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An ethnographical study of the accessibility barriers in the everyday interactions of older people with the web

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Abstract

Older people experience many barriers when they access to the web. However, little is known about which barriers limit more (or less) their daily interactions. This paper presents some findings based on an ethnographical study of the everyday interactions of nearly 400 older people with the web over 3 years. Difficulties remembering steps, understanding terms and using the mouse are more severe than problems perceiving visual information, understanding icons and using the keyboard. This is largely explained by inclusion, independence, and socialisation, which three key components of real-life web use. This paper also shows that these aspects should be considered in other areas of web and ICT accessibility, as technophobia is not the only experience in the interactions of older people with the web, and both social relationships and life experiences beyond technologies need to be taken into account apart from age-related changes in abilities. These findings suggest that the current focus on compensating for age-related changes in functional abilities needs to be widened. Working towards making the web more accessible should not be divorced from real-life use. This paper discusses implications for web (and ICT) design, training and support.

Keywords: ethnography, web accessibility, older people

1. Introduction

The importance of the web today and the barriers that older people are faced with due to changes in major life functions [6], low educational levels and lack of experience with Information and Communication Technologies (ICT) [67], create the need to make the web more accessible to them. Much research has involved laboratory studies and overlooked how older people make use of and interact with the web in their daily lives. However, understanding everyday interactions is key to design better technologies [8, 47].

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[1] Sergio developed this research while he was working in the Interactive Technologies Group at Universitat Pompeu Fabra and Barcelona Media Centre d'Innovació (Barcelona, Spain)

This paper presents findings based on an ethnographical study of real-life use and interactions of nearly 400 older people with the web during 3 years. Such study addresses the barriers that limit their daily interactions, their relative degree of severity, the reasons behind both, and the variations regarding ICT experience and education.

Difficulties understanding terms, remembering steps to perform a task, and using the mouse are shown to limit older people's interactions more severely than understanding icons, perceiving visual information, and using the keyboard. The barriers and their degree of severity are independent of digital literacy and education, and are largely explained by key aspects of real-life use, independence (not relying on others), inclusion (not feeling different or in need of special assistance), and socialisation (not being alone), which is their motivation for using the web (and ICT). These three aspects impact on relevant areas such as design methods and interaction measures. Interactive experience that should be explored more is also uncovered.

The rest of the paper is organised as follows. Section 2 reviews previous work on web accessibility for older people and ethnography. Section 3 describes the ethnographical study by detailing the context, the profile of the participants and the methods. Section 4 presents the findings, which are discussed in Section 5. Section 6 presents the main conclusions and outlines future research perspectives.

2. Related Work

2.1 Web accessibility for older and disabled people

Compensating for age-related changes in functional abilities, lack of experience with the web and low educational levels is central to guidelines, hardware and software research aimed to enhance web accessibility for older people. This type of work is usually conducted in laboratories or controlled environments.

Coping with the effects of age-related changes in vision, hearing, mobility and cognition are documented in web design guidelines [21, 33, 48, 68]. Simpler screens and reduced functionalities were key to develop e-mail systems [2, 19, 30]. The design principles of a portal [50] focused on changes in vision, memory, lack of experience with web concepts and issues related to double-clicking. Published guidelines on visually accessible design and constantly available instructions, written in a non-technical language to reduce cognitive load and learning, were used in the design of a web search and navigation system [18]. Reducing efforts while preserving the pages

layout was the best strategy to alleviate functional impairments in the personalization of web page presentation [41], while solving difficulties in screen reading and using the mouse were key elements in personalization [29]. Age-related changes in manual dexterity had a negative impact on web browsing with several input devices [38]. Small font sizes, confusing advertisements and the standard mouse were relevant barriers for nuns [64]. Scrolling, opening new windows in the browser, the small size of buttons and the short distance between navigation buttons were accessibility barriers for disabled and older users [27, 34]. Solving problems with using the mouse, terminology and remembering the web structure were the basis to design a more accessible search interface [3]. Both the approach and the focus on age-related factors are also the hallmark of Human-Computer Interaction (HCI) research with older people, examples ranging from assistive technologies [32], design methods [22], training materials and programs [45], to the design of input and output devices [24] and interfaces [31, 54, 66].

Yet, very little is still known about the severity of these accessibility barriers in the everyday interactions of older people with the web. It can be argued that this depends on the type of application, context and user. However, this gap indicates that further research is warranted. This paper presents an ethnographical study carried out in order to fill this gap.

2.2 Ethnography in web accessibility for older people

It is widely recognised in HCI that the classical focus on cognitive aspects of individual users engaged in performing tasks efficiently is not sufficient to design better technologies; understanding the social contexts of system use and the experiences of people and ICT also comes into play [4, 8, 9, 36, 46, 63]. HCI has looked to ethnography to gain this understanding. Examples range from the seminal studies of work practices [7, 35, 65] to more recent ones of domestic technologies [51], mobile ICT in taxis [23], and experiences felt by teenagers sending text messages [39].

Ethnography allows (i) to make visible the context of system use, social practices of interactions and communities' sensibilities which might not otherwise be found [43, 44]; and (ii) to provide explanatory frameworks for whatever is observed, providing with new ways of defining the relationship between people and technologies [20]. However, some claim that (i) ethnographical reports might not be veridical representations of the facts observed [10] and tend to be long documents, making difficult for designers to use them; (ii) performing ethnography is time consuming and

consequently expensive, so its integration into engineering processes is difficult [8]. Yet, ethnography has made relevant contributions to further the current understanding of interactions [1, 8, 53]. Several ways of communicating ethnographical insights more effectively have also been created (e.g.; Personas [52] and the Work Models of Contextual Design [5]), as well as reduced[2] forms of ethnography designed to fit in with software engineering [53].

Although ethnographical interviews have been carried out in the design of home-based communication systems [55] and applications to support older people in their own homes [16], no ethnographical studies of their everyday interactions with the web have been published [59]. Considering this and that older people are not standard HCI users [17], a classical ethnographical study was carried out, as "There is no substitute for gaining tacit and implicit knowledge of cultural behaviour than living among people and sharing their lives" [15, p: 291].

3. Description of the study

3.1 Context

This study was undertaken in Àgora from 2005 to 2008. Àgora is a 20-year-old association[3] in Barcelona (Spain) committed to integrating into society immigrants, non-educated and older people, who are or might be alienated from it[4]. This is done through informal learning in free courses in several subjects (e.g., languages, maths and literature). Mastering ICT is regarded as an essential inclusive element, and courses in computing, Internet access and frequent workshops are provided. More than 1000 people (using Àgora's terminology, 'participants') participate in these activities monthly.

Participants decide what technologies they want to (learn to) use according to their needs and interests. Courses and workshops are geared to support daily life activities, ranging from e-mailing their grandchildren and creating multimedia

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[2] Classical ethnography consists of a long period of immersion (minimum one year) into the daily activities of a community of people, combining observation with participation [43].
[3] Within Escola d'Adults La Verneda – St. Martí (an adult centre), http://www.edaverneda.org
[4] Half of the current Catalan population has its roots in other parts of Spain. This immigration took place in the 1930s/40s. Immigrants have very low literacy levels, especially women. Another wave of immigration has been experienced recently, mostly coming from Morocco, South America, Pakistan, India and Romania, representing 13.1% of the population in 2006, with difficulties integrating into society due to language and cultural barriers. A description and analysis of the introduction of the network society in Catalonia can be found in [11].

presentations for birthdays to looking for local information. Another aspect of participation is the use of dialogic learning [25][5] in the activities, wherein the traditional division between teachers and learners is blurred. Older people who started courses with little acquaintance with ICT but who progressed quickly, often become trainers.

Ethnography was used in the context of courses. Thanks to Àgora's participatory philosophy, extensive material was gathered related to real use of ICT, which differs from the one that can be collected in more traditionally oriented training environments.

3.2 Participants

During the study 388 older Spanish people were observed, conversations were held with them. 10% were Catalan, while the others were born in other parts of Spain. All of them were living in Barcelona or towns in the outskirts. They ranged from 65 to 80 years old (M=72; SD=2.4) and experienced normal age-related changes in functional abilities[6]. They are fairly representative of the Spanish population over 60; older people have low literacy levels [37]. 350 participants left primary school when 12, half of them had used some technologies in their jobs (e.g., calculators and cash registers), but none had used computers or accessed the web before. The rest (38) left school when 16 and were familiar with basic web concepts (e.g., clicking and windows management) through use of ICT in their jobs.

Interviews (detailed later) and information conversations revealed that their main motives for enrolling in the courses were: (i) not to lag behind in society, (ii) to keep in touch with their loved ones, and (iii) not to miss the opportunity to learn that they were not given in their childhood. Although some claim that older people tend to lack motivation to use ICT [49], the participants in this study are technology pioneers and show the real use that a number of older people are making of ICT in their lives, which will be more general in the future.

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[5] Dialogic learning assumes that knowledge is not always disseminated from the top down to students. It can flow from the bottom up. Individuals with no academic qualifications (e.g., older people), who would reject formal or academic activities because of a number of reasons (they think are unable to create new knowledge, scholastic skills are difficult to acquire in later life), can produce knowledge on the basis of their own experience and the exchange of information with other people.

[6] Changes in vision, hearing, cognition and mobility due to the normal process of ageing that do not limit the ability of an older person to carry out (Instrumental) Activities of Daily Living on his or her own.

3.3 Data and methods

3.3.1 Observations and informal conversations

During the study, the researchers observed and talked with over 200 participants frequently (2 - 3 times per week, 2 - 4 hours each time) while they were using ICT in courses, workshops and meetings[7] coordinated by one of the authors. Direct contact was also established with almost 175 participants in other educational activities where the researchers attended as observers (see Table 2 in Appendix A). Twenty participants were doing several courses at the same time and were also involved in other Àgora's activities. The others enrolled in one or two courses per year[8]. They also went to Àgora weekly to access to Internet or participate in meetings and workshops.

3.3.2 Formal conversations

Semi-structured interviews were ran with middle-aged trainers, who had been running computing courses for older people for more than five years, to gather their views on the web accessibility barriers faced by older people and guide (together with our literature review) the ethnographical study. As work progressed, it emerged that e-mailing was very important, and the research was enriched by conducting a series of in-depth interviews [60]. Focus groups[9] were carried out regularly at the end of some courses and workshops over the 3 years, to understand better in-situ observations and informal conversations. Details are presented in Table 1.

Method	Topics discussed	Characteristics
Semi-structured interviews	- The type of older people going to Àgora. - The most and least important web accessibility barriers for older people - The role of social relationships in training older people and in their interaction with ICT	- Number: 20 - Duration: 1 hour - Participants: 10 men, 10 women - When: first three months of the study
In-depth interviews	- Interaction with email systems, difficulties and usage - The role of social relationships, relatives and friends, in emailing	- Number: 5 - Duration: 1 hour - Participants: 3 women, 2 men - When: first and second year of the study

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[7] Organized monthly to discuss the positive and negative aspects of the courses and activities carried out in Àgora. These meetings are also an opportunity to discuss aspects of the use of the web (and other ICT), while workshops are hands-on sessions on technologies.

[8] Due to personal responsibilities (e.g., looking after their grandchildren or ill relatives) or because of ill-health conditions.

[9] Focus groups instead of individual interviews because the recruitment was easier to do with the former. Also, socialisation is a key aspect in the real-life use of computers and the web for older people, as discussed later on.

Focus groups	• The most and least important web accessibility barriers • The relevance of relatives and friends in older people's interactions	• Number: 8 • Duration: 2 hours • Participants: between 5 and 10 in each session; 43 men and 27 women • When: every 4 months (approx.)

Table 1: Interviews and focus groups

3.3.3 Gathering and analysis of data

The study relied on written field notes, as recording with video, audio or laptops would lack empathy - participants writing down their notes by using paper and pencil, like other people in the association. Once the individual interviews were transcribed, a second meeting with the participants was fixed to validate them by reading aloud the transcriptions and asking participants to either agree or disagree. As it would have been difficult to organize a second session with exactly the same participants of the focus groups, notes were read aloud at the end of each session.

The conducted (qualitative) ethnographical analysis is based on open, axial and selective coding and the constant comparison technique of the Grounded Theory approach [28]. After an initial detailed reading of the notes to gain an overall sense, a second one was open coded and led to an initial code list; the process was iterated until it was deemed that the analysis of the data gathered had reached theoretical saturation. Most of the codes were taken from the participants' language. Axial coding was carried out to establish relationships between the open-coded categories identified. The initial and axial list produced core and subcategories, so data were selectively coded in those terms. This process was repeated every 3 months, in order to identify emerging relevant issues which could enable to expand the focus of the rest of the study [12].

The core categories that emerged from the analysis were:

- Use: socialisation, independence, inclusion, life experience, feeling of accomplishment and still being useful

- Accessibility barriers: vision, terms, cognition, remembering steps, input devices, icons and assistive technologies

4. Findings

The results are divided into three sections: (i) key aspects of motivation and real-life use, (ii) severity of web accessibility barriers and (iii) aspects of real-life web accessibility research. These sections include extracts taken from field notes, translated

from Spanish into English by the authors. Extracts corresponding to participants are preceded by [gender letter, age], while those corresponding to authors are identified by [Researcher].

4.1 Key aspects of motivation and everyday use

4.1.1 Socialisation

A key and common motivation for all the participants to use the web was to socialise. They did not want to do activities that could isolate them. Socialisation occurred at two levels:

1) Physically: Interactions were often carried out in pairs. One third of the participants were able to use the web independently. However, they said that they felt useful and active when sharing their knowledge with and learning from others. For the rest of the participants, going online with friends was a natural way of learning and using the web. They also pointed out that individual learning activities would not have been so useful, since they were not used to them.

[Researcher]: *How important is for you to go online in pairs?*

[Woman K, 75]: *It's very important. I see my children and other young people in Àgora using computers alone. However, I don't want to be alone when using computers. I do spend a long time alone and I want to socialise a bit. Working with a good friend and discussing how to do things with him is very valuable. Sometimes they tell me things I don't know and I try them out at home, or ask you in courses. I think there's no point in using computers alone when you're an old folk. Sharing what you know with people is very useful; it makes me feel alive!*

[Researcher]: *You two always go online together.*

[Man M, 80]*: Yes, that's true. Is that we feel much more confident if we do things together. We're still a bit afraid of making mistakes. Also, when we were at school and work, most of the things we learnt have been by talking to people, rather than reading books. I've never read a book about how to do the activities I did in my job. I've worked as a builder. Instead, I asked workmates and they taught me how to do this and that. In the courses, we discuss where to click and what to do. We work as a team and this work wonders, as you can see!*

These extracts also show the relevance of education and work experiences, which form the basis for their learning and interaction strategies.

2) Digitally: Most (350) of the participants e-mailed and chatted with their grandchildren, children, and close friends. The specific case of e-mailing has been addressed in a previous paper [60].

[Researcher]: *Welcome to this session on e-mail. Before starting the course, I'd like to know why you've decided to take part in it so that we can do things that are useful to you.*

[Man F, 68]: *I want to send e-mails to my children. They're all studying abroad and told me that we can be in touch by e-mail. I heard that it's also cheaper than the phone, so I'm very interested in the e-mail.*

[Woman X, 74]: *My grandchildren are very special for me and I want to be closer to them. They e-mail a lot and tell me that they want to e-mail me, but I've got no clue about doing it. That's why I'm here.*

4.1.2 Independence

All the participants aspired to go online without relying on anyone: they had been independent individuals in their adulthood and wanted to be so using computers in their old age.

[Woman T, 70]: *It's very frustrating to see that you can't do things with this machine on your own.*

[Researcher]: *Don't despair!*

[Woman T, 70]: *I know what you mean, but the point is that I've been able to bring up my three children, take care of my mother and husband, and all of this while I was working cleaning houses. I haven't required support from anybody. However, I can't move forward on this screen unless you give me a hand, and this is very frustrating!*

A key aspect for achieving independence was to receive training support. However, participants indicated that their children, despite being very important for them, were not the right persons for teaching them. They tend to be impatient and speak computer jargon without explaining the meaning of technical terms. Patience, perseverance and using a language allowing older people to understand technical words in their own way were regarded as key qualities for trainers.

[Researcher]: *Do your adult children give you a hand?*

[Man Q, 62]*: I think that I speak on behalf of all of us when I say that children aren't good teachers. They speak in a language we don't understand. We ask them to go slowly but they take no notice of that. We ask them to repeat the same thing and they tell us that they have other things to do. In conclusion, we've got to find support elsewhere. And we've found it here, in Àgora. You've taught your children a lot of things, and when you need help from them, you find that they don't have time to teach you to use computers. This is life!*

On the other hand, when children were more supportive of their parents' needs (10% of the cases), the participants regarded the help received as insufficient so that they could use computers on their own. Their children could not spend too long with

them due to work and social activities. And participants did not ask questions after the "training sessions" since they did not want not to interfere in their children's lives. This unwillingness to bother their children has been similarly reported in studies of intergenerational communication [42] and everyday competence in older adulthood [62].

[Researcher]: *If you don't remember the steps, you could make a call to your son, who's quite willing to help you.*

[Woman U, 68]: *Yes, he's a nice boy. However, he isn't always available. I mean, he works long hours and has to take care of his own family. Although he always tries to give me a hand with the computer, I don't want to interfere too much in his life. I wish I could go online without relying on him so much!*

Whereas several guidelines for training older people to use computers have been developed, they focus strongly on cognition [24], overlooking the trainer and the context of social relationships. In the work reported here, independence was situated in the context of real-life web accessibility, in accordance with previous research on ageing which points out that one of the prevailing concerns as individuals enter older adulthood is the ability to maintain an indepenent lifestyle [62].

4.1.3 Inclusion

All the participants were concerned about using technologies that could make them look different or frail. Participants indicated that they wanted to use the same technologies as their grandchildren and children. This inclusive use, in line with the motto of Inclusive Design [13], allowed the participants to feel closer to their loved ones. They also said that using current technologies contributed to dispelling stereotypes that their grandchildren and children could have about them.

[Man A, 68]: *Yesterday, I helped my grandchildren to print out their homework. They phoned me as their parents were working and they had no clue about how to make the printer work. They came by and we found out the solution together. It turned out that the file format of their presentation was wrong. My computer doesn't have anything special. I mean, I've got a standard mouse, a normal screen and Word and Internet Explorer. If I'd had something special, such as those things you've talked about and showed us in class today, I think I couldn't have helped them, which is very important when you're a grandfather, you'll see!*

[Man P, 73]: *I don't want to use special things. I don't think that I'm stupid and I don't want to give the impression that I am so. My children think that older people and computers can't get on well with each other, because of our age and the complexities of the new technologies. If they*

saw me using assistive technologies or whatever the name is, it would confirm their view, and I don't want this to happen. I'm not in need of special help. I want to use the things that people use. I know that I'll have more difficulties because I am old and I lack experience. But I think that being old shouldn't mean being useless or unable to use the mouse.

These extracts show the importance that participants placed on their grandchildren and children in their everyday interactions with the web. This concurs with what has been documented in [40], and also adds the interplay some social relationships in ageing have with the older people quest for inclusion.

4.1.4 Experiences beyond technophobia

Whereas older people's fear of using ICT is the most reported interactive experience [49], the interactions observed in the context of this study also created:

1) A feeling of accomplishment when they were able to carry out an activity on their own, which contradicted social stereotypes and encouraged them to achieve their goal of independence.

[Woman B, 70]: *(gets closer to the Researcher and gives him a hug). Thank you very much for teaching me how to download a picture from the web.*

[Researcher]: *You're welcome. Why is it so important for you?*

[Woman B, 70]: *Because this means that despite being old, I still can do things. Many people, my children included, think that the only thing old ladies can do is to clean the house and look after babies. However, I know that old people can do more things, but we must prove it. Thanks to you and these courses, I can show my children that their mum is still able to do things! Now I'm much more confident about my skills and know that with effort and your help, I'll use computers on my own.*

2) A feeling of usefulness when they helped peers with poorer digital skills.

[Researcher]: *Hi! [name of the participant] I wasn't expecting you today. You know a lot, how come you are here? [Smiling]*

[Man S, 73]: *Because being alone at home is useless. I enjoy mingling with people and, if possible, helping them.*

[Researcher]: *Your help is very welcome. I've got a lot of participants...*

[Man S, 73]: *For those who might know more than other older people, helping them is very gratifying. You share what you know with them, you help them to progress. And you also learn a lot from them.*

[Man S, 73]: *(stop for a while) I feel very useful when I help people, especially my friends that are just over there making jokes about me!*

3) A feeling of still being active and important when they helped their grandchildren and children to solve everyday problems with computers.

[Woman R, 67]: *Yesterday, my grandchildren got speechless when I helped them to solve a problem with their computers.*

[Researcher]: *What did you do?*

[Woman R, 67]: *They didn't know that her old grandmother knows how to create a table of contents with Word. They didn't know how to do it and I taught them – by using your notes, of course.*

[Researcher]: *Well done! You look today quite enthusiastic!*

[Woman R, 67]: *It's that you don't know what this means for me. I feel that I'm still active. I mean, I can spend more time with my grandchildren by talking about using computers. I've realised that I can do more things. I want to learn more things, I want to use computers, I feel active when using computers!*

4.2 Severity of web accessibility barriers

4.2.1 Alternative input devices are rejected if they increase exclusion

All the participants reported that the keyboard helped them to make their notes more readable to others. The keyboard was also easier to use than the mouse, due to normal age-related changes in precision and manual dexterity. Yet, none of the participants wanted to use alternative input devices as they wished to feel integrated.

[Researcher]: *You're always complaining about the mouse, but I've never heard you complaining about the keyboard. And you use both to e-mail.*

[Man H, 75]: *The keyboard isn't a problem by any means. Once I learnt how to use capital letters and the other symbols, writing with the keyboard is really easy. Easier than using paper and pencil because I can choose different sizes and fonts, write, delete and write again without worrying about the paper or the pen. And I'm 100% sure that people will understand my letters – my handwriting is horrible! But the mouse is a headache. Sometimes it does't move where I want to, and my hands are old"*

[Researcher]: *If you've got problems with the mouse, we can try using joysticks, I don't know if you've ever heard about them?*

[Woman U, 70]: *Joysticks? I think that my grandchildren use them to play videogames, but to send e-mails, they use the mouse. Imagine if they saw their grandmother using a joystick to send e-mails...I don't want them to think that their grandmother is frail or something. I've got problems using the mouse as you can see...but I'll have less problems tomorrow!*

4.2.2 Remembering is more important than making things bigger

All the participants interacted regularly with standard-sized information on web sites (using Google and Yahoo! Webmail, for instance) and computer applications such as MS Word. 50 participants also owned standard mobile phones. While all the participants had tried out accessibility features available in the Windows operating system and web browsers, such as the screen magnifier and adjusting the text size, they did not use them in their daily interactions. They increased cognitive demands, as some elements that were supposed to be on the screen disappeared or changed position, forcing the participants to remember their new or unusual position and an increased use of the mouse. The participants preferred to put their reading glasses on or get closer to the screen. This made them feel less different.

[Man O, 68]: *The size of the letters on the screen is ok. I mean, I wear glasses to read my newspaper, so if I've got problems in reading on the screen, I put my glasses on and the problem is over. But the solution isn't so easy when I've got to remember how to do something with the computer. I think that I, and old guys in general, need to do the same thing many times so that we can get to remember how to do it. For instance, when I finish my class, I go back home and I remember things. But if I don't use the computer for a week, I forget everything! It's very frustrating!*

[Man P, 73]: *"I think that this thing... I don't remember the name...the magnifier... does more harm than good. I prefer my glasses. It's really difficult to use because you lose information. With MS Word, you see the beginning and the end of a sentence. However, with the magnifier option, you are writing and you somehow lose the left part of the sentence; the mouse also disappears and the information on the desktop...where is it? The icon for going to Google should be there, but now it isn't...Scrolling down and up is horrible because all the big things on the screen move right in front of you and this affects my eyes... It's impossible...who uses that?"*

This lack of relevance of vision contrasts with the very relevant difficulties in remembering steps, which hindered the goal of being independent users.

[Woman F, 68]: *I know that I ask you a lot of questions. But I want to remember how to do this on my own. Always remembering. This is the biggest problem. I don't want to rely on you, because you're not always available to help us and because I have to do it on my own. But I tend to forget things. I wish I could remember things better.*

4.2.3 Terms are easier to remember than icons

Participants had difficulties understanding web and computer jargon, such as 'attach' in e-mail, word which was not part of the participants' everyday vocabulary; or 'examine', which is the word appearing instead of 'browse' in *Save As* dialogs in Spanish and that was associated with 'checkups" rather than 'explore'. However, whereas icons have been reported to be easier to understand than words for non-experts [56], the participants asked very few questions about them and did not write their meaning in their notes, except for the ones associated with main applications (e.g., the W in MS Word or the big E of Internet Explorer). Participants focused on words (e.g., equating "attach" as "send an e-mail with a photo") as they were more consistently used and thus, easier to remember.

[Man W, 68]: *We first learned the name of the functionalities and where they were. We prefer to stick to what we know, because it makes us feel comfortable and we make fewer errors. What's more, we think that words or names are easier to understand than images, especially those used in computers. They may be easier to understand for you, but for me, for instance, it's much easier to understand "delete a message" or "save a message" than click on a 'red cross' or 'on a disk', which I find difficult to remember.*

[Researcher]: *If you click on this icon, you can delete an e-mail.*

[Women S, 74]: *Ah! I did't notice this icon.*

[Researcher]:*Did you see it?*

[Women S, 74]: *Yes, I'm not blind! What happened is that I was looking for the "delete" option, I mean, the word, because I think that every application uses different images [referring to icons]. Look here. A cross is used to close a window and to delete an e-mail. This is very confusing and I have to remember many different things...it makes my life difficult! (smile)*

4.3 Aspects of real-life web accessibility research

4.3.1 Suitable research methods

Research methods involving individuals, such as questionnaires and standard usability tests, are much more difficult to carry out and less useful than social ones in real-life settings [58] because:

1) Individual interactions are unnatural practices, since older people want to be social users.

[Researcher]: *Now I want you to sit in front of the computer alone and do the tasks that are written in this piece of paper*

[Man A, 68]: *I'd like to do this test with my friend [name of the participant]*

[Researcher]: I've thought about you doing the test alone

[Man A, 68]: Alone? I want to do it with him

[Researcher]: I'm sure that you can do these tasks alone

[Man A, 68]: Yes, maybe. But I rarely go online alone. I mean, I use computers with my friend, we discuss things together, and this how both of us use computers. I don't feel at ease being alone. It's very similar to being examined or something like this, and I'm quite nervous on these occasions!

2) Individual activities such as filling out questionnaires increase isolation and reduce motivation. Participants reported being in an exam situation when filling in questionnaires. Interviews were regarded as a much more natural way of establishing social contact with researchers and taking part in research activities.

[Researcher]: Here you have a questionnaire for you to fill in.

[Man O, 65]: I don't know why you ask us to fill in questionnaires. It's much easier for us to talk to you.

[Researcher]: Do you have problems writing or reading? I've seen you taking notes in the course...

[Man O, 65]: I don't have problems! Writing is tiring...but the most important thing is that we want to talk to people.

[Researcher]: What do you mean?

[Man O, 65]: Well, I can fill in a questionnaire. Maybe I'll have some difficulties answering questions. However, I don't want to fill out a questionnaire, as I'll be alone when doing so. I want to talk to you and spend some time with you and other people. For instance, last week you interviewed us in pairs, do you remember? This was very natural and we enjoyed a lot.

Although previous research has shown that HCI methods need to be adapted when conducted with older people in laboratories or controlled situations [17], the conducted study reveals and explains this need of adaptation in real-life research, and how it should be turned into more social and informal (as opposed to 'formal' learning or use).

4.3.2 Interaction measures: errors are more relevant than time

Whereas errors and time are two very important variables in order to measure performance, avoiding making mistakes is more important in real-life interactions with the web (in general computer use as well [57]) since:

1) Older people are afraid of using computers at their initial stages of learning. They think that they can either break them or delete important information.

[Man L, 73]: *Computers have very important information and are expensive.*

[Researcher]: *Why do you say that?*

[Man L, 73]: *I've seen my grandchildren and children studying and working with them. They've got all their life there. Here we work a lot with computers, so I don't want to damage that computer because it might have other people's information and Àgora would need to spend a lot of money repairing it. So, I prefer to go slowly and take steps when I'm sure of my ground.*

2) Making mistakes goes against their non-productive use, increases cognitive demands and prevents them from being independent computer users.

[Researcher]: *Come on! The faster you go, the more training you receive!*

[Man E, 74]: *Slow down! We, and I speak on behalf of all of us, don't need to rush; indeed, we don't want to use computers in a hurry, not like you! We want to take our time, because we've been rushing during all our lives; before, in our jobs; and now, with our grandchildren. We want to relax and use computers slowly"*

[Researcher]: *But, come on...this sounds very like the typical image of older people, you could try to be a little bit more efficient!*

[Man W, 65]: *(smile). Let me tell you something. The faster I go, the more mistakes I make. And, the most important thing is this: if using computers is a hard task for oldies, as you sometimes say!, you can't imagine how difficult it is to recover from your own mistakes, when you've got no clue about how to fix them!*

5. Discussion

This paper has focused on the novel topic of real-life web accessibility with older people and explored the severity of barriers they face in their daily interactions through an approach that has not used in this area yet, ethnography. This raises the issue of understanding web accessibility 'out of labs' and the role ethnography can play in making the web more accessible to older people. The obtained results show that some accessibility barriers limit their interactions more severely than others, the main reason being that older people want to be independent, ordinary and social computer users. This goes beyond and enriches current research focused on age-related factors, and the technophobia stereotypes; social relationships also play a key role. They also show how ethnographical studies can help us further our understanding of older people as web (and ICT) users.

A classical ethnographical study was selected since ethnography had not used in the area before. The challenges and opportunities of classical and novel forms of ethnography developed in HCI for making the web more accessible to older people

should be discussed further based on more research taking this approach. From the accumulated experience, being course instructors did not hinder ethnographical tasks such as observing, talking to participants and taking notes. It allowed the researchers to become integrated in their culture and develop a deep and comprehensive understanding of their barriers while using ICT to perform both educational and everyday activities. Another methodological avenue that has been followed in this study is to carry out quantitative and qualitative studies[10] in parallel in order to understand better ethnographical insights and guide fieldwork.

Although the topic of this special issue is ageing and the web, some extracts make references to other ICT. As the focus of the conducted study was on daily interactions, this led to an understanding of web accessibility barriers within their context.

The next section discusses a number of implications that can be drawn from these results and some limitations of the study.

5.1 Some implications on interfaces, training and support

Although the accessibility barriers discussed are not new, by studying them in-situ it has been possible to identify that altering the size of elements is much less important than reducing the cognitive load. Designing terms and icons drawing on related life experiences can help older people to recognise rather than remember them, the latter being more cognitively demanding. Designing for minimizing errors by making a consistent use of actions and terminology, probably at the expense of making interactions slower, is also worth exploring. In terms of technology acceptance, hardware and software developments that make older people feel different are rejected. In addition to age-related changes in functional abilities, design supporting social relationships and experiences beyond technology should be considered.

Guidelines for developing training materials and instruction can be of little use if implemented through formal learning and not allowing for socialisation. Informal training activities in community centres contribute to reducing isolation and fit in with older people's learning strategies and motivations. Personal qualities of trainers could

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[10] The interactions of older people with online forms in two different was explored contexts, showning that increasing the size of asterisks does not help them fill in forms more correctly. Three web sites have been designed for different pensioner associations, an it has been found out that increasing the size of elements is much less relevant than better navigational structures and similarly when adapting an online web site to a mobile (PDA) version. Terms were also more relevant than icons in the design of a video web browser, blogs and Flickr prototypes for Àgora and for another association. See [61]

also be relevant, as well as exploring how to enhance the support that older people receive from key members of their social circles or compensate for the lack of it.

5.2 Limitations

Whether the results reported in this paper can be generalised to other contexts demands further research. However, the importance of socialisation and the role of community centres has also emerged from studies in the UK [26]. The fact that the involved participants were keen to use ICT, despite their low levels of education and little previous experience with them, makes them a very important (and growing) sector: ordinary older people willing to use ICT. However, this makes them differ from the common (and perhaps overstated) view of older people as computer-phobic. Further ethnographical research can shed more light on this issue.

6. Conclusions and future work

Web accessibility barriers should be understood in the context of web use. The conducted study has revealed that older people do not want to rely on anyone to go online. They refuse to use technologies that make them look extraordinary and their main motivation for using the web is to socialise. These key aspects of real-life use account for the relative severity of the different barriers. Older people use reading glasses or get closer to the computer screen if they have difficulties reading from the screen. Remembering steps and understanding terms are much more important than altering the size of elements, because failing to remember or understanding hinders their goal of independence, as well as being cognitively demanding activities.

Compensating for age-related changes in functional abilities is not all that matters in order to make the web more accessible to older people. While changes in vision, cognition, mobility and hearing have an obvious impact on accessibility, social relationships and life experiences play an important positive role in real-life interactions, suggesting that web accessibility research should widen its current focus on individual factors.

Some of these results challenge common views on the relative severity of accessibility problems of older people, and shed new light on their use of ICT and dispel stereotypes about their (lack of) motivation to use them. Other findings provide a new perspective of web accessibility for older people: from considering them as a

collection of factors to regarding them as social actors. These findings stress the importance of research on web accessibility out of the laboratory.

Taking advantage of the adopted field-based approach, future work will include studying the evolution of the barriers over time through the use of longitudinal data. Currently, the available data are being revised to get a better insight into the role of different social relationships in web accessibility. Motivated by the novelty of the consideration of the role of life experience and the varied interactive experiences, this work will explore how to use them to make the web more accessible. Ethnographical methods should be an input to web accessibility, and requests comparison of different approaches. In this context, qualitative findings and controlled experiments will be combined to ascertain better the impact of the most and least severe barriers on interactions and how to deal with them.

7. Acknowledgements

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Appendix A. Ethnographical implementation

Year	Type of activity / Technologies		Description of activities	Duration	Total Part.
2005	*Courses: Gardens and Towns in the World	E-mail, MS Word, MS PowerPoint	Downloading pictures from the Web about National Gardens and create reports using MS Office tools and Web Pages. Sending their reports to their relatives, friends and instructors by email.	6 months for each course. 2-hour session every week	36
	*Course: Internet	E-mail, Google, Yahoo!	Using the email and several strategies to look for online information.	2 courses. 1 month each course. 2-hour session every week	36
	*Public meetings	Technologies used in the courses	Discussing the positive and negative aspects of the technologies used and the best and worst aspects of the courses	2 meetings. Between 2 and 3 hours.	40
2006	**Course: Online communication	E-mail, chat, blogs, wikis, forums, Google, Yahoo!	Learning basic and advanced aspects of online communication: email, chats, blogs and forum. Learning basic and advanced aspects of strategies to look for online information	4 courses. Lasted 3 months. 2-hour session every week	76
	**Workshops	E-mail, multimedia content edition and finding online information	Special sessions on email, multimedia content edition and finding online information.	3 workshops. 2-hour session every workshop	18
	*Public meetings	Blogs, Yahoo! Flickr, E-mail, wikis	Discussing the value of online technologies to support educational practices in ICT. Discussing the positive and negative aspects of these technologies for their daily lives	2 meetings. 2-hour session every workshop	24
2007-2008	**Course: Advanced aspects of computing	MS Word, MS PowerPoint, MS Excel, E-mail, Google, Yahoo!, Yahoo! Flickr, Google Earth	Learning advanced topics of computer management, documents editing, online communication and searching, multimedia.	4 courses. Lasted 3 months. 2-hour session every week	76
	**Course: Online resources	File management, Windows management, Google, Yahoo!, Blogs, E-mail	Advanced topics of computer management, creation of documents online, online searching and communication	Course lasted 6 month. 2-hour session every week	18
	**Workshops	Blogs, Yahoo! Flickr, E-mail, wikis	Discussing the value of online technologies to support educational practices in ICT and social factors mediating the adoption of ICT	2 workshops. 2-hour session	24
	*Public meetings	MS Word, MS PowerPoint, MS Excel, E-mail, Google, Yahoo!, Yahoo! Flickr, Google Earth, Blogs, File management, Windows management	Discussing the positive and negative aspects of the technologies used and the best and worst aspects of the courses	3 meetings. 2 hour-session	40

Table 2: Ethnographical implementation: courses, meetings and workshops
*Observers; **Observers and Participants