use the internet was considered by them.

The guidelines were evaluated with the help of the prepared examples, which were used to "visualise" each guideline and probe reactions from the participants.

The evaluator first read the description of each guideline, explained it briefly to the user and then presented the user with a good and a bad example, which best conveyed that guideline. The evaluation was a continuous dialogue between the evaluator and the user, as the guidelines were presented to the user one by one.

The user had the option to agree or disagree with the necessity of the guideline, give a rating from 1 to 5, where 1 meant "not at all important" and 5 meant "very important". Furthermore, the user was encouraged to comment on agreement or disagreement with each guideline and suggest any additional problems.

During the dialogue with the user, the evaluator prompted the user to elicit reasons for his/her judgements. Right after each evaluation, the evaluator went through the recorded protocol to check for any discrepancies with the notes taken. This was necessary to make sure that no comments were missed.

The post-evaluation questionnaire was filled out right after the evaluation. It was designed to collect information mainly about any additional problems or issues not mentioned during the evaluation. This information was useful during the analysis of results in identifying any additional guidelines, as that was one of the objectives of this study. The debriefing with users took place after they filled out of the post-evaluation questionnaire. It was not recorded. The interviewer gave participants the opportunity to speak out freely and "off the record" about their experience and gave the opportunity for the users to add any additional comments or problems that they encountered during the evaluation. The whole process was facilitated in a way to make sure that the users understood and felt that their contributions were highly valued and useful to us.

4   Results

The average age of participant was 66.3 years, with the youngest participant being 58 years old and the oldest one being 79 years old. Among the users, 42% (10 participants) were male and 58% (14 participants) were female. Only 12% of the participants said that they had problems using the web due to vision and/or hearing problems.

On average, participants were using the computers for 6.4 years (range between 1 month and 25 years) and were using the internet for 2.1 years (range 1 month to 10 years). Most people ranked themselves being either a novice or competent with using computers (38% novice, 42% competent), with only few of them reporting being advanced or even an expert. Concerning internet usage, less people ranked themselves as novice (25%) and more as competent (63%), but again, very few thought that their skills were advanced or expert. All participants reported using the computer and the internet at least once a week, with the average number of days being 2.7 for computer usage and 2.3 for internet usage. 71% of the participants stated that they were trained in using the internet, and their activities included searching the internet for information about their hobbies, writing emails, online shopping, and even designing their own website.

When asked about the perceived usability of websites, the majority of users (92%) found the Web to be fairly easy, easy, or very easy to use, only 8% finding it difficult. None of the users found using the internet very difficult. 33% reported that they come across websites that are not easy to use either often or very often. The majority of people said that this happened to them occasionally (34%), with 33% of the people reporting it to happen rarely or not at all.

When asked whether the Web should be more accessible to the elderly, all participants agreed that the internet should indeed be more accessible to older people. When asked to rate the importance of it being accessible, on a scale of 1 (not important) and 5 (very important), the average rating was 4.54. The last two questions of the pre-evaluation questionnaire were about users' experiences with the internet. Users were asked to list three things they least and most liked about the internet. After removing any duplicates, the following issues were mentioned:

What are three things you least like about the Web?: Small illegible text, pop up windows, animations, confusing navigation, outdated information, junk mail, complication, repetition, bad background, cluttered information, scrolling text, ambiguity, useless help, jargon, broken links.

What are three things you most like about the web?: Search engine, email, news, learning, online booking, lots of choice, information all in one place, research, convenience, blogging, access to music, socialising, freedom of speech, games, keeps company, publish information.

Overall, our evaluation showed that the SilverWeb guidelines were accepted and rated highly by older internet users. According to the findings, 36 of the original 37 guidelines were accepted by all our participants, 1 guideline was rejected by one participant and 5 new user problems were identified. The guidelines were rated from 1 to 5, the lowest rating being 4.50, the highest 5.00 and the average 4.84.

All participants reported that they found the evaluation interesting and the tasks and examples easy to understand. When asked if they could think of any other issues or problems not covered by the guidelines, 5 additional issues were mentioned:

- Websites should warn users to take breaks if staying in front of them for a prolonged time.
- Text input should be saved regularly to assist users with mistakes.
- Websites should all have a print button on each page.

- A sorting filter should exist in displaying results, when searching by keywords.
- Websites should all have an option of translating the content into English.

The last question of the post-evaluation questionnaire was whether users thought that the guidelines developed will help older people in the future to have better access to the Web. 96% thought it will definitely help, whereas 4% thought that that "might" be the case.

5 Discussion

The main objective of this report was to validate the SilverWeb guidelines with users. We investigated whether the developed guidelines were accepted by older internet users, and to what extent. Since the number of the developed guidelines was relatively large and many guidelines received equal ratings, we decided to examine in detail the guidelines that received the two highest and lowest ratings.

The guideline with the highest rating of 5.0 was guideline number 15 "Avoid information overload on the screen, e.g. introduction paragraphs should be relevant and short". Berners-Lee [2] and Nielsen [11] argue that people browse websites for their content. They wish to get to it quickly and easily. After users were shown the bad example of this guideline, their comments about it were that, when the information is literally "dumped" on the screen with no spaces or introduction paragraphs, it is difficult to understand and "decipher" it. The rating of this guideline indicates that it is important for older web users that the information is presented to them in a clear and organised manner with not too much information at once. Texts should be divided into paragraphs that make it easy for the user to get a first overview over the structure and content. As Brink et al. [3] advocate, non-functional graphics and other interface elements can skew a user's perception of usability.

The next second highest rating was 4.96, which was given to the guidelines: 7 "Clear navigation should be provided that matches the user's mental model", 14 "Language should be simple, clear and consistent, using the active voice", 17 "Information should be concentrated mainly in the centre", and 32 "Choose typefaces and fonts by their familiarity, advisably use san serif type font i.e. Helvetica, Arial of 12-14 point size. Drop shadows on text".

Guideline 7 "Clear navigation should be provided that matches the user's mental model": In order to get to the information, users have to go through the navigation of a website, which to users can either be a helping hand or a time wasting maze and strain. One of the users considered navigation as the main aspect of his web experience. He admitted that in several occasions, although he knew that particular websites held the information he was looking for, he could not access it, because of their confusing navigation. This finding shows that navigation is a key element in accessibility of websites for older people and should be taken seriously by web designers. As the high rating of this guideline shows, a confusing navigation structure can seriously restrain older internet users from accessing a website.

Guideline 14 "Language should be simple, clear and consistent, using the active voice": The language has to be inclusive, simple and clear to follow. The bad example of this guideline was commented from users to be confusing, irritating and unhelpful.

Again, users wanted the information and content of a website as easy and clear as possible. One of the users suggested an additional guideline, which was based on the language. She suggested that all websites should have an option of translating their content into English, so that it is accessible to a wider audience.

Guideline 17 "Information should be concentrated mainly in the centre": This guideline was rated to be very important and the information was commented to be easier to read and less time consuming to find if placed at the centre of the page. A lot of websites put the content in the centre of the page with the navigation and sometimes advertisements placed around it. This strengthens users' expectations that the main content is placed in the centre of the page. Content that is placed at the border of the page is therefore often overlooked.

Guideline 32 "Choose typefaces and fonts by their familiarity, advisably use san serif type font i.e. Helvetica, Arial of 12-14 point size. Drop shadows on text": As vision deteriorates with age, larger font is more visible and easier to read for older users. Furthermore, a clear font style adds to an effortless reading experience. All of the users found a large font size more readable. Even users who argued that their vision was fine, and they were able to read small fonts preferred a large font size as it made reading the text easier for them.

The lowest rated guideline was number 10 "Avoid pull down menus" (rating: 4.50). Many users did not mind the pull down menus. Some did not think that pull down menus made the navigation difficult, while others even enjoyed them. One user said that they help in grouping the information all in one place. The results showed that 20% of users rated this guideline 3 out of 5, 8% at 4 out of 5 and 72% at 5 out of 5. Users seemed to prefer alphabetic lists to drop down menus, since it helped them scan through menu options easily.

The second lowest rated guideline was number 19 "There should be differentiation between visited and unvisited links", at 4.67 out of 5. The majority of users rated this guideline relatively high and recognised that it was very helpful in distinguishing between visited and unvisited links. However, some users indicated that sometimes the change of colour was not clear enough to distinguish between the links. Although raised by a small number of users, these comments point out that web designers should be careful in colour selection of links.

A number of users had concerns regarding some of the guidelines. One user disagreed with guideline number 11 "Do not have a deep hierarchy; avoid this by grouping information into meaningful categories". He argued that information is easier to find in deep hierarchies, and believed that the more horizontally spread the information is, the less precise the categorisation is likely to be.

On the other hand, the deeper the hierarchy, the more difficult it is for an older internet user to select the information. 17% of users participating in the evaluation suffered from different disabilities, one of which was arthritis. A deep hierarchy would prove to be an unnecessary difficult challenge for this user group. Looking at the ratings of this guideline by the rest of our users, it can be seen that most of them rated this guideline as quite important. 8% of the participants rated it 4 out of 5 and 88% rated it at 5 out of 5. Although disagreed by one user, since the overwhelming majority agreed with this guideline, it can safely be considered as accepted.

6 Conclusions

Our study showed that the inclusion of older people in the development and evaluation of age-centred web design guidelines is crucial in order to ensure that the guidelines are in line with users' needs and preferences.

Although the SilverWeb guidelines were generally rated high by our evaluation participants, additional problematic issues that were not covered by the guidelines were identified. This shows that guidelines need to constantly be evaluated and revised according to current user needs.

The results of this study should be looked in combination with the previous stages of our systematic approach in developing the SilverWeb guidelines. Overall our previous papers [9], [20], [21] together with this reported study provide a complete approach and methodology for user-centred development of design guidelines for older people. We believe that such an approach achieves better accuracy and clarity of the guidelines and leads to an easier acceptance and use of them by web developers.

The SilverWeb guidelines and the results of our evaluation can serve as a basis for future research. Investigations need to be conducted in order to validate, improve, and refine the guidelines and to bring them in line with user needs and preferences. The additional guidelines generated from this study need to be analysed in more detail in order to generalise and validate them with a larger user population. Furthermore, the SilverWeb guidelines can be fed into analysis tools, which check the compliance of websites with accessibility guidelines.

We encourage researchers to apply our approach of guideline evaluations with the user population to accessibility guidelines that focus on other user populations. We believe that the inclusion of the user in the development and evaluation of web design guidelines is a crucial part to ensure the validity and usefulness of these guidelines.

References

1. BBC. Silver surfers taking to the net (2002),
   `http://news.bbc.co.uk/1/hi/sci/tech/1899354.stm` (accessed May 13, 2007)
2. BrainyQuote. Tim Berners-Lee quotes (2006),
   `http://www.brainyquote.com/quotes/authors/t/`
   `tim_bernerslee.html` (accessed May 13, 2007)
3. Brink, T., Gergle, D., Scott, W.: Usability for the web: designing websites that work. Morgan Kaufmann, San Fransisco (2006)
4. Coleman, R.: Inclusive design (2006),
   `http://www.designcouncil.org.uk/inclusivedesign` (accessed May 13, 2007)
5. Dooghe, G.: The ageing of the population in Europe: Socio-economic characteristics of the elderly population. Garant Publishers, Leuven (1992)
6. Dumas, J., Redish, J.: A practical guide to usability testing. Intellect. Exeter (1999)
7. Guardian Unlimited. On the crest of a wave (2004),
   `http://technology.guardian.co.uk/online/story/`
   `0,3605,1353207,00.html` (accessed May 13, 2007)

8. Hayslip, B., Panek, P.: Adult development and ageing. Harper & Row Publishers, New York (1989)
9. Kurniawan, S., Zaphiris, P.: Research-derived web design guidelines for older people. In: Proceedings of 7th International ACM SIGACCESS Conference on Computers and Accessibility (ASSETS 2005). ACM Press, Baltimore (2005)
10. Nicolle, C., Abascal, J.: Inclusive design guidelines for HCI. Taylor & Francis, London (2001)
11. Nielsen, J.: Designing Web Usability: The Practice of Simplicity. New Riders, Indianapolis (1999)
12. Nielsen, J.: Usability for Senior Citizens (2002),
    `http://www.useit.com/alertbox/20020428.html` (accessed May 13, 2007)
13. Nielsen, J.: Durability of usability guidelines (2005),
    `http://www.useit.com/alertbox/20050117.html` (accessed May 13, 2007)
14. ONS. Population trends 123 – Press release January 2006: Rise in proportion of over 85s living alone (2006),
    `http://www.statistics.gov.uk/pdfdir/pop0306.pdf` (accessed May 13, 2007)
15. Pew. Older Americans and the Internet (2004),
    `http://www.pewinternet.org/pdfs/PIP_Seniors_Online_2004.pdf` (accessed May 13, 2007)
16. Senior Journal. Seniors online increase (2003),
    `http://www.seniorjournal.com/NEWS/SeniorStats/3-02-04SnrsOnline.htm` (accessed May 13, 2007)
17. The Register. Government Websites Fail to Meet Standards – Elderly, disabled, not being served (2005),
    `http://www.theregister.co.uk/2005/11/28/electric_disabled/` (visited May 29, 2006)
18. Tinker, A.: Elderly people in modern society. Longman, New York (1992)
19. W3C. Web Content Accessibility Guidelines 1.0 (1999),
    `http://www.w3.org/TR/WAI-WEBCONTENT/` (accessed May 13, 2007)
20. Zaphiris, P., Kurniawan, S., Ghiawadwala, M.: A Systematic Approach to the Development of Research-Based Web Design Guidelines for Older People. Universal Access in the Information Society (2007)
21. Zaphiris, P., Ghiawadwala, M., Mughal, S.: Age-centered research-based web design guidelines. In: Proceedings of CHI 2005 Human Factors in Computing Systems. ACM Press, Portland (2005)