Getting access to website health information: does age really matter?

Loos, E.; Mante-Meijer, E.

Publication date
2012
Document Version
Author accepted manuscript
Published in
Generational use of new media

Loos, E. F., & Mante, Meijer E. A. (2012). Getting Access to Website Health Information: Does Age Really Matter? In **E. F. Loos**, L. Haddon, & E. A. Mante-Meijer (Eds.), *Generational Use of New Media* (pp. 185-202). Farnham: Ashgate.

Publication including Table and Figures available at
http://www.ashgate.com/isbn/9781409426578

CHAPTER 10

Getting Access to Website Health Information: Does Age Really Matter?

Eugène Loos and Enid Mante-Meijer

Introduction[1]

Digital Gap or Digital Spectrum?

In the majority of the western countries the population is aging at a rapid pace. At the same time, society is increasingly becoming more digitalised. Information is supplied to a growing extent, and frequently solely, in digital form. It is obvious, that this trend poses dangers for people, like senior citizens, who have problems using such new media. They risk being excluded from crucial information (Duimel, 2007: 7). A complicating factor is that the landscape in which older people currently reside[2] is largely shaped by what De Lange (2007: 23) calls the 'decollectivisation of the life course':

> The late modern life course becomes a series of *individual* passages; leaving the parental home, finding a job, becoming unemployed, marrying or not marrying, divorce, having children, retiring, growing (very) old – individuals must find their own way, without these transitions being embedded in any traditional institutional frameworks or accompanied by collective rituals. Constructing continuity and coherency in the life course is up to the individual. (translation)

[1] This chapter is based on an unpublished paper of Loos and Mante-Meijer (2009a) and also uses parts of Loos (2010, 2011a/b).

[2] See also Hagberg (2004: 163) who argues that we all live, literally and metaphorically, in a technological landscape. See also chapter 5 by Hagberg in this volume.

What does this 'decollectivisation of the life course' entail for senior citizens living in an ever more digitised society? Schnabel (1999: 18) pointed out the vital part ICT could play in this respect over a decade ago:

> If this development continues, in a few years every single individual will have a virtual connection with all the members of his social network, will be able to build virtual new social networks and will have access to an inconceivable amount of information. (translation)

This prediction has largely been fulfilled. According to Wellman et al. (2003) there has been a move to 'networked individualism'[3], in which the person has become a 'portal'.

In our information society, more and more information about products and services is provided by new media, such as the internet. This development risks excluding those citizens who cannot or do not wish to use the medium. Duimel (2007: 24-57, 104-105) argues that these citizens (so-called 'non-liners'[4]) are afraid of trying something new and making mistakes. The costs, unfamiliarity with the possibilities of this new medium and emotional factors, such as shame, performance anxiety and loss of face may well also play a role. The size of this group should not be underestimated. According to figures for the Netherland issued by CBS (Statistics Netherlands), in 2010 some 40% of the 65 to 75 year-olds had never used the internet, compared to 14% of the group aged 55 to 65 and 5% of the 45 to 55 year-olds.[5] CBS publishes no figures for the age group 75 and over, but their non-use of the PC and the internet is probably even higher. If senior citizens are non-liners, their access to information is limited, which can endanger their participation in our society.

Some researchers even argue that there is a widening generational 'digital gap' between those people who are able to use new media and those who are not. It was Prensky (2001)

[3] See Wellman et al. (2002, 2003) for a further discussion of the role of the internet for networked individualism and the implications for social cohesion.

[4] See also Table I.1 in the introduction of this volume.

[5] http://statline.cbs.nl

who coined the notions of ‘digital natives’ and ‘digital immigrants’. From an educational point of view, he considers students to be ‘digital natives’ who

> are all native speakers of the digital language of computers, video games and the Internet. So what does that make the rest of us? Those of us who were not born into the digital world but have, at some point later in our lives become fascinated by and adopted many or most aspects of the new technology are and always will be compared to them, *Digital Immigrants*. (Prensky, 2001: 1, 2)

Do they really exist, these ‘digital natives’, the generations who grew up with new media and are able to use them without any problem? And is there really an older generation of ‘digital immigrants’ playing catch-up by trying to learn how to use new media? Other researchers, e.g. Lenhart and Horrigan (2003), take a different perspective. They introduced the notion of a ‘digital spectrum’, in which people use the new media to varying degrees, depending not only on age but also on factors such as sex, education and frequency of internet use.

Senior citizens can learn to work with the new media up to a certain point, although the question remains as to what extent people continue to master new media with which they have not grown up.[6] Becker (1992a/b) and Becker and Hermkens (1993) point out how important the formative period in the life of humans (between the 15th and 25th year of life[7]): people born in a certain year and who form a cohort all ‘have experienced certain life events’.[8] Obviously, the introduction of a new technology counts as such an event, which can lead to the rise of a new ‘technology generation’ (Sackman and Weymann, 1994: 41-43; Weymann and Sackman, 1998).[9] Huysmans et al. (2004: 20) argue:

---

[6] See also the concept of ‘structural lag’ proposed by Riley & Riley (1994) that can be used to show how the ‘dynamism of structural change’ and the ‘dynamism of changing lives’ are inextricably bound together. Lawton (1998) also discusses this subject.

[7] Becker (1992b: 21) relies here on Mannheim (1928/1929). Also see Peiser (1999) and Bouma (2000: 68, 76) on the role of the formative years in media usage.

[8] Becker (1992b: 25) refers to Ryder (1965) for his definition of the concept of ‘cohort’.

[9] See also chapter 7.

> Successive cohorts grow up, each with their own specific constellation of available media, media competency and media preferences. These early experiences with media could later lead to shared behaviour patterns. (translation)

Socialisation theory states that people are formed by the period in which they grow up. Socio-economic and political circumstances and the technology available during their formative years shape their behaviour.

It is also plausible, though, to assume that differences will be visible within a technology generation regarding the degree to which each is able to master a new medium. The fact that individual differences increase as people age, is termed aged heterogeneity by Dannefer (1988: 360):

> Thus, members of a cohort are sometimes described as "fanning out" as they age, becoming more unlike each other on any characteristic (e.g. Baltes, 1979).

Health Information as a Primary Good

If we wish to ensure that senior citizens can continue to participate in our society, then accessible information is of prime importance. Especially health information is vital for senior citizens, in view of their age (Coombs, 2008; Loos and Mante-Meijer, 2009a: 11-12). Van den Hoven (1994: 369)[10], referring to Rawls (1971, 1993), goes so far as to refer to 'primary goods', which have

> a "use" in every rational plan of life in the sense of being normally necessary means to formulating, pursuing, and executing a rational plan incorporating any final ends whatsoever (…).

As more and more health information is provided by websites nowadays, it is important that these digital information resources remain available to senior citizens. This will allow them to ensure their access to the information related to the product and services they need, provided by public and private organisations. In handbooks, such as *Older Adults, Health Information, World Wide Web*, edited by Morrell (2002), guidelines for website design for senior citizens

[10] See also Bovens (2003: 96-97).

are presented.[11] Literature reviews (e.g. Chisnell and Redish, 2004; Arch, 2008; Loos and Mante-Meijer, 2009b), show how international studies of digital information accessible for senior citizens are based on interviews that were conducted with website users or else their navigation behaviour was observed (e.g. Pernice and Nielsen, 2002). Research by Van Deursen (2010) (see also chapter 9 in this volume) provides insights into the various internet skills of different generations. What is lacking, however, is insight into the similarities as well as the differences in the actual navigation behaviour of older and younger people. This chapter therefore presents the results of an explorative Dutch eye-tracking study[12] that focuses on the following question: to what extent do people from younger and older generations navigate websites in different ways when searching for health information?

Eye-Movement Characteristics of Navigating Older Users

There are a limited number of *eye-tracking* studies furnishing insight into the way younger and older generations *navigate* websites. The article 'Older adults and the Web: Lessons learned from eye-tracking', by Tullis (2009) reported empirical research results about differences between younger and older U.S. users in the way they use web pages:

> An eye-tracking study of a prototype website was conducted with 10 younger adults (ages 20-39) and 10 older adults (ages 50-69) to determine if there are differences in how they scan web pages. They performed the same task on the website. On the average, the older adults spent 42% more time looking at the content of the pages then did the younger adults. They also spent 51% more time looking at the navigation areas. The pattern of fixations on almost all pages showed that the older adults looked at more parts of the page then did the younger adults. (…) One thing we did not see was any difference in the likelihood of older and younger users to view page content "below the fold" (i.e., that they had to scroll the view). (Tullis 2007: 1030, 1038)

This study shows interesting patterns that may be validated by future comparable empirical research. Another example of such research is that of Houtepen who in 2007 conducted an

[11] See also Becker (2004) who evaluated web usability for older adults seeking online health resources.

[12] See McElhal (2007) for a further explanation of eye-tracking and the purposes for which this eye-tracking can be used.

explorative eye-tracking study in the Netherlands with 13 younger users (18-25 years) and 7 older users (older than 50). Like in Tullis' study, they were requested to perform search tasks to find health information (in this case at the websites of the five largest Dutch health insurance companies). The results showed that:

- the older users needed more time to fulfil the task (almost 6 minutes compared to the 2.5 minutes the younger users spent to fulfil their task);
- older people read more and make less use of the website's search box facility.

Like Tullis' study, Houtepen's research shows that older users need more time to conduct a search task[13] and that they follow a different navigation pattern.[14] Hill et al. (2011: 1152) refer to studies by Fukada and Bubb (2003), Tullis (2007), Capozzo et al. (2008) and Zaphiris and Savitch (2008), which conclude, with one exception (Josephson and Holmes, 2004), that older users are slower than younger ones. A measurement study, using three websites and a Web-wide task, with 20 older users and a control group of 20 users between the ages of 21 and 55 conducted by Pernice and Nielsen (2002) also confirms the differences in time spent on the task: 12:33 minutes for the older users versus 7:14 minutes for the younger control group. Pernice and Nielsen (2002: 4) also offer an explanation for this difference:

> Websites tend to be produced by young designers, who often assume that all users have perfect vision and motor control, and know everything about the Web.[15] These assumptions are rarely upheld, even when the users are not seniors. However, as indicated by our usability metrics, seniors are hurt more by usability problems than younger users. Among the obvious physical attributes often affected by human aging process are eyesight, precision of movement, and memory.

[13] Docampo Rama et al. (2001) and Romano (2010: 1362) also reported that older users needed more time to conduct search tasks at websites.

[14] The eye-tracking study of Josephson and Holmes (2004) also compared patterns of fixations of different generations of users (6 users age 8-11, 6 users age 15-25, 6 users age 35-45 and 6 users age 55-65) and found no differences. This is probably due to the very low number of participants and the relatively young age of the older age group.

[15] See also Chisnell and Redish in chapter 6.

The studies conducted by Tullis (2007), Houtepen (2007), and Pernice and Nielsen (2002), as well as studies cited in the reviews by Chisnell and Redish (2004, 2005), Arch (2008) and Loos and Mante-Meijer (2009b), offer insights into differences related to spent on time on tasks and navigation patterns between younger and older users. However, a few critical comments would seem in order:

● The number of participants in the studies was very low, which means that research with more users is necessary.

● These studies focused only on age, failing to take into account the role of factors such as sex, education and frequency of internet use[16]. It is therefore unclear whether differences within an age group are larger than the differences between younger and older people.

Explorative Eye-Tracking Study: Research Questions and Methodology

What is needed is research with larger groups of older and younger users, in order to take into account the role of factors like sex, education and frequency of internet use, and hence look beyond mere age. Now the question is, of course, how to set up and conduct such research. In this chapter we use the data of our eye-tracking study carried out among younger and older users (respectively about 21 years old and 65 years and older) in the Netherlands over the course of 6 days in April 2009 (Loos and Mante-Meijer, 2009b). Compared to the above mentioned earlier eye-tracking research, our eye-tracking study boasted a relatively large number of participants: 29 young people and 29 older people (of whom 18 were daily internet

[16] Hill et al. (2011) did examine the role of age and the internet experience of senior citizens. This eye-tracking study (among 12 novice older computer users and 6 more experienced), though, did not take into account the role of sex and education, and did not include young participants into their research design. Djamasbi et al. (2010) conducted an eye-tracking-study to examine the role of images for the visual appeal of web pages. They focused on younger users (age 18-31), but did not include older participants in their research design, nor did they take into account the role n of sex, education and internet experience.

users), that also amply fulfils the minimum of eight participants required for this type of usability study.[17]

INSERT TABLE 10.1 HERE

For all users we examined the role of age. Attention was also paid to the role that sex, level of education (higher or lower) and the frequency of internet use (daily or not daily) played for navigation behaviour. We focused on effectiveness (i.e. the task was successfully accomplished within a 5 minute time limit), efficiency (i.e. the time needed to accomplish the search task) and navigation behaviour (i.e. patterns of eye fixations[18] and the use of the search box[19]). This instrument uses infrared to measure eye movements in navigation patterns in a non-invasive manner as the equipment is built into the rim of the monitor. Heatmaps are generated, with the different colours showing what the participants looked at on a webpage and how often navigation areas are visited by using different colours (red, yellow and green: respectively very intense, moderate and low intensity), based on the number of fixations of different groups of users.

INSERT FIGURE 10.1 HERE

[17] See Wichansky (2000), referred to by Goldberg and Wichansky (2003: 512).

[18] By using an eye-tracker, based on heatmaps described below.

[19] See Loos and Mante-Meijer (2009b) for a complete overview of all navigational aspects and the gazeplots of individual younger and older users which were also analysed in this eye-tracking study.

The users performed a search task at the website of ANBO (a Dutch organisation for senior citizens)[20] and the website of Univé (a Dutch (health) insurance company). At each website they had to find information about discounts related to health insurance that was located on a specific web page of both organisations (see Loos and Mante-Meijer (2009b) for more information). The results of a search task at a third website (a Dutch municipality) that the participants visited are not presented here because the search task was not related to health information. In order to avoid a learning effect, we presented the search tasks to the participants in a random order.

It appeared that sex and education did not have a major impact on the navigation behaviour. For this reason we will present – beside the impact of age – the effects of the frequency of internet use, which, as we will see, influences the way people navigate the website while conducting a search task.

Results Search Task Performed at the ANBO website

Effectiveness (task successfully accomplished within the 5 minute time limit)

Most users (87.9%) accomplished the search task within the 5 minutes time limit, although some differences were apparent between user groups. 82.8 % of all older users accomplished the search task successfully versus 93.1% of all younger users. Older people who used the internet daily were more successful than older people who did not: 88.9% versus 72.7%.

Efficiency (time needed to accomplish search task)

On average, users needed 86 seconds to accomplish their search task. Younger users were almost twice as fast as older users, averaging 64 seconds versus 111 seconds. Older users

[20] For this website we asked the older users to perform the search task for themselves and younger users were asked to perform the search for their grandparents.

making daily use of the internet were faster than those who did not, averaging 99 versus 135 seconds.

Use of the Search Box

The heatmaps that are presented in the next subsection will show us that the majority of users did not make use of the search box during the search task. The following data confirm this result: Only 13.8% in both the older and the younger age group used the search box. This result is not in line with the findings of Houtepen's study, which showed that older people used the search box less frequently than did younger users. A possible explanation is that the search task at the ANBO website in our eye-tracking study was rather easy to perform (see subsection effectiveness), so most users apparently did not need to use the search box. Older people making daily use of the internet used the search box in 22.2 % of the cases; of the group who did not use the internet daily, not a single person made use of the search box.

Navigation Areas

The patterns of fixations of older and younger users seem to be different. Most of the younger users looked at the right place where they were supposed to click (the upper part of the green column) in order to arrive at the web page containing the information they were looking for, but more older users than younger ones looked longer at the wrong place to click: the pink column. This is shown by the red zone appearing in that navigation area on heatmap Figure 10.2 (see insert), which is absent on heatmap Figure 10.3 (see insert). So, at first sight the patterns of fixations of older people compared to those of younger people seem to be different. However, if we compare the patterns of fixations of older peopl*e using the internet daily* (heatmap Figure 10.4, see insert) with those of the younger age group (heatmap Figure 10.3), these patterns are in fact not as dissimilar as first thought. Like the younger users, the older people using the internet daily looked less intensily (no red zones in this navigation

area) in the pink column, in contrast to the patterns of fixations of the older people *not using the internet daily* where a clear red zone is visible in that column (heatmap 10.5, see insert). In other words, the frequency of internet use impacts more heavily on our patterns of fixations than does age.

Results Search Task Performed at the Univé website

Effectiveness (task successfully accomplished within 5 minutes time limit)

Most users (89.7%) accomplished the search task within the 5 minute time limit, although some differences were apparent between user groups. 79.3 % of the older users accomplished the search task successfully versus 100% of the younger users. There appeared to be almost no difference between older people who used the internet daily and older people who did not.

Efficiency (time needed to accomplish search task)

On the average, users needed 91 seconds to accomplish their search task. Younger users were faster than older users, averaging 81 seconds versus 104 seconds. Older users who made daily use of the internet were faster than those who did not, averaging 98 versus 113 seconds.

Use of the Search Box

The heatmaps presented in the next subsection will show us that many users made use of the search box (at the right top of the red navigation bar) and the other parts of the navigation bar during the search task. The following data confirm this result: 67.2% of all participants used the search box. The percentage of younger users making use of the search box is higher than that of the older users: 75.9% versus 58.6%. This result confirms the findings of Houtepen's study, which showed that older people used the search box less frequently than the younger people did. In particular, those older people who did not make daily use of the internet daily

did not use the search box very often (only 27.3%); 77.8 % of the group who used the internet daily made use of the search box.

Navigation Areas

The patterns of fixations of older and younger users seem to be different (Figures heatmap 10.6 and 10.7, see insert). First of all the large red-yellow-green zones show that older users looked in a more intense way at more navigation areas on the home page than did younger users. This confirms the findings of Tullis' study. Another notable fact is that the older users more often look at and click on *links* that lead to the information they are looking for while the younger users used the *navigation bar* more often. In Figure heatmap 10.7 (see insert) of the younger users the large red zones with a small yellow-green part and the red-white clicking demarcations in the navigation bar show this clearly. Older users used the navigation bar less often, which appears clearly in Figure heatmap 10.6 (see insert) as the large yellow-green zones and the limited number of red-white clicking demarcations in the red navigation bar. So, at first glance, the patterns of fixations of older people appear to differ from those of younger people. However, if we compare the patterns of fixations of *older people who use the internet daily* with those of the younger age group, these patterns are, in fact, not as dissimilar as first thought. In particular, the use of the navigation bar by older *people using the internet daily* is interesting in this regard: Figure heatmap 10.8 (see insert) clearly shows a red zone that is comparable to the one of the younger age group in Figure heatmap 10.7 (see insert). This red zone is absent in heatmap 10.9 (see insert) which shows the patterns of fixation of the older people *not using the internet daily*. Hence, as regards the use of the navigation bar on this website, the frequency of internet use impacts more heavily on our patterns of fixations than does age.

Evaluation: Navigation Behaviour and the (Ir)relevance of Age

On the one hand our eye-tracking study confirms the conclusions from previous studies noted earlier: older people tend to take more time looking at the content of the website page. This was true for the search tasks on both websites. It appeared that older people, compared to younger people, looked longer at the navigation area and at the ANBO home page they directed their focus more often at the wrong area. They were also slightly less successful than their younger counterparts.

On the other hand, these generational differences became smaller when the older user was more experienced i.e. used the internet more frequently. This result was also found by the eye-tracking study carried out by Hill et al. (2011: 1159) among 12 novice older computer users and 6 more experienced[21] older computer users (2011:

> In conclusion, on three web-viewing tasks, marginally experienced older adults displayed eye-movement behaviors consistent with "typical" behaviors, as measured by mean fixation durations. By contrast, less experienced users of similar ages displayed eye-movement behaviors that have generally be regarded as characteristics of older people. This study suggests that behaviors previously identified as characteristics of ageing might be related instead to other factors, such as experience, and challenges assumptions about the effects of age as opposed to other aspects that divide the older age group. Age and personal experience remain highly correlated properties, which questions the merit of any over-simplified approach to improving the user experience of the older demographic.

So, the heatmaps from the ANBO and Univé homepages clearly confirm that age is only to a certain extent responsible for the navigation behaviour of younger and older generations. Internet experience also plays a role. We agree with Kronjee et al. (2003: 4) who are critical about the use of age as the ultimate explanatory variable in much social scientific research:

> Not only is it open to question whether age is the most appropriate variable for the topics that these researcher wish to investigate, it is also questionable whether the reported differences actually yield the insight claimed. Even if age should be an explanatory variable, simply reporting differences according to age is not enough.

[21] 12 novice older computer users (mean age 77, range 71-93) and 6 more experienced older computer users (mean age 78.5; range 70-90). The experience was related to the use of Email, word processing or the access of the internet (Hill et al., 2011: 1154).

> After analysing the effect in age differences, they should examine which theory should best be used to interpret the age effect. (translation)

Our eye-tracking study carried out shows that in the case of patterns of fixations for search tasks on websites, age is not the explanatory variable for navigation behaviour. The frequency of internet use plays a more important role.

Interesting results were also found as regards the use of the search box. On the ANBO website the search box was seldom used, whilst on the Univé website the search box was used by a majority of the participants. There was no generational difference when we look at how often the search box was used for the search task at the ANBO website. At the Univé website the percentage of younger users making use of the search box was clearly higher than that of the older users, which result confirms the findings of Houtepen's study. It appeared that for both websites that the frequency of internet use also played a role: Those who used the internet frequently also used of the search box more often.

So, although differences in navigation behaviour related to a health information search task are to some extent age-related, differences are also seen within the group of older people, a good example of 'intra-age variability' (Dannefer, 1988; see also chapter 6 by Chisnell and Redish and chapter 7 by Schreder et al. in this volume) due to frequency of internet use. Older people are often more diverse than younger persons. Bouma (2000: 68), for example, explains that:

> Education and job specialization have been rising all through the 20th century, and the new generations of older citizens have learned to be both assertive and active. It is certain that they will be a heterogeneous group, since cumulative life experiences vary so much more than among young adults.

In this eye-tracking study, the black-and-white distinction between Prensky's 'digital natives' and 'digital immigrants' was absent.[22] Instead, what emerged was far more a digital spectrum rather than a digital divide (Lenhart and Horrigan, 2003). This means that in this case

[22] See also Schulmeister (2008) and Bennett et al. (2010) for a critical review of Prensky's rigid division and his lack of empirical evidence to support this.

socialisation theory, which states that people are formed by the period in which they grow up (as socio-economic and political circumstances and the technology available during their formative years shape their behaviour), does not apply to all senior citizens. The main differences are visible *within* this group, which could be considered as a 'technology generation' regarding the degree to which each is able to master a new medium. So, we agree with Hill et al. (2011: 1157) that 'inexperience is likely to be an important factor, possibly as important as age itself'.

Implications for designers

If future empirical research confirms our findings, the implication for website designers (who often belong to a younger generation – see also chapter 6 by Chisnell and Redish) might be that they should take into account diversity between and *within generations* by 'designing for dynamic diversity' (Gregor et al., 2002), '(…) the premise of which is that older people are much more diverse in terms of life experience and levels of capability and disability than their younger counterparts (…)' (Chisnell and Redish, 2004: 48).

In particular, older users who use the internet less frequently and have a broader reading pattern on websites[23], and the very old who are confronted with age-related limitations owing to declining visual, hearing, cognitive and motor functions[24], so called 'age-restricted users'[25], have to receive more attention. Bouma (2000: 71-72), for example, comments that age-related functional limitations occur with a certain regularity from the age of 75 onwards, and are common from the age of 85 and over. So, as people grow older, there is no escaping the fact

[23] See also Houtepen (2009) and Tullis (2009: 1030, 1038).

[24] See also Bouma (2000), Czaja and Lee (2009) and Loos and Mante-Meijer (2009a: 38-39) for an overview of the studies on age-related functional limitations in these areas.

[25] Hawthorn (2003) referred to by Chisnell and Redish (2004: 50). See also Hanson (2001) on age-related disabilities and the Web.

that age can start to play a certain role regarding the accessibility of the digital information, and that it then may be regarded as an explanatory variable. 'Age-restricted users' are at considerable risk from age-related functional limitations, making it difficult and more time-consuming for them to search information on websites.[26] Wright (2000: 86) notes that in such a case, 'multi-modal redundancy', for example, using both visual and auditory signs, could help. Zajicek and Morissey (2003), referring to 'multimodality', also advocate the use of text and sound. Moreover, White et al. (2001) discuss special software that facilitates the access of groups with age-related functional limitations to our information society.

Researchers and designers working on new 'interface architecture' would be wise to make a note of such insights where older people are concerned.[27] The fear that this might irritate younger and more experienced users is unfounded. A study carried out by Johnson and Kent (2007) showed that, rather than having an adverse effect on a site's user friendliness, it tended to enhance it for all users (see also chapter 6 by Chisnell and Redish in this volume).

References

Arch, A. (2008), *Web Accessibility for Older Users: A Literature Review*. W3C working draft 14 May 2008. Available at: <http://www.w3.org/TR/wai-age-literature>.

Baltes, P.B. (1979), 'Life-span developmental psychology: Some converging observations on history and theory', in Baltes, P.B. and Brim jr., O.G. (eds), *Life-Span Development and Behaviour*, Vol. II. (New York: Academic Press).

Becker, H.E. (ed.) (1992a), *Dynamics of Cohort and Generation Research: Proceedings of a Symposium held on 12, 13 and 14 December 1991 at the University of Utrecht, the Netherlands* (Amsterdam: Thesis publishers).

Becker, H.E. (1992b), *Generaties en hun Kansen* (Amsterdam: Meulenhoff).

[26] Economists refer in this connection to 'obsolescence'. Also see Thijssen (2006: 15-25) and Van Loo (2005).

[27] See also Chadwick-Dias et al. (2003).

Becker, H.E. and Hermkens, P.L.J. (eds) (1993), *Solidarity of Generations: Demographic, Economic and Social Change and its Consequences* Vol. II. (Amsterdam: Thesis publishers).

Becker, S.A. (2004), 'A study of web usability for older adults seeking online health resources, ACM Transactions on Computer-Human Interaction (TOCHI), 11 (4), 387-406. Available at: <http://doi.acm.org.ezproxy.auckland.ac.nz/10.1145/1035575.1035578>.

Bennett, S., Maton, K., and Kervin, L. (2008), 'The 'digital natives' debate: A critical review of the evidence', *British Journal of Educational Technology*, 39 (5), 775–786.

Bouma, H. (2000), 'Document and interface design for older citizens', in Westendorp, P., Jansen, C. and Punselie, R. (eds), *Interface Design & Document Design* (Amsterdam: Rodopi).

Bovens, M.A.P. (2002), Information rights. Citizenship in the information society, *The Journal of Political Philosophy*, 10, 317-341.

Capozzo, D., Groezinger, R.L., Ng, K.-F.F. and Siegel, M.J. (2008), *Appeal of Web Page Layout and Characteristics based on Age: Usability Research through Eye-tracking at Fidelity Investments Inc.* (Worcester USA: Worcester Polytechnic Institute).

Chadwick-Dias, A., McNulty, M., Tullis, T.S. (2003), 'Web usability and age: How design changes can improve performance', CUU'03, November 10-11, 2003, Vancover, British Columbia, Canada. Available at: <http://www.bentley.edu/events/agingbydesign 2004/presentations/tedesco_chadwickdias_tullis_webusabilityandage.pdf>

Chisnell, D. and Redish, J. (2004), *Designing Websites for Older Adults: A Review of recent research.* AARP. Available at: <http://www.aarp.org/ olderwiserwired>.

Chisnell, D. and Redish, J.C. (2005), 'Designing web sites for older adults: Expert review of usability for older adults at 50 web Sites', report to AARP, February 2005. Available at: <http://www.aarp.org/olderwiserwired>.

Coombs, T.T. (2008), 'Internet use across the life-span', in Donsbach, W. (ed.), *The International Encyclopedia of Communication* (Malden, MA: Blackwell).

Czaja, S.J. and Lee, C. (2003), 'Designing computer systems for older adults', in Jacko, J.A. and Sears, A. (eds), *The Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications* (Mahwah, NJ: Lawrence Erlbaum).

Dannefer, D. (1988), 'What's in a name? An account of the neglect of variability in the study of aging', in Birren, J.E. and Bengtson, V.L. (eds), *Emergent Theories of Aging* (New York: Springer).

Djamasbi, S., Siegel, M. and Tullis, T. (2010), 'Generation Y, web design, and eye tracking', *Journal of Human-Computer Studies*, 68, 306-323.

Docampo Rama, M., Ridder, H. and Bouma, H. (2001), 'Technology generation and age in using layered user interfaces', *Gerontechjournal*, September 2001, 1 (1), 25-39.

Duimel, M. (2007), *Verbinding maken*: *Senioren en Internet* (The Hague: Sociaal en Cultureel Planbureau).

Fukada, R. and Bubb, H. (2003), 'Eye tracking study on Web-use: Comparison between younger and elderly users in case of search task with electronic timetable service', *PsychNology Journal*, 1 (3), 202-228.

Goldberg, J.H. and Wichansky, A.M. (2003), 'Eye tracking in usability evaluation: A practitioner's guide, in Hyönä, J. Radach, R. and H. Deubel, H. (eds), *The Mind's Eye: Cognitive and Applied Aspects of Eye Movement Research* (Amsterdam: Elsevier).

Gregor, P., Newell, A.F. and Zajicek, M. (2002), 'Designing for dynamic diversity: Interfaces for older people', *ASSETS* 2002, 151-156.

Hagberg, J.-E. (2004), 'Old people, new and old artefacts: Technology for later life', in Öberg, B.-M., Närvänen, A.-L., Näsman, E. and Olson, E. (eds), *Changing Worlds and the Ageing Subject: Dimensions in the Study of Ageing and Later Life* (Aldershot: Ashgate).

Hanson, V.L. (2001), 'Web access for elderly citizens', *WUAUC'*01, May 22-25, 2001. Alcácer do Sal, Portugal.

Hawthorn, D. (2003), 'How Universal is good design for older users?', conference paper, ACM SIGCAPH Computers and the Physically Handicapped, Proceedings of the 2003 Conference on Universal Usability Issue, 73-74.

Hill, R., Dickinson, A., Arnott, J., Gregor, P. and McIver, L. (2011), 'Older users' eye movements: Experience counts', *CHI 2011*, May 7-12, Vancouver, BC, Canada.

Houtepen, L. (2007), *Op zoek naar Informatie. Onderzoek naar het vinden en beoordelen van informatie op de websites van de vijf grootste zorgverzekeraars* [Unpublished Master thesis] (Utrecht: Utrecht University / Utrecht School of Governance).

Hoven, M.J. van den (1994), 'Towards ethical principles for designing politico-administrative information systems', *Informatization and the Public Sector*, 3 (3/4), 353-373.

Huysmans, F., Haan, J. de and Broek, A. van den (2004), *Achter de schermen: Een kwart eeuw lezen, luisteren, kijken en internetten* (The Hague: Sociaal en Cultureel Planbureau).

Johnson, R. and Kent, S. (2007), 'Designing universal access: web application for the elderly and disabled', *Cognition, Technology and Work*, 9, 209-218.

Josephson, S. and Holmes, M.E. (2004), 'Age differences in visual search for information on web pages', *Eye Tracking Research & Application: Proceedings of the 2004 Symposium on Eye tracking research and applications* (San Antonio Tx).

Kronjee, G. (2003) 'Voorwoord', in Wagemakers, A. and Quispel, Y., *Verkenning van het gebruik van leeftijd in onderzoek* (Utrecht: Landelijk Bureau Leeftijdsdiscriminatie).

Lange, F. de (2007), *De mythe van het voltooide leven: Over de oude dag van morgen* (Zoetermeer: Meinema).

Lawton, M.P. (1998), 'Future society and technology', in Graafmans, J., V. Taipale, V. and Charness, N. (eds), *Gerontology: A Sustainable Investment in the Future* (Amsterdam: IOS Press).

Lenhart, A. and Horrigan, J.B. (2003), 'Re-visualizing the digital divide as a digital spectrum', *IT & Society*, 5, 23-39.

Loo, J. van (2005), *Training, Labor Market Outcomes, and Self-management* (Maastricht: ROA).

Loos, E.F. (2010), *De oudere: een digitale immigrant in eigen land?Een terreinverkenning naar toegankelijke informatievoorziening* [Senior citizens: Digital immigrants in their own country? An exploration of accessible information delivery]. [Inaugural lecture] (The Hague: Boom/Lemma).

Loos, E.F. (2011a), 'Generational use of new media and the (ir)relevance of age', in Colombo, F. and Fortunati, L. (eds), *Broadband Society and Generational Changes* (Frankfurt am Main etc.: Peter Lang).

Loos, E.F. (2011b), 'In search of information on websites: A question of age?', in Stephanidis, C. (ed.), *Universal Access in Human-Computer Interaction. Users Diversity*, HCI International 2011, LNCS 6766 (Berlin, Heidelberg, New York: Springer).

Loos, E.F. and Mante-Meijer, E.A. (2009a), 'Getting access to website health information: Does age really matter?', research paper presented at the conference Digital Media Technologies Revisited, University of the Arts, Berlin, 20-21 november 2009.

Loos, E.F. and Mante-Meijer, E.A. (2009b), *Navigatie van ouderen en jongeren in beeld: Explorerend onderzoek naar de rol van leeftijd voor het informatiezoekgedrag van website-gebruikers [Navigation of older and younger people: Explorative study into the role of age on website users' information search behaviour]* (The Hague: Lemma).

Mannheim, K. (1928/1929), 'Das Problem der Generationen', *Kölner Vierteljahreshefte für Soziologie*, 7 (1928), 157-185 and (1929), 309-330.

Mares, M.L. and Woodard, E. (2006) 'In search of the older audience: Adult differences in television viewing', *Journal of Broadcasting & Electronic Media*, 50, 595-614.

McElhal, M. (2007), Eye-tracking: Eye candy vs I can do. Available at: <http://www.webcredible.co.uk/user-friendly-resources/web-usability/eye-tracking> (accessed 20.07.2011).

Morrell, R.W. (2002), *Older Adults, Health Information, and the World Wide Web* (Mahwah, NJ: Lawrence Erlbaum).

Peiser, W. (1999). 'The television generation's relation to the mass media in Germany: Accounting for the impact of private television', *Journal of Broadcasting & Electronic Media*, 43, 364-385.

Pernice, K. and Nielsen, J. (2002), *Web Usability for Senior Citizens. Design Guidelines Based on Usability Studies with People Age 65 and Older* (Fremont: Nielsen Norman Group).

Prensky, M. (2001), 'Digital natives, digital immigrants', *On the Horizon*, 9 (5), 1-6.

Rawls, J. (1971), *A Theory of Justice* (Cambridge, Massachusetts, London: Belknap Press of Harvard University Press).

Rawls, J. (1993), *Political Liberalism* (New York: Columbian University Press).

Riley, M.W. and Riley, J.W. (1994), 'Structural lag: past and future', in Riley, M.W., Kahn, R.L. and Foner, A. (eds), *Age and Structural Lag* (New York: Wiley-Interscience).

Romano, J.C. (2010), 'Using eye-tracking to examine age-related differences in web site performance', *Proceedings of the Human Factors and Ergonomics Society 54th Annual Meeting*, 1360-1364.

Ryder, N.B. (1965), 'The cohort as a concept in the study of social change', *American Sociological Review*, 30, 843-861.

Sackmann, R. and Weymann, A. (1994), *Die Technisierung des Alltags. Generationen und Technische Innovationen* (Frankfurt: Campus Verlag).

Schnabel, P. (1999), 'Individualisering in wisselend perspectief', in Schnabel, P: (ed.), *Individualisering en sociale integratie* (Nijmegen: Sun).

Schulmeister, R. (2008), *Gibt es eine »Net Generation«?* Work in Progress. Hamburg, (Universität Hamburg: Zentrum für Hochschul- und Weiterbildung). Available at: <http://www.zhw.uni-hamburg.de/uploads/schulmeister-net-generation_v2.pdf> (accessed 20.07.2011).

Thijssen, J.G.L. (2006), *De tweede loopbaanhelft. Ontwikkelen en perspectieven in een vergrijzende samenleving.* Rede in verkorte vorm uitgesproken bij het afscheid als gewoon hoogleraar Strategisch Human Resource Management aan de Universiteit Utrecht, departement Bestuurs- en Organisatiewetenschap, op donderdag 16 november 2006 (Utrecht: Utrecht University / Utrecht School of Governance).

Tullis, T.S. (2007), 'Older adults and the Web: Lessons learned from eye-tracking', in Stephanidis, C. (ed.), *Universal Access in Human-Computer Interaction. Coping with diversity*, HCI, LNCS 4554, (Berlin, Heidelberg, New York: Springer).

Van Deursen, A.J.A.M. (2010), *Internet Skills: Vital Assets in an Information Society* [Dissertation] (Enschede: University of Twente).

Wellman, B., Boase, J. and Chen, W. (2002), 'The network nature of community: Online and offline', *IT & Society*, 1 (1), September 2002, 151-165.

Wellman, B., Quan-Haase, A., Boase, J., Chen, W., Hampton, K., Isla de Diaz, I. and Miyata, K. (2003),'The social affordances of the internet for networked individualism', *JCMC*, 8 (3), April 2003.

Weymann, A. and Sackmann, R. (1998), 'Technikgenerationen', *Literatur- und Forschungsreport Weiterbildung*, 42, 23-35.

White, K., Jerrams-Smith, J and Heathcote, D. (2001), 'Improving access for elderly and severely disabled persons: a hybrid adaptive and generic interface', in Stephanidis, C. (ed.), *Universal Access in HCI: Towards an Information Society for All*, Vol. III, 1025-1028 (Mahwah, NJ: Lawrence Erlbaum).

Wichansky, A.M. (2000), 'Usability testing in 2000 and beyond', *Ergonomics*, 43 (7), 998-1006.

Wright, P. (2000), 'Supportive documentation for older people', in Westendorp, P., Jansen, C. and Punselie, R. (eds), *Interface Design & Document Design* (Amsterdam: Rodopi).

Zajicek, M. and Morissey, W. (2003), 'Multimodality and interactional differences in older adults', in Carbonell, N. (ed.), *Multimodality: A Step Towards Universal Access. Special Issue of Universal Access in the Information Society*, 2 (2), 125-133.

Zaphiris, P. and Savitch, N. (2008), 'Age-related differences in browsing the Web', SPARC Workshop on "Promoting Independence through New Technology", Reading, New England.