

Design of a website for home modifications for older persons with dementia

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Abstract.

BACKGROUND: At present, persons with dementia and their family caregivers in the Netherlands are not adequately supported to modify their dwellings to match their personal needs.

OBJECTIVE: To facilitate aging-in-place for persons with dementia, a website was designed.

METHODS: The website was designed with persons with dementia and their spouses. In consultation sessions existing websites were discussed. Based on this discussion, a demonstration website was created and then discussed with and judged by the participants. Visits to the website were monitored using Google Analytics.

RESULTS: Participants prefer a website that is easy to print. In addition, the navigation menu should have a maximum of three levels, and the website menu should be positioned on the left. Participants dislike the use of meaningless photographs because these do not add any value to the information given.

CONCLUSIONS: Participants prefer a website that is as accessible as reading a book. Some differences are related to culture, such as the participants dislike for the use of English terms. Therefore, preferences or dislikes of items on a website could not be generalized as such. However, the preferences and dislikes may provide useful input for the design process of an appropriate website.

Keywords: Older adults, Alzheimer's disease, usability, housing, website, home modifications, adaptations

1. Introduction

In the Netherlands, approximately 65% of the 230,000 older adults with dementia live in the general community. Simultaneously, 40% of the Dutch housing stock is not sufficiently supportive to enable older adults to live independently [1]. Caring for a person with dementia requires constant vigilance. This need results in significant stress on the family caregivers and often ultimately leads to admission to a nursing

home. Although nursing-home admission cannot always be avoided, it may be postponed by modifying the dwelling and through the use of technology. At present, persons with dementia and their family caregivers lack the means to adapt their dwellings to their needs, because they lack the essential knowledge and do not have access to the correct information. Thus, the creation of dementia-friendly housing by older persons and their caregivers has lagged the need for such housing.

The Dutch Alzheimer's Society¹ (*Alzheimer Nederland*) recognizes this problem and has asked the research team to provide information about dementia-

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¹<http://www.alzheimer-nederland.nl/>.

specific environmental adaptations, including home modifications that can support aging-in-place and accessibility for persons with dementia and their family caregivers. The Dutch Alzheimer's Society possesses information about home modifications, but this information is related only to the themes covered by the Dutch Social Support Act² (*Wet maatschappelijke ondersteuning, or Wmo*), such as the placement of grab bars in the bathroom or the removal of doorsteps. In the UK, similar web-based sources exist, but they only provide information about assistive technology [2].

In the Netherlands, family caregivers already care for four times as many people as professional caregivers and thus provide the most significant fraction of care [3]. Dementia is the most expensive health problem in the Netherlands. The costs account for 4.7% of the total national costs for healthcare [4], and the annual costs for care support are on average € 617 per family caregiver [5]. Family care – which is care that is provided to a person with dementia by relatives, particularly spouses and children- not only represents a great societal value, but also a great economic value. Wimo et al. [6] estimated that the worldwide societal cost of family care for dementia was € 82.7 billion in 2005, and that the cost for the European Union (EU) was € 26.8 billion (approximately € 4,700 per person with dementia). These values represent the costs that family caregivers face in terms of expenses and loss of income. Beyond the economic burden, admission to a nursing home has a major impact on family life and spousal relations. Spouses wish to live together and age-in-place for as long as possible. With the appropriate information -and in the case of limited purchasing power, with additional financial means-, they can live as desired.

Internet-based (psycho-educational and coaching) programs for people with dementia and their family caregivers play an increasing role in daily care and in the search for health care information [7–10]. Anderson et al. [9] conclude that for dementia caregivers, the Internet is a convenient source of answers to their many questions and needs. The Internet offers a wide array of resources, including a significant amount of information, advice, and opportunities for support. Considering the demands placed on dementia caregiving and the increasing number of people in society faced with this daunting task, it is in our best interests to provide caregivers with the most accurate, current, and usable on-

line information and support. Lewis et al. [10] demonstrated that an Internet-based psycho-educational program can strengthen family caregivers' confidence in caring for persons with dementia. In this study, we describe the creation of a website to offer information about home modifications for older adults with dementia and their family caregivers.

2. Research design and methods

The website for environmental modifications for older adults with dementia was developed through a combination of literature research, consultation rounds with end-users, and distribution of a set of questions.

2.1. Literature research

The content on the website is based on the literature regarding environmental interventions, home modifications, and design of the physical indoor environment and related building services [11–17]. The environmental interventions in this study can be identified as object modification, task simplification, assistive devices, or home modification, following Gitlin and Corcoran [18] (Fig. 1). Based on this categorization, the website comprises four categories: interior design, technology and devices, aspects of the indoor environment, and architectural modifications. This layout is used for all living spaces in a dwelling.

2.2. Consultation rounds

A series of consultation rounds was conducted to assess the desires and expectations of persons with dementia and their family caregivers. All potential participants had received an e-bulletin with information about the purpose of the project. This e-bulletin was distributed by the Dutch Alzheimer's Society and was published on their website. An invitation to participate in the consultation rounds was sent by the Dutch Alzheimer's Society by e-mail to the coordinators of several Alzheimer's Cafes in the Province of Utrecht. The participants were potential end-users of the website under construction, and were considered experts in their own field: coping with dementia with respect to aging-in-place. The recruitment of participants, who consented to participate, was performed digitally. The participants were active as volunteers in several working groups of the Dutch Alzheimer's Society. The participants were three couples in which the husbands had

²<http://www.rijksoverheid.nl/onderwerpen/wet-maatschappelijke-ondersteuning-wmo>.

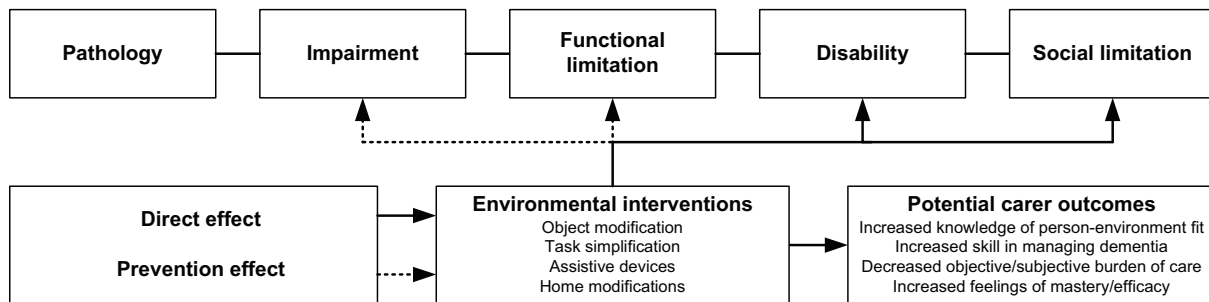


Fig. 1. Disablement model, role of home environmental interventions, and impact on caregivers. Taken and adapted from Gitlin and Corcoran [18].



Fig. 2. Participants commenting on the usefulness of existing websites. (Colours are visible in the online version of the article; <http://dx.doi.org/10.3233/TAD-140399>)



Fig. 3. Providing feedback about existing websites. (Colours are visible in the online version of the article; <http://dx.doi.org/10.3233/TAD-140399>)

early dementia (probable Alzheimer's disease). The skills of the participants were such that they could join the consultation rounds. All couples lived independently in their own homes.

Three consultation rounds were scheduled. The first consultation was held on March 25th 2010, the second was held on April 22nd 2010, and the third was scheduled for June 24th 2010. In Session 1, four older adults aged 65 and older participated, and in Session 2, six older adults aged 65 and older participated. A third consultation round was scheduled to gather feedback about the developed demonstration version of the website. All participants had a personal computer (PC) at home and access to the Internet. One couple was novice PC users. The other couples used PCs on a daily basis. The female participants were the ones who used the PC at home and read the information on the Internet for their spouses. The webpages were printed such that the text could be read again after using the PCs.

The consultation rounds were facilitated by members of the research team and were held in one of the faculty's multimedia rooms with access to the Internet. A coordinator of one of the Alzheimer's Cafes at-

tended the two consultation rounds. Each consultation round started with an explanation of the purpose of the session. The primary author served as the facilitator. The members of the research team observed the participants, took notes, and if necessary, asked the participants to clarify their answers, feelings or attitudes. Each session lasted approximately 1.5 hours, with a 15-minute break in between the sessions.

The first consultation round aimed to investigate the participants' perspectives on websites. This session included questions about the design, menu, colors used, and ease of finding the information needed. First, the participants were asked to look at and comment on screen shots of several websites (Figs 2 and 3). In addition, the participants were invited to search for websites on the Internet. Notes and observations from this first session were used to develop the topics of the second session. Therefore, during the second consultation round, we focused on how participants search for information about dementia-friendly housing and which keywords they use in this search. This session included questions such as the following: (i) Which issues are of interest? (ii) Is there a differ-



Fig. 4. The preliminary screen-shot based on literature research and the outcomes of the first consultation round, which were used for the discussions with participants. (Colours are visible in the online version of the article; <http://dx.doi.org/10.3233/TAD-140399>)

ence between long and short uniform resource locators (URLs)? and (iii) Which of the following arrangements for websites is preferred: by (instrumental) activities of daily living ((I)ADL), problem, room, or some combination thereof? In this session, the participants were also asked which URL they would prefer for a website about dementia-friendly housing. The participants discussed several types of website screen shots that were specially made for this session and based upon the results from the first session (Fig. 4). Prior to the third consultation round, a written-consultation round was held to receive feedback about the developed demonstration website for dementia-friendly housing. This demonstration website was developed using the functionalities for creating a website offered by iGoogle. The intention was also that participants would use the demonstration website at home. The themes discussed in the third meeting, were based on those that emerged in the first and second consultation rounds, but focused only on those that were related to the developed demonstration website. The requirements for the development of a demonstration website already met the necessary requirements for web accessibility as specified by the Dutch government [19]. Moreover, work by other researchers regarding websites for older people, the digital provision of in-home assessments for home modification services, and communication practices for people with dementia were consulted [20–23].

2.3. Set of questions for the users

Six weeks prior to the official introduction of the website, a set of questions was electronically distributed to the participants in the consultation groups. Furthermore, four months after the official introduction of the website, the set of questions was sent to all participants in the consultation groups and to the participants who were present at the official introduction of the website. In total, 20 people responded to the first set of questions, and 12 people responded to the second set of questions, which was sent after four months. The first set of questions consisted of five parts: Part 1 included general personal data, Part 2 referred to the impressions that the user has about the website, Part 3 was an assignment to search for solutions for wandering in the case of dementia, Part 4 included closed questions scored on a seven-point Likert scale according to the USE questionnaire for measuring usability [24], and Part 5 offered room for remarks. The questionnaires were constructed as seven-point Likert rating scales. Users were asked to rate agreement with the statements, ranging from strongly disagree (1) to strongly agree (7). The results from this first set were used to adapt the website.

The second set of questions consisted of only one part and was intended to evaluate how the website was being used four months after being published on the Internet. The questions were based on Krout's "Seven

'A's", which are considered key elements for community support [25]. One year after the official introduction of the website, we again analyzed the results from Google Analytics to determine whether the website was still being used.

3. Results

In the following section, the results of the consultation rounds, including the set of questions and Google Analytics data, are presented.

3.1. Consultation rounds

The participants' expectations were that the website would be a tool for supplying information about environmental modifications and, would ideally provide them with quick access to the appropriate information. They expected to receive information about the possibilities for environmental modifications within the context of the Dutch Social Support Act. Participants would like to be supported and advised on how to modify their home environment from the onset of the dementia process onwards. As native Dutch speakers, they disliked the use of English terminology (Table 1). Bottlenecks that were experienced included the following: (1) information about home-based environmental modifications for dementia being found in several places, (2) reimbursement policies within the Social Support Act differ from one municipality to another, and (3) the technological devices needed to age-in-place often being too complicated to use. The participants' comments about the selected screen shots of websites for older users and their favorite websites, which the participants selected themselves, are summarized in Table 1.

The second session delivered additional information beyond that already yielded by the first session. The participants preferred the use of one color and formal language on the website. The web text should be understood by a layman. The participants disliked closing pop-up menus on a page and preferred menus that can stay open. The homepage should clearly indicate what the website is about. Thus the use of 'ambiance' pictures of older persons on the home page or front page was disliked, partly because of their stigmatizing character. The participants also preferred to have the possibility to read about the experiences of other users.

The most important observations made during this session when the participants browsed on the Internet

and had to search for keywords were the following. The participants read the text of the search menu and then clicked on the keywords given. The next method of searching involved the participants first browsing an entire menu of a website to determine whether the website had the content they were looking for. In addition, the keywords used in the searches by the participants were solution-oriented.

During the second session, the participants were invited to discuss their experiences with home environmental modifications. They were interested in having information on the website about automated night-lights and being able to adjust the kitchen countertop in a rectangle such that couples could use the countertop together (i.e., using one place for cooking and another place for washing dishes). The height of the worktop must allow the individuals to see into the pots. During the session, the URL of the website was created through discussion with the participants. The URL should include the words 'dementia', 'safety and security', and 'home', because the participants felt that these captured the essence of the website's content. The participants preferred the information on the website to be arranged by room, or by room first and then by activity.

The participants were content with the demonstration website, which they judged on their home PCs. Some remarked that they preferred the use of simple web text on the website. In the third session, the participants provided feedback about the developed demonstration website. The participants were proud of the website, which they referred to as 'theirs'.

3.2. Set of questions

All but one respondent to the first set of questions was a family caregiver. One respondent was a staff member of a home organization. For six respondents there was a child or child-in-law relationship. The respondents who were taking care of their spouses were all 65 years old or older. All respondents had at least vocational training. All respondents used the Internet more than twice per week. The first impression of the respondents was that the website was well-organized and instructive. One suggestion was to also use spoken text. All respondents but two completed the assignment. The assignment was easy to perform for seven respondents. For two respondents, the assignment was too difficult. According to the respondents, the website had a logical enumeration, and the design of the website was skillful and convenient. The respondents

Table 1
Preferences and dislikes of the participants as expressed in the first session

Preferences	Dislikes
Website menu on the left side of the page	Website menu at the top of the page
Website menu that is easy to navigate	Use of several sub-menus
Use of a large font size	Use of a small font size
Serene-looking pages	Lively looking pages
Use of the buttons onward and retrace	Extensive scroll menus
Easy-to-read letters	Use of bold letters
Clickable text denoted with underlining	Information (text) too close together
White space between sections and use of primary colors	Use of several colors
Text written in the active voice	Text written in the passive voice
Functional photographs only	Photographs with people
Website content that is also of interest for installers and electricians	Pictograms
	Use of animations
	Clickable pictures
	Use of English terms

Table 2

The results for the six weeks prior to the official introduction of the website. The scores for the closed questions (expressed on a seven-point Likert scale: strongly disagree (1) – strongly agree (7)) are presented

<i>n</i> = 9 respondents	Use of Bullet points	Bullet points give structure to the text	Ease of finding information	Bullet points are legible	All information can be found about home modification for dementia	The design of the website is appropriate for what I want to do	The colors are appropriate for the website	Pictures do support the text	Pictures are not necessary
Mean	6.2	6.3	5.8	5.4	4.9	5.6	3.0	5.4	1.8
SD	0.8	1.0	1.6	2.3	2.2	1.7	2.4	1.4	1.8

Table 3

The results of four months after the official introduction of the website. The scores for the closed questions of the Use questionnaire for the measurement of usability (expressed on a seven-point Likert scale: strongly disagree (1) – strongly agree (7)) are listed

<i>n</i> = 11 respondents	Usefulness	Ease of use	Ease of learning	Satisfaction
Mean	5.7	5.7	6.1	5.3
SD	1.2	1.0	1.3	1.8

stated that they lacked information about where to purchase the home modifications and technological solutions, the actual target group of the website, certain safety aspects, and information for atypical dwellings. The use of pictures was appreciated by the respondents (Table 2).

Four months after the official introduction, twelve participants returned the set of questions. In Table 3, the results of the USE questionnaire are given. All but one respondent answered the closed questionnaires. According to the respondents, the usability of the website was good.

3.3. Website

This Dutch-language website <http://www.thuiswon-enmetdementie.nl> was officially introduced on November 11th, 2010. Figure 5 shows the website's introduction page. The introduction page contains information about the purpose of the website, and allows users to browse information about various living spaces of

a home. The website distinguishes between existing homes (retrofitting) and homes that are to be newly designed. The font can be adjusted for persons with impaired vision. There is also a search function available to users. Figures 6 and 7 show some of the information about bathrooms. As mentioned above, the website includes four categories: interior design, technology and devices, aspects of the indoor environment, and architectural modifications (Fig. 6). This layout is used for all living spaces in a dwelling. Figures are included on the website to provide real examples of modifications.

3.4. Google analytics data

On November 11th, 2011 the website had been available to the public for exactly one year. In this first year, the site was visited more than 13,000 times. More than 80% of the visitors were new visitors. Less than 20% of the visitors returned to the website more than once. Approximately 37% of the visitors consulted only one page: these visitors are referred to as

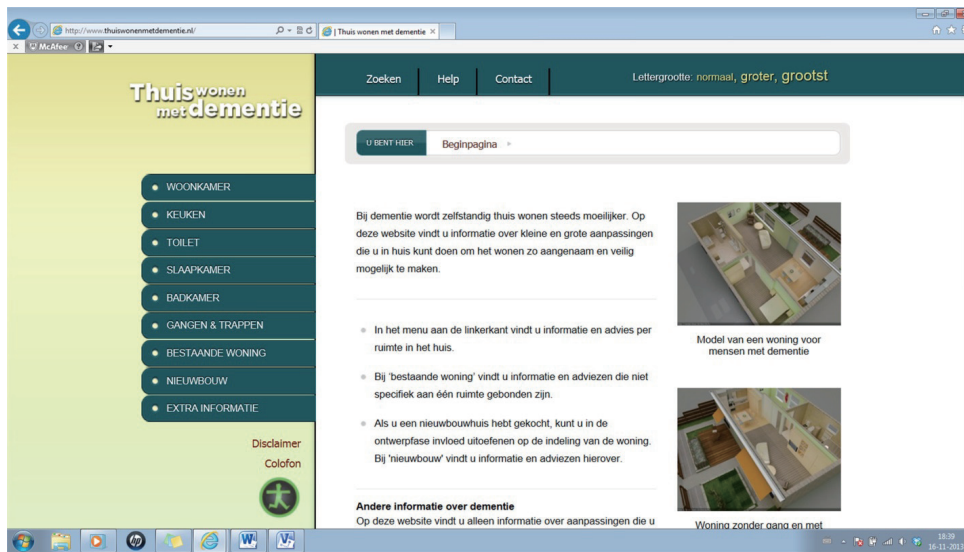


Fig. 5. The website's introduction page. (Colours are visible in the online version of the article; <http://dx.doi.org/10.3233/TAD-140399>)

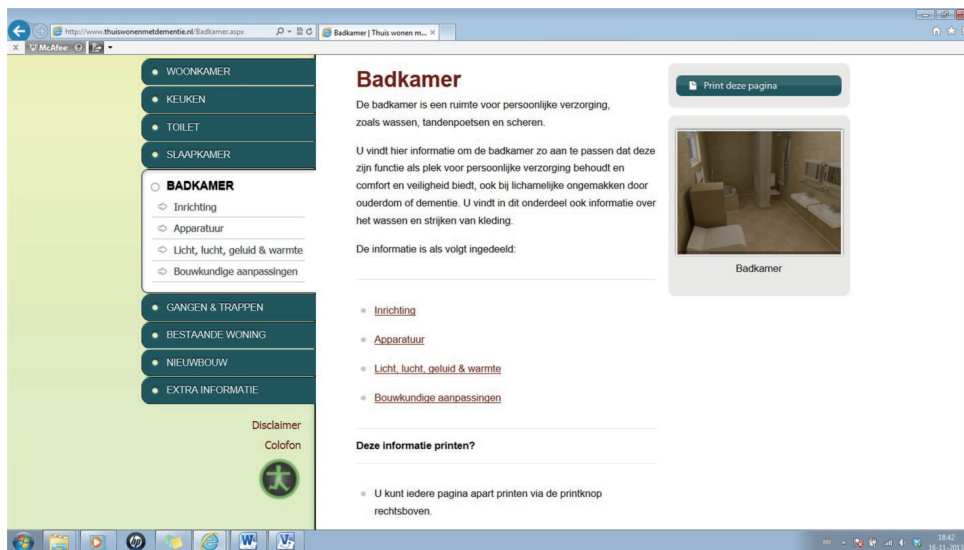


Fig. 6. The webpage that shows the subpages related to the bathrooms. (Colours are visible in the online version of the article; <http://dx.doi.org/10.3233/TAD-140399>)

accidental visitors. On average the visitors read more than five pages per visit. The highest number of visitors browsed the website on December 9th, 2010. The website was mostly read on weekdays. A total of 37% of the visitors found the website directly, and 19% found it through a search engine such as Google. Approximately 42% of the visitors visited the website through a link from another website. The search function on the website was rarely used. The most-read page was the first page on the website, namely the introduction

page. The visitors remained there one minute per visit on average.

To date a link to the website is provided on the website of the Dutch Alzheimer's Society. This society also hosts the website.

4. Conclusions

Family caregivers of persons with dementia do not have much spare time because of their demanding daily



Fig. 7. The webpage that shows the bathroom's subpage about aspects of the physical indoor environment. (Colours are visible in the online version of the article; <http://dx.doi.org/10.3233/TAD-140399>)

care tasks. These caregivers regularly consult websites to gather information about dementia and possible environmental modifications. Family caregivers are usually spouses, who are still engaged in marital relationships. Their wish is to involve the persons with dementia for as long as possible in the decisions they make based on the information they gathered from the Internet. The participants prefer a website to be as accessible as reading a book. The results were partially in accordance with the results reported in the literature for web design for persons with cognitive disabilities [20,22] and with the checklist for senior-friendly websites [19,23]. Some differences are related to culture, such as the participants dislike for the use of English terms. Therefore, preferences or dislikes of items on a website could not be generalized as such. However, the preferences and dislikes may provide useful input for the design process of an appropriate website.

On the website, dementia-friendly home modifications of the living environment are arranged by living space followed by the activity or problem that occurs. Problems are categorized by (I)ADLs, behavior, or cognitive impairment. In the future, the requirements given by the participants could be used for the design of other websites. However, the usability of this website for persons with dementia and their family caregivers needs to be examined. It is important to the participants that caregivers and professionals from the domain of building construction also have access to information about how to design a dwelling in a dementia-friendly way, because these individuals will

execute environmental modifications as indicated and desired by the person with dementia or the family caregiver. This information is also of value for professional caregivers and policy makers at the municipal level. Professional caregivers may direct individuals with a lack of knowledge about home modification to relevant web-sources [26]. However, information alone is not sufficient. Instead, training of these professionals is needed to enable persons with dementia to age-in-place [16]. Information about environmental modifications contributes, according to Gitlin and Corcoran's model [18], to increased knowledge of person-environment fit, increased skills at managing dementia, decreased objective/subjective burden of care, and increased feelings of mastery/efficacy (Fig. 1). Furthermore, environmental modifications are needed to support the activities of persons with dementia and their family caregivers [16].

The website was still being visited after one year. Most visitors found the website directly or through a hyperlink on the website of the Dutch Alzheimer's Society. As with any website, it is necessary to ask whether the approach used in this experiment has met the stated goal, which was to inform families with dementia, care professionals and professionals from the domain of building construction and design, and help them with decision making. Further study to examine the usefulness of the designed website is planned.

An earlier study demonstrated that older adults with cognitive impairments (at an early stage) are capable of providing feedback on the design and use of assistive

technologies [27]. The results of this report concern the design and use of the website. This design process was executed in a single experiment. Therefore, the findings should be interpreted with caution because, the context of the study (housing in the Netherlands, for example) and the small sample number of participants in the consultation rounds may not be generalizable for application in other contexts and countries. The design process reflects the needs of a small group of older people with dementia and their spouses from a Dutch perspective. Nevertheless, the procedure followed in this study may help future developers of websites that have persons with dementia and their spouses as the primary intended audience.

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