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# Senior citizens: Digital immigrants in their own country?

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**Abstract**

Populations are ageing at a rapid pace in the majority of western countries. At the same time, these countries are increasingly becoming more digitised and information is supplied to a growing extent in digital form. To what extent is there an actual problem for senior citizens who are looking for accessible information? Is age the deciding factor for the way they make use of old and new media to gain access to information or are there other explanations for their information search behaviour? The results of the empirical studies presented in this article (Mante-Meijer & Loos, 2008; Loos & Mante-Meijer 2009 and Loos, 2011) show that the Dutch citizens, young and old, are spread across a 'digital spectrum'. (Lenhart & Horrigan, 2003), rather than facing one another across the much-touted age-based 'digital divide'. Prensky's (2001) 'digital natives' and 'digital immigrants' do not appear to exist in the Netherlands, at least as far as their information seeking behaviour is concerned. This article will show that not only age but life stages, to some extent socialisation and (as people start to age older) age-related functional limitations also play a role. Adopting a multi-channel approach and designing information sources by the principle of 'dynamic diversity' (Gregor et al., 2002) could offer a solution.

**Keywords**: digital divide, digital spectrum, digital natives, digital immigrants, senior citizens, eye-tracking

## Introduction[1]

'Information will increasingly be supplied via the digital route', a public servant at one of the Dutch Ministries once told me. When I asked whether senior citizens were able and willing to make use of the digital route, he answered: 'Whether or not senior citizens can or want to use new media like the internet is not a social problem. That generation of senior citizens will automatically die out.' Such sentiments are not uncommon. The statement is not only crude, it remains to be seen whether the underlying assumptions are even true:

- Senior citizens may be regarded as a homogenous group.
- This group does not want to or is not able to make use of digital information sources.
- It is not a problem, because as time passes, the older generation that is unable to use the new media will simply expire, to be succeeded by a new generation that has no problem whatsoever with living in a society in which the information supply mainly runs via the digital route.

[1] This article is based on part 1 and 2 of the inaugural lecture by Loos (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 information accessibility] The Hague:Boom/Lemma.

In my opinion, there is no empirical evidence to support these assumptions. There is much to be said for 'aged heterogeneity' (Dannefer, 1988, pp. 360-362): individual differences increase the older people become. On the basis of explorative qualitative research that I conducted in the Netherlands (Mante-Meijer & Loos 2008; Loos & Mante-Meijer, 2009 and Loos, 2011). I will show in this article that there is no such thing as the average Dutch senior citizen and that when it comes to the use of (digital) information sources it would be more correct to refer to a 'digital spectrum' (Lenhart & Horrigan, 2003). This would appear contradictory to the much-heard lament that we are confronting an ever-widening 'digital divide'.[2] So Prensky (2001) makes a rigid distinction between what he calls 'digital immigrants' and 'digital natives'.[3] Digital immigrants are senior citizens who, with much effort can learn to use digital media up to a certain point. By contrast, digital natives grew up in a digital world. At first glance, this seems plausible. I will show, however, that regarding digital information search behaviour, there is no empirical evidence to support such a rigid, age-based division, and that therefore by no means all senior citizens have become digital immigrants in their own country. I will also demonstrate why, in each generation, there will always be people who have trouble with new media.

We should not fixate, though, solely on the use of new media sources, such as the internet, email and mobile phones. I will also demonstrate that old style classical media sources, such as folders, newspapers, the telephone and other people, will continue to play an important role as information source, even in our rapidly digitising society.

This article will take you into a landscape[4] in which the inhabitants are ageing and information about services and products is increasingly provided via the digital route. In order to clarify the consequences of this development, with which a heterogeneous group of senior citizens are increasingly being confronted, I will discuss the following questions:

1. To what extent is there an actual problem for older inhabitants of the landscape who are looking for accessible information?
2. Is age the deciding factor for the way this group makes use of old and new media to gain access to information or are there other explanations for their information search behaviour?
3. Which are the implications for accessible information delivery?

[2] See Van Ingen et al. (2007, p. 14) on the 'digital divide', according to them a term coined in 1995 by two journalists, Jonathan Webber and Amy Harmin of the *LA Times*, after which Al Gore further popularised the term in May 1996.
[3] 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.
[4] Also see Hagberg (2004, p. 163) who argues that we all live, literally and metaphorically, in a technological landscape.

**Accessible information for senior citizens in our society**

*Ageing, digitisation and individualisation*

Populations are ageing at a rapid pace in the majority of countries in the west. At the same time, these countries are increasingly becoming more digitised. Information is supplied to a growing extent in digital form. It is obvious, that this trend poses dangers for people, such as senior citizens, who have problems using such new media. Duimel (2007, p.7) rightly states that:

> 'The moment services available from commercial suppliers, but also from the government, are definitely digitised, senior citizens unable to use the internet will run into problems.' (translation)

A complicating factor is that the landscape in which senior citizens currently reside is largely shaped by what De Lange (2007, p. 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)

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

> '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 since largely been fulfilled. According to Wellman et al. (2003) there has been a move to 'networked individualism'[5], in which the person has become a 'portal'. Paradoxically, however, although senior citizens are more than ever before surrounded by a large numbers of age peers, they are, at the same time, forced to rely to a far greater extent on their digital information sources. For senior citizens unable to use the new media as an information source, digitisation will not offer sufficient compensation for this 'decollectivisation of the life course'.

Duimel (2007, pp. 24-57, 104-105) argues that there are senior citizens who cannot or do not wish to use the internet (so-called 'non-liners') because they are afraid of trying something new and making mistakes; at the same time, the costs, unfamiliarity with the possibilities of this new medium and emotional motives, such as shame, performance anxiety and loss of face may well also play a role.

[5] 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.

*Information rights for all citizens*

If we wish to ensure that senior citizens can continue to participate in our society, then accessible information is of prime importance. Just health information alone is vital for senior citizens, in view of their age (Coombs, 2008). Van den Hoven (1994, p. 369), referring to Rawls (1971, 1993), goes so far as to refer to a 'primary good'.

As all citizens have an equal right to access to information, Bovens (2002) advocates granting citizens information rights, next to the classic (freedom) rights. His focus is on the right to access public government information and he distinguishes between '*primary*, *secondary* and *tertiary information rights'*. *Primary information rights* refer to 'rights giving citizens direct claims to access to actual (government) information', *secondary information rights* are 'entitling citizens to government support in gaining access to crucial information channels', while *tertiary information rights* relate to 'rights that support citizens in their horizontal information relations with other citizens and with private legal entities'. (Bovens, 2002, p. 327) He elaborates on this, pointing out that citizens should be supported in gaining access to information. This concerns the physical aspects (the government must ensure that information channels function unhindered), the financial aspects relating to such access (affordable equipment and services) and the intellectual aspects (citizens must be able and want to make use of information channels; education and user friendliness are important to achieve this). Finally, Bovens (2002, pp. 334-335) notes that the government should carefully consider which information channels citizens should make use of. Adopting a multi-channel approach can make this possible (Mante-Meijer & Loos, 2008).

The focus in this article is not on accessible government information alone; information rights apply to the information provided by all organisations. If they wish to act in a social responsible manner, they would be wise to realise that accessible information is the only way to ensure that their products and services are available to all.

## Senior citizens and new media: A real problem?

There are undoubtedly critics who think that the problems senior citizens have with using new media are exaggerated. They could demonstrate this using a number of arguments. I will go through these now one by one, and refute them.

*'The use of new media is a hype that will pass as fast as it came'*

This argument is frequently adduced in the case of technological innovations and is superbly illustrated by the following Dutch cartoon:[6]


*Figure 1: A technological innovation*

Left monk: This printing press thing … no way it's here to stay!

Right monk: People will always keep wanting to read handwritten books!

These two monks are stereotypes of people who think that the fuss about new technological developments is greatly exaggerated. Although this obviously is a modern-day cartoon, there will undoubtedly have been people back then who were convinced that printed books were doomed, as people would always prefer to read manuscripts. Today, we know that they were terribly wrong. The same could be said of those in the last century who declared that they would never buy a colour television set, a PC or a mobile phone, and would certainly never use the internet or email at work. History teaches that once technological innovations such as the printing press, the steam locomotive or new media have started to be used by a certain number of people, they are here to stay. As we can learn from Rogers (1962), successful innovations are

[6] This cartoon was also used on the cover of their historical e-canon, see http://www.velon.nl/uploads/ecanonfokkesukke_1_.pdf With thanks to Reid, Geleijnse & Van Tol for their permission to use this cartoon.

first used by 'innovators', 'early adopters', then by the 'early majority', followed by the 'late majority' and finally even by the 'laggards'.

*'The problem will go away by itself as time passes'*

A much-heard sentiment is that the problem will go away by itself as time passes. The civil servant I quoted at the beginning of this article, who said that the generation of senior citizens unable to make use of today's media would automatically die out, is a good example. Apart from the fact that, because life expectancy has grown it will still take years before the present generation of senior citizens with difficulties using the new media has gone, there is another reason why the problem won't simply go away by itself as time passes. Media are also subject to development and new media continue to evolve. Already, mobile technology allows us to communicate directly with other people and gain access to information, whenever and wherever:

> 'This information is increasingly coupled to locations, and with the help of the *global positioning system* (GPS) and digital maps we can now determine exactly where we are and to see what our surroundings have to offer. For example, it is possible to see where your husband is, where the nearest cafe is and to find visitors' reviews of that cafe, or where the theatres are, find out what is playing and check the reviews.[7] We are increasingly surrounded by information and no longer surf the net but *live in* the web (Van 't Hof, Daemen & Van Est, 2010). (…) It may confidently be expected that, again, the same groups will take the lead and that again, senior citizens, those with a low level of education and the inactive part of the population will move far more slowly towards a life in the web.' De Haan & Adrichem (2010, pp. 105-106) (translation)

Yet today's new media will be obsolete by tomorrow. History continues to repeat itself, as Marvin (1988) demonstrates so admirably in her book *When old technologies were new*, in this case with reference to the technological innovation that was electricity at the end of the 19th century.

*'Senior citizens can learn to use the new media.'*

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.[8] Becker (1992a/b) and Becker & Hermkens (1993) point out how important the formative period in the life of humans (between the 15th and 25th year of life[9]) is, as, people born in a certain year and who form a

[7] See also Von Bredow et al. (2010) for more examples.
[8] 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.
[9] Becker (1992b, p. 21) relies here on Mannheim (1928/1929). Also see Peiser (1999) and Bouma (2000, pp. 68, 76) on the role of the formative years in media usage.

cohort all 'have experienced certain life events'.[10] Obviously, the introduction of a new technology counts as such an event, which can lead to the rise of a new 'technology generation' (Sackman & Weymann, 1994, pp. 41-43). Huysmans et al. (2004, p. 20) argue:

> '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)

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, p. 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).'

This means that the average senior citizen is a myth, which makes the task of ensuring that information remains accessible to senior citizens even more challenging.

The problem is, in fact, one of literacy. Who is literate enough to learn how to use a new medium (Kress, 2003 and Livingstone, 2003)?[11] Although we don't always realise it, certain skills are required in order to make use of a specific medium. A film can be found on YouTube[12] playfully showing what happens when the skills needed to utilise a medium that once upon a time was new (the paper book) are lost. Like the Dutch cartoon about the printing press, the perspective is once again that of a monk's. The film transports us to an imaginary future in which the book is no longer a new medium, but has become an old medium. The monk enlists the aid of a helpdesk person because he is unable to gain access to the book lying in front of him. The helpdesk employee has to explain how to open the book, and that the way to browse it is by turning the pages by hand. After reassuring him that no information can be lost, he moves to leave. The monk calls him back in panic, because he still cannot read the book. He has forgotten that he needs to open the book at the front. When the helpdesk person asks him why he hasn't read the manual, he answers that the manual was also a book and that he couldn't figure out how to use it, either.

How can we ensure that the landscape inhabited by senior citizens is organised in such a way that they are actually able to make use of the new media? This is of particular importance for certain groups of senior citizens, for example, those with little to no (work) experience with the new media. Knowledge is gained for the most part through 'situated learning', and the older a person is when learning to use the new media, the more difficulty this tends to yield, especially if the person in question has not had a lot of intensive

[10] Becker (1992b, p. 25) refers to Ryder (1965) for his definition of the concept of 'cohort'.
[11] See also Baake (1998), Aufenanger (2000) and Hartung et al. (2009) on 'Medienkompetenz'.
[12] http://www.youtube.com/watch?v=xFAWR6hzZek

practice (such as at work), which is often the case for older women (Bouma, 2000, pp. 68, 76). 'Experience concentration' can play a role in this respect:

> 'The experience concentration theory states that, as age increases, experience quantity will generally increase, while experience diversity will decrease, as a result of which people become increasingly more knowledgeable about an increasingly smaller area of expertise.' Thijssen (2006, p. 21)[13] (translation)

In short, a lack of internet experience during an earlier period of life is the reason why some senior citizens cannot or only with great difficulty are able to make use of this new medium. Bouma (2000, pp. 76-77), therefore, holds that skills training programmes and well-formulated user instructions offer only a limited solution to the difficulties confronting senior citizens who did not grow up with a particular new medium. He sees more benefit in a new interface architecture, with more user-friendly displays for senior citizens.

**Using of old and new media: a matter of age?**

Age often serves as the ultimate explanatory variable in social science research (Wagemakers & Quispel, 2003, pp. 93-96). For example, it is assumed that age explains work-related absenteeism.[14] According to Nauta et al. (2004, pp. 23, 50) reality, at least in the Netherlands, is a bit more nuanced. According to them, senior citizens are in fact *less often sick* than younger people, but when they do fall ill, it takes them *longer to recover* than younger people. Factors such as lifestyle offer a better explanation for this absenteeism than age alone. Hence Kronjee (2003, p. 4) is critical about the use of age as the ultimate explanatory variable in much research:

> 'Not only is it open to question whether age is the most appropriate variable for the topics which these researchers 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. After analysing the effect in age differences, they should examine which theory should best be used to interpret the age effect. (translation)

The danger of erroneously using age as the ultimate explanatory variable also arises in empirical studies on the information search behaviour of senior citizens with the help of old and new media. To avoid this, attention should also be given to such variables as sex, educational level and frequency of internet use when conducting empirical research in this area. In the two exploratory qualitative studies, which I conducted in the Netherlands in this area, the results of which I will later be presenting later in this article, such variables were included in the research design. It is also important to remain open to complementary

[13] See also Thijssen & Rocco (2010) for more information about 'experience concentration' and Hoyer (1990) about a related theorectical concept: 'encapsulation'.
[14] See also Thijssen (2006, p. 23) who refers to Boerlijst & Van der Heijden, 2002, p. 479) and states that: 'the differences found within age categories are repeatedly shown to be bigger that between age categories'.

theories which could offer an alternative explanation for any differences in information search behaviour when using old and new media (see also Huysmans et al., 2004, pp. 207-208). I will therefore now first present two such complementary theories: the socialisation theory and the life course theory.

*The role of socialisation*

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. Socialisation theory, therefore, is consistent with the idea of 'technology generations', which I discussed earlier. Commenting on the relevance of socialisation theory for media use, Van der Goot (2009, p. 255) argues:

> 'This influence is also assumed for media use: generations may very well develop specific patterns of media use when young and remain loyal to these patterns throughout the rest of their life (Hofmann & Schwender, 2007 and Mares & Woodard, 2006).' [translation]

*The role of life course*

A different way to explain people's media usage focuses not on the period in which they grow up, but on the role of the life stages they are going trough at particular moments. We pass through a number of stages during our lives that are marked by 'life events', such as going to school, leaving the parental home, having children, and collecting retirement benefits. Depending on the life stage we are in, we have a certain amount of time and interest in using a particular medium. So, Huysmans et al. (2004, p. 203)[15] argue:

> 'Objectively and subjectively, time pressure is the highest in the period between a person's twentieth and fiftieth year (Van den Broeck et al., 2001, p. 19). During this stage, careers are established and pursued, and children are born. The growing need to combine work and care, creating even more time pressure is, on the one hand, the result of the rise in dual-income couples and on the other hand, due to the increased number of singles in the stage up to approximately the fortieth year. In the course of time, the children leave and by around the age of 65, it is time to retire, which frees up a substantial amount of time.' (translation)

[15] See also Van der Goot & Beentjes (2008, p. 3021) on 'media use across the life-span'.

*The influence of age-related functional limitations*

As people grow older, however, there is no escaping the fact that age can start to play a certain role regarding the accessibility of the digital information supply, and that it then may be regarded as an explanatory variable. Biological developments during the life course affect our media use. Examples include age-related functional limitations owing to declining visual, hearing, cognitive and motor functions. Chisnell & Redish (2004, p. 50) refer in this connection to Hawthorn (2003), who uses the term 'age-restricted users'.[16]

Especially the very old are at considerable risk for age-related functional limitations, making it difficult and more time-consuming for them to search, for example, for information on websites.[17] Wright (2000, p. 86) notes that in such a case, 'multi-modal redundancy', like the use of both visual and auditory signs, could help. Zajicek & Morissey (2003), referring to 'multimodality', 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 accessible interfaces would be wise to make a note of these and other insights where senior citizens are concerned. Bouma (2000, pp. 71-72), for example, comments that age-related functional limitations occur with a certain regularity from age 75 on, and are common from age 85 and up.

## Two explorative qualitative studies

*Media choice*

There are various information sources to which senior citizens have access. New, but also old media can play an important role. The question is whether senior citizens can and want to make use of the same media sources than as those used by the young. In 2006, an ideal situation for finding an answer to this question arose in the Netherlands. At that time, each inhabitant of the Netherlands had to decide whether to stick with the health insurance company they had, or to switch to a new one. Hans Hoogervorst, the then minister of Health, Welfare and Sports, was totally convinced that the Dutch population would collectively bombard the comparison sites in order to arm themselves down to the last detail with information about what the various insurance providers had to offer. In order to find out which information source(s) citizens actually used, a total of 133 people were interviewed (Mante-Meijer & Loos, 2008).

This explorative qualitative study showed that in general, use of old-style classical information sources (such as folders, newspapers, the telephone, other people) was more popular than the use of new media

[16] See Bouma (2000) and Loos & Mante-Meijer (2009, pp. 38-39) for an overview of the studies on age-related functional limitations in these areas.
[17] Economists refer in this connection to 'obsolescence'. Also see Thijssen (2006, pp. 15-25) and Van Loo (2005).

sources, which required people to actively search for information themselves (e.g., comparison sites). This they would do only if convinced that it was worth the effort.

Compared to the other age categories, the group aged 35-54 gathered extensive information, using both old and new media. One explanation for their outsized need for (information about) a good health insurance company could be the life stage they are in, their busy schedules and the possibility of health problems, either their own, or those of their partner and children, if they have them.

Interestingly, the youngest age group (aged 24-34)[18] made the least use of information sources. They probably fail to see the relevance of searching for a health insurance company. In all likelihood, this is because they figure that the chance of developing health problems is very slight in the life stage they are going through.

A striking finding was that senior citizens between the ages of 55 and 75 took the time to become very well informed and in doing so, made relatively frequent use of the new media. Apparently, if these senior citizens had access to the internet, they actively made use of it. They both could and wanted to. And in view of their age, a time when health problems are prone to strike, their need for (information about) good health insurance is hardly surprising.

It was further found that senior citizens aged 75 and up for the most part neither could not nor would not use the new media as a source of information (also see the 'capability model' developed by Heres et al., 2005). Socialisation theory may offer an explanation for this. The senior citizens aged 75 and up did not grow up with the new media and did not learn how to use these during their formative years, which means that taking the steps to learn how to do this is probably too much to ask. Moreover, age-related functional limitations of the kind I discussed previously may also play a role. At their age, the risk of health problems is relatively high, while the need for accessible information is considerable. It hardly comes as a surprise, therefore, that their major sources of information were family members, friends and others in their support network. Antonucci & Akiyama (1987, p. 519) refer to family members and friends[19] as a 'convoy':

> 'The term *convoy*, borrowed from anthropologist David Plath (1980), is used to evoke the image of a protective layer, in this case, of family and friends, who surround the individual and help in the successful negotiation of life's challenges. Each person can be thought of as moving through life surrounded by a group of other people to whom he or she is related through the exchange of social support. Convoys are thought to be dynamic and lifelong in nature, that is changing in some ways but remaining stable in others, across time and situations. For example, parents and children usually remain within one's support network throughout one's life.'

[18] Young people under age 24 are often still in school and live at home, and were therefore not included in this study.
[19] See Bakardjieva (2005, pp. 98-103) who also refers to such people as 'warm experts'.

This explorative qualitative study found no evidence for any relationship between educational level and the use of a specific medium as a source of information in choosing a health insurance company. A slight difference was found in the way men and women made use of the various sources of information available when making their choice. Women were more likely to consult information sources (particularly the folders put out by the government) than men. In addition, men tended to visit general sites, while women navigated to the insurance company's site itself. Also, women, more than men, were likely to ask other people for information.

In short, the varied choice of media used by the four age categories shows that in this area, at least, there is no digital divide between older and younger people, with the former never and the latter always making use of the new media (Prensky, 2001). A far more accurate description is that of a digital spectrum (Lenhart & Horrigan, 2003). Future policy should therefore be targeted at ensuring the availability of simple, accessible information sources for citizens, whether young or old, who are unable or unwilling to use the new media. In other words, a multichannel approach is essential.[20]

*Information searching behaviour on websites*

Although the inhabitants of our multimedia landscape make use of both old and new media, the supply of new media in our society is on the rise. For this reason, I also address the online information searching behaviour of our older and younger inhabitants. I will focus on websites, a new medium offering a huge range of information, and I will examine the relevance of age for the way people navigate websites. 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). What is lacking, however, is insight into the similarities and differences in the *actual* navigation behaviour of older and younger people. In the explorative qualitative study which I conducted in 2009 this behaviour therefore was visualised with the help of 'eye-tracking', by having 29 older and 29 younger users[21] perform searches on a number of websites (Loos & Mante-Meijer, 2009 and Loos, 2011).[22]

The eye-tracker is an instrument that uses infrared to measure eye movements in navigation patterns in a non-invasive manner. The eye-tracking equipment is built into the rim of the monitor.[23] Heatmaps are generated, with the different colours showing what the participants looked at on a webpage, how often and

[20] See Mante-Meijer & Loos (2008).
[21] Aged, respectively, 21 or thereabouts, and 65 and older.
[22] Compared to earlier eye-tracking research carried out in this area by Houtepen (2007) and Tullis (2007) this empirical study boasted a relatively large number of participants: 29 young people and 29 older people (of whom 18 were daily internet users), thus amply fulfilling the mimimum of eight participants required for this type of usability study, see Wichansky (2000) in Goldberg & Wichansky (2003, p. 512). These are, however, random samples that are limited because of their size. By including larger numbers of participants, the representativeness is better assured and statistical analyses can reveal significant differences or similarities.
[23] See McElhal (2007) for a further explanation of eye-tracking and the purposes for which this research instrument can be used.

how long: not very often (green), more often (yellow) or very often (red). Information about navigation patterns of this kind can help web designers to design sites on which both young and old can successfully find the information they are seeking.

This explorative qualitative study revealed a number of trends. Generally speaking, the younger age group successfully completed the search more often than the older group, and in most cases was also much faster.[24] This may be due to their age: they are not yet held back by age-related functional limitations. It may well be that 'fluid intelligence' also plays a role in this respect.[25] Thijssen (1996, p. 93) notes that:

> '[this] is a concept that refers to certain aspects of "academic intelligence", in particular to the ability to solve new problems that require mental agility and the ability to draw inferences by combining unknown elements. (…) The individual differences within a single age category are extremely broad, but in general it is assumed that the average scores for Gf [generic fluid intelligence] will start to decline after age twenty (…).' (translation)

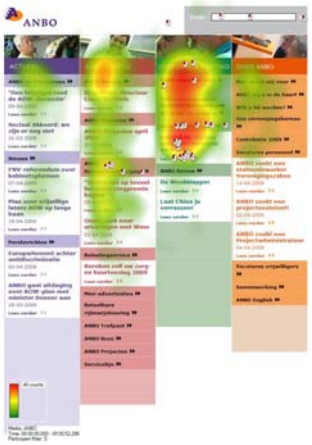
In view of the fact that the older generations did not grow up using websites, once again, socialisation theory could also provide an explanation.

There was also considerable variation within the older group: older males more often successfully completed the searches and were faster, than older females.[26] Educational level was found to play only a marginal role: a college or university education caused only a very slight variation within the group of older website users as far as successfully completing the searches was concerned. The percentage of senior citizens who were able to do so was very slightly higher among college and university graduates than among those lacking this background.

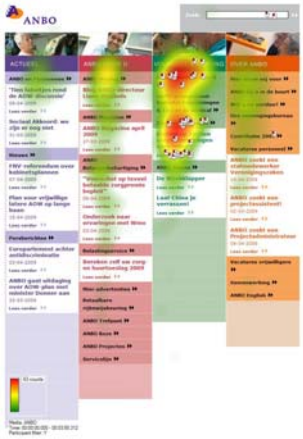
Regarding the *navigation patterns* of older and younger website users, let me show you a number of heatmaps from the homepage of the ANBO, a Dutch organisation for senior citizens.[27] The patterns of fixations of older and younger users seem to be different. Most of the younger users looked at the 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 look longer at the wrong place to click: the pink column. This is shown by the red zone appearing in that navigation area on heatmap 1, which is absent on heatmap 2. 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 the older people *using the internet daily* (heatmap 3) with those of the younger age group (heatmap 2), these patterns are in fact not as dissimilar as first thought. Like the younger users, the older

[24] See also empirical research of Docampo Rama et al. (2001, pp. 32-34) into the use of interfaces by older people compared to that of the young, from which the same conclusion could be drawn.
[25] See also Horn & Cattell (1972).
[26] Younger women were just about as fast as younger men, but slightly less successful (85.7% versus 100%, see Loos & Mante-Meijer, 2009, pp. 61-62).
[27] Grateful thanks to Robert-Jan van Diepen (Diepbizniz), who generated the heatmaps.

people using the internet daily looked less intensely in the pink column (no red zone in this navigation area), in contrast to the patterns of fixations of the older people *not using the internet daily* where two clear red zones are visible in that column (heatmap 4).



*Heatmap 1: all older people*



*Heatmap 2: all younger people*

*Heatmap 3: the older people using the internet daily*

*Heatmap 4: the older people not using the internet daily*

It appears that daily internet use has far more impact on our navigation patterns than does age. This shows that in this explorative qualitative study *age* is *not* the explanatory variable for the navigation

patterns in information search behaviour. *Experience with internet* plays a much more important role. In short, even if a person was not exposed to the internet during his or her formative years, this can be compensated by learning to work with the internet at a later age. Hence, in the case of navigation patterns the socialisation theory does not apply to all senior citizens.

It is nonetheless imperative that (in many cases, young) website designers consider the needs of older users who, for whatever reason, lack internet experience. Adopting the principle of 'designing for dynamic diversity' (Gregor et al., 2002) is a means to ensure that this group of older users is also able to find the information they are looking for on websites. Wright (2000, p. 86) notes that in such a case, 'multi-modal redundancy', like the use of both visual and auditory signs, could help. Zajicek & 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. The fear that this might irritate younger and more experienced users is unfounded. A study carried out by Johnson & Kent (2007) showed that, rather than having an adverse effect on a site's user friendliness, it tended to enhance it.

**Evaluation and implications for accessible information delivery**

In this article I have shown that the problem regarding the accessibility of digital information to senior citizens is anything but transient. It is important to pay attention to this problem, as senior citizens are also entitled to have access to information that is important for them to be able to continue to function in our society. One way to do this would be by ensuring the availability of simple, accessible information sources for citizens - a multichannel approach is essential.

Yet it is also important to consider whether age is indeed the determining factor in the way people make use of media to gain access to information, or whether other explanations for their information search behaviour are feasible. We may conclude that in the Netherlands younger and older people are spread across a digital spectrum (Lenhart & Horrigan, 2003), rather than facing one another across the much-touted age-based digital divide. At least as far as their information seeking behaviour is concerned we cannot lump all senior citizens together in one category: Prensky's (2001) digital natives and digital immigrants do not appear to exist in the Netherlands. Life stages, to some extent socialisation and (as people start to age older) age-related functional limitations also play a role. Designing websites according to the principle of 'dynamic diversity' could offer a solution. The use of textual, visual and auditory signs could help (Wright, 2000; Zajicek & Morissey, 2003).

This article has offered a reconnaissance of the accessibility of information for senior citizens in a multimedial landscape. All of us, young and old, live in this landscape. The digitisation of our society will almost certainly increase rather than decrease – just like the ageing population. If we adopt a multi-channel approach and allow ourselves to be guided by the principle of 'dynamic diversity' in designing information sources, we can prevent senior citizens from becoming digital immigrants in their own country. In this way, *all* senior citizens will continue to have access to relevant information about the services and products that are relevant for them, and they will continue to be able to participate in full in our society.

The empirical studies presented in this article concern explorative qualitative research, using random samples with sample-size limitations. For future empirical studies the use of a larger sample of participants is recommended in order to better ensure representativeness, so statistical analyses can reveal significant differences or similarities between the older and younger age groups.

In order to establish the role of socialisation, life course and age-related functional differences, focus groups could also be used. Older and younger people could be asked about their experience as a technology generation, the role of the life stage in which they currently find themselves and the extent to which they are helped or hindered by their age. This would provide us with insight into their preferences and distastes for a particular medium and to ascertain the degree to which access to information is related to age.

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