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The Essential Elements for a Nursing Home According to Stakeholders from Healthcare and Technology: Perspectives from Multiple Simultaneous Monodisciplinary Workshops

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Technology and architectural solutions are needed as a means of support in future nursing homes. This study investigated how various monodisciplinary groups of stakeholders from healthcare and technology envision the nursing home of the future and which elements are necessary for its creation. Moreover, differences in needs and interests between the various stakeholders were considered.

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This qualitative study gathered data via 10 simultaneous sticky note brainstorm sessions with 95 professional stakeholders, which resulted in 1459 quotes in five categories that were clustered into themes and processed into word clouds. The stakeholders prioritized the needs of the resident and placed the most importance on the fact that a nursing home is primarily a place to live in the final stages of one's life. A mix of factors related to the quality of care and the quality of the built environment and technology is needed. Given the fact that there are differences in what monodisciplinary groups of stakeholders see as an ideal nursing home, multidisciplinary approaches should be pursued in practice to incorporate as many new views and stakeholder needs as possible.

KEYWORDS *Post-it[®], design, qualitative, older adults, geriatrics, word clouds*

INTRODUCTION

Technology and architectural solutions are needed as a means of support in nursing homes (van Hoof et al., 2013). There are approximately 165,000 individuals residing in Dutch long-term care institutions (100,000 in residential care homes and 65,000 in nursing homes) (Actiz, 2013; de Klerk, 2011; Statistics Netherlands, 2013). In 2008, there were 299 nursing homes for somatic residents (individuals with a physical impairment who reside in an institution on a permanent basis or temporary basis for rehabilitation) and 398 nursing homes for residents with psychogeriatric diseases (mainly individuals with dementia) (de Klerk, 2011). Approximately 6% of the Dutch population aged older than 65 years lives in a long-term care institution (de Klerk, 2011). Approximately 77% of the residents are female, approximately 86% has at least one chronic disease, and the average age is 85 years (Actiz, 2013; de Klerk, 2011).

Policy and practice are increasingly shifting focus to aging-in-place. Nursing homes and other institutional forms of geriatric care pass into less important facilities within the housing and care continuum (van Hoof, Kort, & van Waarde, 2009). There is a decrease in the number of older individuals living in institutions despite the aging of the Dutch population, and the health status of residents is relatively more reduced. Therefore, the average time spent living in a nursing home will be shorter given the shorter life expectancy of individuals who have a lower health status. Demographic changes (aging) and political reforms (budget cuts, stimulation of aging-in-place) make the population in Dutch nursing homes evolve into a group of residents with a more complex demand for care and support than before (de Klerk, 2011). Furthermore, the number of healthcare professionals who are willing to pursue a career in geriatric care is under pressure (van Zadelhoff

& Verbeek, 2012). The public is largely negative in its opinion of nursing homes, coining term as “houses of mourning” (Schols, 2003, 2012), and even among community-dwelling older adults there are negative views of fellow older individuals living in sheltered housing (Bodner, Cohen-Fridel, & Yaretzky, 2011). Schols (2003) stated that an important reason for this negativism is the actual living environment, referring to public outcries that prisoners are better off than nursing home residents in terms of private space. There is a growing awareness that the built environment needs rethinking in terms of offering privacy to the residents and providing opportunities for interactions. The architecture of long-term care settings is in a process of transformation in which both the character and appearance of buildings is noticeably changing (Schols, 2012; Schwarz & Brent, 2001; van Hoof et al., 2014). This has led to the emergence of small-scale group accommodations that emphasize deinstitutionalization as a strategy to reduce the unfavorable outcomes associated with nursing home residence, such as behavioral problems and lack of interactions (Rabig, 2009; van Hoof et al., 2009; Verbeek et al., 2009). Various researchers have systematically reviewed the factors associated with quality of life of residents in long-term care facilities (Beerens, Zwakhalen, Verbeek, Ruwaard, & Hamers, 2013; Bradshaw, Playford, & Riazi, 2012). Beerens et al. (2013) suggested that depressive symptoms and agitation are related to lower quality of life of residents with dementia. Bradshaw et al. (2012) systematically reviewed 31 qualitative studies that have examined residents’ views of quality of life. They identified four key themes: (a) acceptance and adaptation, (b) connectedness with others, (c) a home-like environment, and (d) caring practices. Again, the design of the home environment is an important factor in the quality of life of older people residing in nursing homes.

The design and construction of nursing homes is a complex and dynamic process, as the very design of these buildings forces us to consider the technology-human interface directly in terms of living-space, ethics and social priorities (van Hoof & Verkerk, 2013). Terms often heard in relation to the construction of new nursing homes and healthcare facilities are evidence-based design and healing environments (Huisman, Morales, van Hoof, & Kort, 2012; Ulrich et al., 2008; van Hoof & Verkerk, 2013). In the case of nursing homes, technology and architectural solutions are considered to support the well-being, activities of daily living, and quality of life of older residents and to support and optimize the work processes of healthcare professionals and professionals in the domain of maintenance (Knibbe & Waaijer, 2012; Marquardt, 2011; Parker et al., 2004; Zimmerman et al., 2013). However, this does not mean that the technological and architectural solutions are studied in great detail and that the evidence regarding the outcomes of these solutions is widely available. At the same time, nursing home organizations are facing a challenge to think about which technological and architectural solutions are truly effective (evidence-based design) in one of the three aforementioned domains (resident, care professional, and maintenance/facility management). Currently, the knowledge base of

the evidence-based design of nursing homes is small and not easily available to practitioners. Moreover, the complexity of designing nursing homes is adding to the challenge.

Verkerk, Hoogland, van der Stoep, and de Vries (2007) have provided an introduction to both the analytical and critical traditions of the philosophy of technology in connection to the design of healthcare facilities. They show that in the design process three types of complexity have to be distinguished: dimensional complexity (values of its users), technological complexity (different aspects of a building and building services), and stakeholder complexity (Verkerk et al., 2007). Stakeholder complexity refers to the diversity of stakeholders whose interests are involved. The residents of nursing homes and their relatives, care professionals, and professionals in the field of maintenance and real estate management are the main stakeholders in the domain of nursing homes. These three types of complexity can be understood as different cross sections in the design process that have to be managed in close coherence (van Hoof & Verkerk, 2013; Verkerk et al., 2007). In the current study, the focus is on the stakeholder complexity. The ideal nursing home incorporates as many solutions as possible that suit the needs of the various stakeholders. The set of chosen solutions should reflect the dual character of a nursing home as a place to reside and as a place to work. Too often, needs of residents and care professionals are considered via anonymous guidelines and checklists. In such cases, design disciplines only have contact with their principals, often managers or workers of the real estate management department. According to Heylighen and Bianchin (2013), a design is inclusive when it is produced by exploiting the information and competences at the disposal of the designer and the people he or she designs for in qualified circumstances. It also means that designing should be done together with people who will use the artefact (i.e., nursing home). However, there are design processes in which the residents and care professionals have a clear voice, but in which maintenance workers and facility managers and their tasks are largely ignored. In fact, we do not fully understand the differences and overlaps in needs and interests between the two main groups of professionals working in nursing homes (i.e., the care professionals and the maintenance workers and facility managers and their interactions with suppliers and technical consultants).

This study investigates the needs and interests related to the technological and architectural solutions of professionals working in the domain of nursing home care and the design and implementation of technological and architectural solutions. This study was performed through 10 parallel sessions. The goal of the sessions was to find out how various homogeneous and monodisciplinary groups of stakeholders envision the nursing home of the future as a place to reside and work and which elements are necessary for its creation. The focus is on the aspects of design, architecture, and technology, although other elements are also included.

The sessions should clarify which insights and visions groups composed of different stakeholders have in relation to excellent nursing home care and nursing home design. At the same time, we also wanted to study whether there are differences in needs and interests between the various stakeholders and, if so, what differences there are.

METHODOLOGY

Procedure

An interactive, qualitative design was chosen for the study. A total of 95 participants joined in 10 sessions that were held simultaneously (Table 1) on May 28, 2013. Each session lasted for 75 minutes. The participants either had a background in healthcare or in technology and architecture. The groups consisted of largely homogeneous and monodisciplinary groups of professionals because the main goal of the sessions was to explore the differences in attitudes, interests, needs, and knowledge. This approach allowed for a comparison of the results of the various disciplines. Nursing home residents were not included because the focus was on professionals.

First, the goal of the work sessions was explained to the participants in a plenary session. Thereafter, the groups split up. All participants signed informed consent for the use of written data and photographic material. At the same time, personal data were taken, including name, sex, date of birth, type of work and organization, and years of work experience (Table 1).

Every session was guided by a session leader and an assistant. All session leaders and assistants had been briefed about the uniform procedure and were provided with a manual and an instruction guide 1 week before the start of the sessions. The role for the session leader was to stimulate creativity and to obtain a maximum of variety in responses and input. The assistant's role was to support the session leader and to observe the group dynamics. At the same time, the assistant helped by collecting written materials and making photos. The session leaders were lecturers/researchers working with the organizing university who work in the field of healthcare and technology. The assistants were students of the Department of Industrial Design of a collaborating university of technology, one staff member with a background in Industrial Design, and one student from the Bachelor course of Applied Gerontology. These assistants were trained and skilled in the procedure and methodology applied.

Activity

At the start of each session, a scenario was read out aloud. This scenario was the same for each group:

TABLE 1 List of Sessions and the Characteristics of the Participants

Group (leaders and assistants)	Background	Characteristics of participants	Mean age (years; months)	Mean number of years of work experience (years; months)
1 SP, TR	Building services	n = 8 (2 females, 6 males)	42;7	3;7
2 PG, LV	Healthcare	n = 10 (9 females, 1 male)	43;7	10;0
3 EW, BP	Assistive aids and beds	n = 9 (3 females, 6 males)	42;0	4;7
4 JH, CVL, JW	Construction, real estate and maintenance	n = 12 (5 females, 7 males)	46;1	6;7
5 MM, MW	Policy makers	n = 7 (6 females, 1 male)	46;1	3;6
6 MN, TW	Education and research	n = 9 (7 females, 2 males)	40;7	5;5
7 CV, CH	ICT and home automation	n = 11 (1 female, 10 males)	45;6	6;5
8 LZV, LOW	Healthcare	n = 8 (2 females, 6 males)	47;1	10;2
9 AD, CDH	Healthcare	n = 9 (5 females, 4 males)	53;0	12;4
10 AE, NP	Architecture and interior design	n = 12 (7 females, 5 males)	37;1	8;7
Total: 10 leaders, 11 assistants	5 groups healthcare, 5 groups technology	n = 95 (47 females, 48 males)	44;4	7;2

The care for older adults residing in nursing homes is under increasing pressure due to political reforms. These reforms are related to the financial models in long-term care, aging of society, the upward change in conditions for eligibility for residence in institutions ('sheltered residence with intensive dementia care' as a lower threshold), the propagation of aging-in-place, and expected shortages of highly skilled care professionals on the labor market. In addition, there is an adverse attitude towards nursing homes in society.

This situation urges practice to look for creative solutions to be able to offer good quality and affordable care to older persons. Evidence-based practice, technology and the built environment, and satisfaction in living, comfort, and the provision of services play a role in the nursing home of the future.

In this project we look for future solutions that contribute to a positive, though realistic image of living/residing, and working in a nursing home. Three elements are of importance:

- 1) Residents need to experience a maximum of well-being and a sense of home;*
- 2) Care professionals work with satisfaction and experience support from the built environment in the execution of their work tasks; and*
- 3) Consideration is given to sustainability and maintenance in relation to living and well-being.*

In short, what does the ideal situation look like, and what is needed to realize this situation? Five elements play a role: knowing, doing, thinking, dreaming, and don't-ever-do-again:

What do we know about the nursing home of the future? (evidence-based design, emerging trends in policy and practice)

What do we do at this moment to make the nursing home of the future a reality? (current practice)

What do we think of whenever we give consideration of the nursing home of the future? (financially viable hypotheses)

What do we dream of? (hypotheses and wishes for which financial means are limited)

What don't we ever want to do or come across in a nursing home?

Participants were invited to write down their thoughts on sticky notes (also known as Post-it[®] notes). These notes were supplied in five colors: knowing (dark yellow), doing (green), thinking (orange), dreaming (pink), and don't-ever-do-again (light yellow). The color scheme was printed on paper and attached to the walls as a prompt. Participants were encouraged to write down keywords or short statements on these notes and then stick them to the walls (Clark, 2011; Wiethoff, Wimmer, Richter, & Butz, 2010) (Figure 1). There is limited space on an adhesive paper to write down what matters



FIGURE 1 View of one of the sticky notes sessions.

and share it with the group (Ismail, 2013), so the participants needed to be concise in their responses. There was no limit on the number of ideas that the participants could write down. However, the ideas had to be related to the theme of the session: the future nursing home.

Participants were requested to focus on the design and construction, interior design, technology, furniture and assistive aids; on a sense of home; and on the support of work processes. After 30 minutes of brainstorming, the group as a whole was invited to cluster the sticky notes into themes (Figure 2). It was discussed with the participants whether the elements fit. Here, the adhesive property of the sticky notes was used to cluster the notes on the walls and to freely move them from one theme to another. After a plenary discussion in the group, which led to consensus, it was up to the participants to decide on the labels that were given to the themes.

Data Analysis

After the sessions, the clustered notes were put into separate envelopes (one envelope contained one theme) for analysis. The assistants used a template in Microsoft Excel and Google Spreadsheet for digitalizing the notes. The first template contained five columns for each color code. The second template was used for word clusters, again each word was labeled with their own color code. These separate notes were inserted into a master template and sorted by theme and by group. Translations of the labels were made from Dutch



FIGURE 2 Process of clustering the sticky notes.

to English. To find out how often certain themes and subjects emerged in the notes, word clouds were made (Godwin-Jones, 2006; Rivadeneira, Gruen, Muller, & Millen 2007; Seifert, Kump, Kienreich, Granitzer, & Granitzer, 2008; Viégas & Wattenberg, 2008) using the five colors of the notes. This showed the main points of focus in the groups. A word cloud is a visual representation for textual data, typically used to depict keyword metadata (tags) on Web sites or to visualize free-form text. Tags are usually single words, and the importance of each tag is shown with font size or color. This format is useful for quickly perceiving the most prominent terms and for locating a term alphabetically to determine its relative importance.

Lohmann, Ziegler, and Tetzlaff (2009) summarized some important aspects and benefits of using tag clouds that were considered:

- Tag size: large tags attract more user attention than small tags (effect influenced by further properties, for instance, number of characters, position, neighboring tags).
- Scanning: Users scan rather than read tag clouds.
- Centering: Tags in the middle of the cloud attract more user attention than tags near the borders.
- Position: The upper left quadrant receives more user attention than the others.

- Exploration: Tag clouds provide suboptimal support when searching for specific tags.

Word clouds were made as a means to visualize the word frequency of the ideas identified during the interactive sessions. The word size represented the number of items to which a tag was applied as a presentation of each tag's popularity or importance. The results of the homogeneous groups were processed into tag clouds containing the colors of the notes. These word clouds were made using a java-applet named Wordle (www.wordle.net). Wordle counted words one-by-one and, based on the frequency of a word, this word was given a certain weight that showed in the font of the word in the eventual word cloud. Frequently used words without a specific significance, such as "the," "it," and "a," were filtered out. Word clouds were made for two main stakeholder groups, namely five for professionals from the field of healthcare and policy (groups 2, 5, 6, 8, and 9), hereafter called Healthcare, and five for professionals from the field of technology and architecture (groups 1, 3, 4, 7, and 10), hereafter called Technology. In this way, we visualized the main points of focus for the two groups of stakeholders. The points of focus, and differences between and within the two groups were illustrated by quotes found on the notes. In the end, an additional five word clouds, representing the five categories of sticky notes, were made of the statements of the group as a whole.

RESULTS

Fifteen word clouds were produced reflecting the results of the sessions. A total of 1,459 quotes were written on notes, containing 5,106 words after translation into English and 7,057 in Dutch: 267 for knowing, 321 for doing, 240 for thinking, 339 for dreaming, and 292 for don'ts. This was, on average, 15.7 notes per participant. There were 1,753 unique words after translation into English. For making the word clouds, words such as "nursing home" and "physical environment" were written as single words (without a space). Tables A and B (available as supplemental files online) show the word clouds and a selection of building-related solutions for both groups of stakeholders. Based on the sticky notes, clusters were made leading to the emergence of themes.

Knowing

The sticky notes in the category knowing showed that the stakeholders from healthcare placed the most importance on the resident of the nursing home and the stakeholders from technology emphasized the resident and

technology. Living was an important theme for both groups, as a nursing home is foremost a place to live and not a place where care is provided. In general, the stakeholders from healthcare underscored the importance of future trends in healthcare and the quality of life for nursing home residents. They mentioned emerging technologies as an important development that will impact the daily lives of residents and the work processes of care staff:

Many older people are not afraid of modern (assistive) technologies.
Many of them are used to working with technology and ICT. (Group 6)

The stakeholders from the technology groups were well aware of the technological options and solutions for nursing home care that were available on the marketplace, and they emphasized the need for involving residents and care professionals in decision-making processes regarding the design of nursing homes and the purchase and implementation of technologies. They also showed an awareness that their own work processes need improvement to match with the expectations of their end-users.

Technology can support a longer lifespan and can reduce costs.
(Group 1)

Doing

The sticky notes in the category doing showed that the stakeholders from healthcare placed the most importance on the residents and living in their answers, and so did the stakeholders from technology. Thus, living is important for both groups: a nursing home is not just an environment in which healthcare is supplied to older people. Foremost, it should be a place to live:

We need to act like the resident is still living at his/her own home.
(Group 2)

Both groups showed a great awareness of technological options available for nursing home care, such as home automation technologies. At the same time, participants placed critical remarks to the current implementation of these technologies. Within Group 9, these contradictory statements were manifested:

We need more home automation technologies in nursing homes.

We need fewer home automation technologies and continue the way things were.

The coming together of various stakeholders working in the field of nursing home care was considered to be an important future development. Moreover, technology, despite all challenges, was considered to be a welcome attribute, as were environmental modifications.

More domesticity in terms of atmosphere. Assistive technologies should be kept out of sight as much as possible. (Group 3)

Thinking

The sticky notes in the category thinking showed that the stakeholders from healthcare placed the most importance on the resident and care in their answers and the stakeholders from technology emphasized the resident, care, and living. Living was important for both. The number of quotes was smaller than in the previous categories. Nevertheless, there were some remarkable notions. First, the professionals from healthcare again came up with a large array of technological and architectural solutions that they thought were beneficial for the provision of healthcare and the quality of life of residents. They called for smaller spaces and small-scale solutions, as well as freedom of movement and the need to stimulate a resident's independence skills:

Staff should be coached in techniques to provide peace and structure. (Group 8)

The professionals from technology also mentioned the need for small-scale solutions and familiarity. They seemed to be aware that their skills and knowledge related to healthcare should be improved to meet the needs of their clients. Moreover, they also acknowledged that the solutions offered by them are subject to rapid developments, which make technologies rapidly become out of date:

Communal rooms should be built in smaller units. (Group 10)

Dreaming

The sticky notes in the category dreaming showed that the stakeholders from healthcare again emphasized the resident of the nursing home in their answers, whereas the stakeholders from technology emphasized the resident and the physical environment, care, and technology. Here, the contrasts were the largest. Care professionals envisioned a bright future for nursing home residents, including the use of light and lighting:

Dynamic lighting. (Group 2)

In their view, a future nursing home could also refer to their own home instead of a separate healthcare facility. Self-directedness and self-management were important features, as were attractive interior designs and a good quality of life. Residents should no longer share facilities, such as two-person bedrooms and shared sanitation:

A room which one can alter based on one's personal needs and wishes.
(Group 5)

Even stakeholders from technology stressed the need for nursing homes to become a part of the society: facilities should no longer be built in the middle of a remote forest. In their view, technology played a large role in the nursing home of the future. Pets and other animals, both life and robotic, should be part of daily living patterns:

A fully integrated unit within a neighborhood. (Group 3)

The Don'ts

The sticky notes in the category don'ts showed that both groups of stakeholders again placed the most importance on the residents. Stench and unwanted odors, large-scale facilities, remotely located nursing homes, and clinical and industrial looking facilities were considered to be absolute don'ts by both groups:

Clinical, hospital-like environment (color of furniture and light). (Group 6)

The management of a nursing home, both in relation to inadequate steering of the provision of care, and the implementation of technologies, were mentioned. A lack of positive stimulation and the limitations to freedom of movement were mentioned as items that need to be changed. Again, a nursing home should feel like a true home instead of like a hospital:

Letting residents wait in their room without interaction. (Group 7)

Entertaining residents as if they were children. (Group 7)

Summary of Results

The word clouds reflected the main points of focus for the participants and exhibited that a mix of factors related to the quality of care and the quality of the built environment and technology is needed. It is clear that the



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When considering the similarities in the domain of housing-related solutions, the need for transparency was paramount. Participants wanted transparent buildings, with glass facades for daylight access and contact with nature. This connectedness with the outdoors was an often-mentioned phenomenon (gardens, animals, pets) to broaden the world of the nursing home residents. Moreover, there was a need for flexibility in construction, which allows maintenance staff to easily adapt the private rooms to match with the needs of the residents and care givers. Thresholds in bathrooms were considered as the most unwanted item in the built environment, as they are a limitation to independence and mobility. Home automation systems, including emergency response systems, were mentioned by both groups as helpful tools to improve safety and security and to assist care staff. This type of technology should be integrated within the home environment and should be unobtrusive. Moreover, controls should be kept as simple as possible for both residents and staff. Safety and security were considered to be important in both groups, but this should not go together with limitations to personal freedom, including medical restraints and locking up. Monotony and uniform environments were considered to be unwanted by both groups because they do not contribute to a home-like atmosphere.

There were some contradictory statements within and between groups. The most prominent was the need for a single, private room. Single rooms improve privacy and offer the possibility for customization of the interior design and choice of furniture. At the same time, single private rooms may reinforce the feelings of loneliness, given the fact that many residents have enjoyed a family life before. Furthermore, the participants with a background in healthcare emphasized the need for more assistive technologies for staff and the support of residents. At the same time, they called for a decrease in the number of assistive technologies. When looking at the true meaning of these statements, the participants in favor of a decrease actually meant making technologies less obtrusive. This, in turn, was supported by the participants from technology and design, who called for making technologies less visible and obtrusive. The call for special design features for individuals with dementia was, on one hand, emphasizing the need for familiarity through the use of older furniture and bringing in personal belongings; on the other hand, participants called for the creation of virtual environments by projecting images using beamers and screens. Here, fostering nostalgia and the introduction of modern technologies seemed to go hand-in-hand.

Emerging Themes

Participants were asked to cluster their sticky notes into themes (Table 2). Many similar themes emerged in both groups. The most important themes

TABLE 2 Emerging Themes per Group^a

Main themes	Themes (group) Healthcare	Technology
Interior design and construction	<i>Space and environment (2,6)</i> <i>Interior Design (2,5,8)</i> <i>Layout of the room (8)</i> <i>Structure (8)</i> Building (2) Group living (2) Group dynamics (6)	<i>Space (3)</i> <i>Environment (10)</i> <i>Interior design (10)</i> <i>Layout of the room (10)</i> <i>Structure (10)</i> Sterile environment (7) Facilities/construction/architectural aspects (4,7) Single-person room (4) Scale (4,7) User-Centered Design (4) Light(ing) (4) Location (4) Green (4) <i>Technology (3,7,10)</i> Home automation (4) Development of solutions (7) <i>Financial aspects (3,4,7)</i> <i>Domesticity/feeling at home/home experience (3,4,7)</i> Feelings/emotions (10) Experience (10) <i>Safety and security (4,7)</i> <i>Well-being (10)</i> <i>Activities and activation (4,7)</i> Motivating older people (7) Food (3,4) Odors/stench (4) <i>Communication: listening to older people (7)</i>
Technology	<i>Technology, Assistive Technology, ICT (2,5,6,8)</i>	
Financial aspects	<i>Financial aspects (2,5,6)</i>	
Emotions and feeling of home	<i>Emotions (feeling of home) (5,6)</i>	
Safety and security	Atmosphere (8)	
Well-being	<i>Safety and security (5)</i> <i>Well-being (8)</i> Materials (well-being) (5) <i>Activities (well-being) (5)</i> Participation (8) Life rhythm and pastime (6) Hygiene (6) <i>Communication (2)</i>	
Hygiene		
Communication		

Relatives and social contacts	<i>Relatives (network) (5)</i>	<i>Communication: contact (10)</i> <i>Involving relatives / informal care (4, 7)</i>
Staff and management	<i>Vision on provision of care (2,6)</i> Work processes of staff (2) Changing role of care professionals (6) New ways of working (5) Care (5) Education (8)	Loneliness (4) <i>Vision of the future (10)</i> Staff (4,10) Insufficient highly skilled staff (7) Involvement/participation of staff (7) Disrespectful treatment (7) Time (4) Organization (4) Autonomy (4)
Client: Self-directedness and autonomy	Self-directedness of the client (9) <i>Freedom (6,8)</i> Mobility (6) Client (2)	<i>Choices/Freedom (to choose) (3, 7)</i> Locking up (7) Independence (7) Quality (3) Dementia (4) Soft and hard values (1)
Values		

^aThemes and related subthemes found in both groups of stakeholders are italicized.

were interior design and construction, technology, financial aspects, emotions and feeling of home, safety and security, well-being, hygiene, communication, relatives and social contact, vision, staff and management, the client, and values. These themes can be used for programming the nursing home of the future. All main themes, apart from values, are acknowledged by the two groups of stakeholders. Some of the themes are related, such as well-being and having social contacts, as well as the feelings of home and architectural aspects.

DISCUSSION

The discussion section deals with the differences and similarities in group outcomes, the inclusion of residents in research and design, evidence-based design and training, technological complexity, and a reflection on the methodologies applied. These discussion points were chosen as the participants of this study raised questions about the inclusion of residents and the need for inclusive design. Moreover, there was a latent presumption that there were large differences between the two groups of stakeholders. Technological complexity is discussed because the themes themselves are merely ingredients for the design of larger and more complex buildings. The methodologies used are not often encountered in the scientific literature and, therefore, are discussed.

Differences and Similarities Between the Groups

What this study showed is that both groups of stakeholders put the resident first and stated that a nursing home (in whatever its form or building type it may be) is first and foremost a place to live and not a place where care is provided. This supported the notion of speaking of older individuals in nursing homes as “residents” and not as “patients.” The study also showed that, for the creation of an ideal nursing home of the future, architectural and technological solutions are important elements, but activities and participation and adequate care support are just as much needed for well-being and quality of life.

Despite the limited differences between the two professional groups, there were some nuances that can be distinguished. The differences were often influenced by the personal and professional backgrounds of participants of the 10 groups. A group with representatives with a background in interior design typically emphasized the need for certain types of furniture and color schemes. Individuals with a background in healthcare often dealt with the physical environment (such as, insufficient space, thresholds in

bathrooms) with their own work experience in mind. This also implied that when carrying out real design processes, it might be worthwhile to include other stakeholder groups to get a larger diversity of what is needed to create a well-functioning healthcare facility. Only in multidisciplinary groups can one account for the majority of stakeholders' needs.

None of the stakeholders mentioned guidelines, scales, and audit tools as instruments for the creation of a nursing home. Examples of such guidelines and scales are the Therapeutic Environment Screening Survey for Nursing Homes (TESS-NH) (Sloane et al., 2002), the Sheffield Care Environment Assessment Matrix (SCEAM) (Parker et al., 2004), or the design audit checklist developed by the Dementia Services Development Centre (Hadjri, Faith, & McManus, 2012). However, aspects such as safety and security, which are important aspects of the instruments, were mentioned by both groups of stakeholders. The statements made by the stakeholders were often general ideas and notions, whereas many practical guidelines for the construction of nursing homes are specific in terms of surface areas needed for rooms and the dimensions of bathrooms. Post-occupancy evaluation methods, which can be useful to elicit detailed information about environmental performance and suggest modifications for future design processes (Cutler & Kane, 2009), were not mentioned as a method to gain more research data.

Although many views and ideas were shared, there were some conflicting notions between the groups, such as the need for single-person rooms. Xu, Kane, and Shamliyan (2013) reviewed the association between nursing home characteristics and residents' quality of life. Their study indicated that in facilities with a higher percentage of private rooms, there was better self-reported resident quality of life (Xu et al., 2013). Some of the participants suggested the creation of two-person rooms to allow couples to stay together. Despite the large number of ideas that were generated, there was no consensus on the ideal nursing home in this respect. However, reaching a consensus was not the goal of this study.

Evidence-based Design and Education

Many ideas written on the sticky notes could not be backed by scientific data, which is a crucial element in evidence-based design. Xu et al. (2013) concluded that the available evidence in the scientific literature does not permit strong conclusions about the association between nursing home characteristics and residents' quality of life. However, the evidence does raise questions about whether the nursing home structure alone can improve residents' quality of life. This being the case, it is unlikely that practitioners have access to these scarce data and utilize the information.

None of the participants could produce hard data or mentioned studies dealing with evidence-based design in healthcare, or, for example, review

studies by Ulrich et al. (2008). Light therapy was a topic that was often mentioned as being a relevant innovation. This is illustrated by a quote from Group 10: “Dynamic lighting has a positive impact on persons with dementia during the night hours.” The evidence-base for ceiling-mounted light therapy is growing, but the implementation of such lighting is still not leading to optimum results in practice (van Hoof et al., 2012). One could wonder whether professionals from both domains are influenced by what they see and read in media such as professional magazines and advertisements. For professionals in the field, it was hard to distinguish between what is truly evidence-based and what is not.

Given the obstacles stated above, the exposure of practitioners to academic literature on evidence-based design, the implementation of technology in healthcare, and psychological findings on quality of life needs to be improved. Education on how to interpret and use academic literature and statistics (and setting aside professional development time to read and discuss journal articles and other references with colleagues) seems indispensable. At the same time, it needs to be ensured that such sources are made available (i.e., subscribed to) by government agencies or other organizations. Verbeek, Zwakhalen, Schols, and Hamers (2013) emphasized the strong need for the development and implementation of technology and evidence-based practice in nursing homes and called for a solid interaction among clinical practice, education, and scientific research.

Including Residents: Call for Inclusive Design

The results of the sticky notes session showed that the two groups of stakeholders do not differ, to a large extent, in their views on what is needed for the creation of the nursing home of the future (both technological and architectural solutions) and other aspects. This refutes the notion that the two domains of healthcare and technology are irreconcilable, or at least have different views on the provision of healthcare. Both groups of stakeholders are well aware of their own short comings and strengths and were willing to share their views with their counterparts. The monodisciplinary character of the groups may have contributed to an open attitude and willingness to share and speak freely, as people were among peers. Both groups put most focus on the resident. However, this raises a question about whose needs are being served. Do stakeholders from both domains adequately articulate the needs of residents? Neither residents nor their representatives were included in this study, and a validation study should be conducted to examine whether the emerging themes are also shared by actual residents. The need for user-centered design (also referred to as participatory design) was mentioned by stakeholders from construction, real estate, and maintenance as one of the subthemes in Table 2.

The involvement of the internal end-users in the design process of a nursing home is important. Apart from care professionals and maintenance staff, these are residents and their relatives. In the rather philosophical paper by Heylighen and Bianchin (2013), the authors ask the questions “who is to set the standards? Should the norms be decided by the best knower or by the people (affected by the decision, no matter how poorly informed they might be about it)? This leads to two other fundamental questions: what is there to know? And who is the best knower?” (p. 93). In other words, are the stakeholders in this study the best source of design information and do they know better than let us say architects and designers? It was found that designers and architects (Group 10) identified several identical themes (Table 2) as individuals with a healthcare background, but that the focus was on communication and the layout of the rooms. Thus, there was an intrinsic understanding of the needs of the health-related end-user within the group of designers as identified by healthcare professionals. In this study, both external and internal professional stakeholders were involved as representatives of one’s own needs and of those of the residents and their relatives.

Heylighen and Bianchin (2013) continued by stating that the “assumption often seems to be that professionals possess the best possible knowledge, in other words, are the best knowers. Yet, in relation to inclusive design...it may be problematic to state that the people are ignorant (as opposed to the knowledgeable professionals); they may lack the designer’s professional knowledge, but they are likely to have other kinds of knowledge” (p. 101). They also state that “participation in design predictably transforms the design process because it requires a cooperative enterprise between both professionals and users” (Heylighen & Bianchin, 2013, p. 103). They conclude that a “deliberative process does not just demand that stakeholders converge, it requires them to ‘construct’ such convergence by cooperating in the design process, by exchanging information and arguments in a public discussion, so that they will not just share their (judgments), but also the reasons for them. Here stakeholders will not just happen to converge in their attitude, but come to converge by virtue of the justification they get through dialogue” (Heylighen & Bianchin, 2013, p. 106).

When considering these conclusions and acknowledging the importance of constructing convergence, including professional stakeholders working in a nursing home seems to be less arduous a task as engaging in design processes with older residents themselves, particularly those with psychogeriatric health problems. Nevertheless, making small contributions by both residents and their relatives (as proxy users) should be encouraged for the sake of inclusivity. This implies getting residents involved in the creation of new nursing homes, as was suggested by Heylighen and Bianchin (2013) as a way to achieve inclusive design. In future studies, similar research should be conducted with nursing home residents and their relatives. Helgesen, Larsson, and Athlin (2010) explored the residents’ participation in everyday

activities for individuals with dementia living in special care units in nursing homes. Joining in participatory sessions, in this case a design process, goes together with the presence and support from care professionals in body, mind, and morality to fully exploit the participation capacity of the residents. One could think of activity sessions and interviewing and reminiscing techniques to involve residents in the design process.

Technological Complexity

The creation of a new healthcare facility is a complex task, most of all because of the large number of relevant stakeholders. Verkerk et al. (2007) showed that, apart from dimensional complexity and stakeholder complexity, there is a technological complexity as well. The building (i.e., a nursing home) itself represents this technological complexity. This can be elucidated by using Brand's (1994) division of a building into six systems: stuff, space plan, services, skin, structure, and site. The success of the final design is the result of how well the needs of the stakeholders are met by these building systems. The three subsystems such as stuff (furniture, assistive technologies), services (lighting, home automation, air-conditioning, smells), and the space plan (lay-out of the building) were often mentioned by the stakeholders as being important as elements for the design of nursing homes. This matches with the notion put forward by van Hoof and Verkerk (2013) that these three subsystems are most important when designing healthcare facilities and that the elements match most with values of stakeholders.

The skin (windows and daylight access) and site (gardens, no remote location) were also mentioned, just as structure (flexibility of walls), albeit less often. Space is an important feature in nursing homes, both in terms of way-finding (Marquardt, 2011) and in providing sufficient space for use of patient lifters and shower chair transfers (Knibbe & Waaijer, 2012). In relation to site and skin, one of the factors often mentioned by the participants was connectedness to nature, the outdoor world and accessible gardens. The importance of these features has been studied and described before (Chalfont, 2007, 2008; Gibson, Chalfont, Clarke, Torrington, & Sixsmith, 2007; Hernandez, 2007).

When designing nursing homes, it seems important to include the surroundings of a facility and think over the design of outdoor spaces as well. In relation to the domain of services, apart from the aforementioned lighting systems, many participants stressed the importance of designing for the senses, particularly in relation to the indoor environmental parameters (light, sound, temperature, indoor air quality, and odors). These parameters were mentioned by many groups of stakeholders, and not just the architects and participants from the building services sector. It is known that the perception of the indoor environment changes due to biological aging and dementia,

and this, in turn, can impact the quality of life of nursing home residents (Barrett, Barrett, & Davies, 2013; Garre-Olmo et al., 2012; van Hoof, Kort, Duijnste, Rutten, & Hensen, 2010; van Hoof, Kort, Hensen, Duijnste, & Rutten, 2010). Participants with a background in healthcare seemed to be aware of these changes. To design a building and its interior in terms of holistic sensory space design, we need to integrate knowledge from the neurosciences, as well as environmental psychology, into the art of design (Barrett et al., 2013).

New Methodologies Applied

Within the scientific literature, the use of sticky notes and making word clouds have not been reported as a methodology for investigating homes, buildings, and occupants' needs. There are other qualitative methodologies for studying these phenomena, such as interviewing, sketching, writing, and through photographs, as was applied by Eggen, Hollemans, and van de Sluis (2003). Focus groups (Barnes et al., 2012; van Hoof, Blom, Post, & Bastein, 2013; van Hoof & Kort, 2009) and storytelling (Kankainen, Vaajakallio, Kantola, & Mattelmäki, 2012) are additional methods of researching service design in healthcare settings. Although the word clouds showed which items are most frequently mentioned, they did not provide in depth information on views and thoughts, as did the quotes taken from the sticky notes. However, they did reflect that both groups of stakeholders were involved in trying to create optimum environments for the residents. They showed, to a large extent, that professionals from both domains had their minds set on achieving the same goal. If it was decided to filter out the word "resident," other words would have looked more prominent in the word clouds. Nuances and the use of language were different from each other, but this was fully self-explanatory given the backgrounds of both groups. For example, the stakeholders from healthcare spoke of individuals, whereas the stakeholders from technology used the word "residents" and were more detailed in their description of technological solutions. The method provided an insight into the items that were relevant to a group but did not provide space for differentiation and writing large explanatory texts. When conducting a similar session in practice, the main emerging themes should be elaborated by conducting interviews and by going through existing checklists and guidelines (Hadjri et al., 2012; Parker et al., 2004; Sloane et al., 2002). However, the method itself was an engine for quick thinking and innovation and could be used in building sciences and practice for a variety of research purposes. It allowed group members to interact with each other and have discussions about the allocation of sticky notes. Given the limited effort, using sticky notes could even be an activity in nursing homes, which can be conducted by activity facilitators with nursing home residents, to let them express what

they want. In future studies, the number of categories may be reduced to do's, don'ts, and dreams, as the distinction between the current categories was sometimes hard to make for some of the participants (knowing versus thinking, and knowing versus doing).

CONCLUSION

Creating an ideal nursing home requires the fulfilment of a large number of factors, which are related to the quality of care and the quality of the built environment and technology. This study showed that professional stakeholders from the domains of healthcare and technology did not differ substantially in their views on programming and designing future nursing homes. It seemed that stereotypical thinking about both groups of stakeholders does not hold, for instance, that stakeholders from the domain of technology are only occupied with technology on their minds and do not fully consider the needs of residents and that stakeholders from the domain of healthcare have a limited knowledge of technology. Both groups put the needs of the residents first and stressed the fact that a nursing home is primarily a place to live in the final stages of one's life instead of regarding this facility merely as a place where care is provided. Given the fact that there were differences in what monodisciplinary groups of stakeholders see as an ideal nursing home, multidisciplinary approaches should be pursued in practice to incorporate as many new views and stakeholder needs as possible. The insights gained can be used to further investigate the evidence base of the identified items.

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SUPPLEMENTAL DATA

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REFERENCES

- Actiz. (2013). De verpleeg- en verzorgingshuiszorg en thuiszorg in kaart. Feiten, financiering, kosten en opbrengsten [A map of residential care, nursing home care and home care. Facts, financing, costs and yields]. Actiz, Utrecht, The Netherlands. Retrieved from <http://www.actiz.nl/feiten-en-cijfers>
- Barnes, S., Torrington, J., Darton, R., Holder, J., Lewis, A., McKee, K., ... Orrell, A. (2012). Does the design of extra-care housing meet the needs of the residents? A focus group study. *Ageing and Society*, 32, 1193–1214.
- Barrett, P., Barrett, L., & Davies, F. (2013). Achieving a step change in the optimal sensory design of buildings for users at all life-stages. *Building and Environment*, 67, 97–104.
- Beerens, H. C., Zwakhalen, S. M. G., Verbeek, H., Ruwaard, D., & Hamers, J. P. H. (2013). Factors associated with quality of life of people with dementia in long-term care facilities: A systematic review. *International Journal of Nursing Studies*, 50, 1259–1270.
- Bodner, E., Cohen-Fridel, S., & Yaretzky, A. (2011). Sheltered housing or community dwelling: quality of life and ageism among elderly people. *International Psychogeriatrics*, 23, 1197–1204.
- Bradshaw, S. A., Playford, E. D., & Riaz, A. (2012). Living well in care homes: A systematic review of qualitative studies. *Age and Ageing*, 41, 429–440.
- Brand, S. (1994). *How buildings learn: What happens after they're built*. New York, NY: Viking-Penguin.
- Chalfont, G. (2007). The Dementia Care Garden: Part of daily life and activity. *Journal of Dementia Care*, 15, 24–28.
- Chalfont, G. (2008). The Dementia Care Garden: Innovation in design and practice. *Journal of Dementia Care*, 16, 18–20.
- Clark, K. A. (2011). Human interaction and collaborative innovation. *Lecture Notes in Computer Science*, 6776, 13–21.
- Cutler, L. J., & Kane, R. A. (2009). Post-occupancy evaluation of a transformed nursing home: The first four Green House[®] settings. *Journal of Housing for the Elderly*, 23, 304–334.
- de Klerk, M. M. Y., ed. (2011). *Zorg in de laatste jaren* [Care in the final years]. The Hague, The Netherlands: The Netherlands Institute for Social Research.
- Eggen, B., Hollemans, G., & van de Sluis, R. (2003). Exploring and enhancing the home experience. *Cognition, Technology & Work*, 5, 44–54.
- Garre-Olmo, J., López-Pousa, S., Turon-Estrada, A., Juvinyà, D., Ballester, D., & Vilalta-Franch, J. (2012). Environmental determinants of quality of life in nursing home residents with severe dementia. *Journal of the American Geriatrics Society*, 60, 1230–1236.
- Gibson, G., Chalfont, G. E., Clarke, P. D., Torrington, J. M., & Sixsmith, A. J. (2007). Housing and connection to nature for people with dementia: Findings from the INDEPENDENT project. *Journal of Housing for the Elderly*, 21, 55–72.
- Godwin-Jones, R. (2006). Tag clouds in the blogosphere: Electronic literacy and social networking. *Language Learning and Technology*, 10, 8–15.
- Hadjri, K., Faith, V., & McManus, M. (2012). Designing dementia nursing and residential care homes. *Journal of Integrated Care*, 20, 322–340.

- Helgesen, A. K., Larsson, M., & Athlin, E. (2010). "Patient participation" in everyday activities in special care units for persons with dementia in Norwegian nursing homes. *International Journal of Older People Nursing*, 5, 169–178.
- Hernandez, R. O. (2007). Effects of therapeutic gardens in special care units for people with dementia: Two case studies. *Journal of Housing for the Elderly*, 21, 117–152.
- Heylighen, A., & Bianchin, M. (2013). How does inclusive design relate to good design? Designing as a deliberative enterprise. *Design Studies*, 34, 93–110.
- Huisman, E. R. C. M., Morales, E., van Hoof, J., & Kort, H. S. M. (2012). Healing environments: a systematic review. *Building and Environment*, 58, 70–80.
- Ismail, I. (2013). *Design Thinking Method 1: Post-It's!* Retrieved from <http://izwani-smailblog.wordpress.com/2013/01/11/design-thinking-method-1-post-its/>
- Kankainen, A., Vaajakallio, K., Kantola, V., & Mattelmäki, T. (2012). Storytelling group: A codesign method for service design. *Behaviour & Information Technology*, 31, 221–230.
- Knibbe, J. J., & Waaijer, E. (2012). Designing the care environment in hospitals and nursing homes: A pilot for a new and reliable method for determining the optimum space to live in and work in. *Work*, 41, 5650–5651.
- Lohmann, S., Ziegler, J., & Tetzlaff, L. (2009). Comparison of tag cloud layouts: Task-related performance and visual exploration. *Lecture Notes in Computer Science*, 5726, 392–404.
- Marquardt, G. (2011). Wayfinding for people with dementia: A review of the role of architectural design. *Health Environments Research and Design Journal*, 4, 75–90.
- Parker, C., Barnes, S., McKee, K., Morgan, K., Torrington, J., & Tregenza, P. (2004). Quality of life and building design in residential and nursing homes for older people. *Ageing and Society*, 24, 941–962.
- Rabig, J. (2009). Home again: Small houses for individuals with cognitive impairment. *Journal of Gerontological Nursing*, 35, 10–15.
- Rivadeneira, A. W., Gruen, D. M., Muller, M. J., & Millen, D. R. (2007). Getting our head in the clouds: Toward evaluation studies of tagclouds. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 995–998). New York, NY: ACM.
- Schols, J. M. G. A. (2003). Ruimte voor de verpleeghuiszorg [Room for nursing home care]. *Medisch Contact*, 51, 1854.
- Schols, J. M. G. A. (2012). Kwaliteit van verpleeghuiszorg [Quality of nursing home care]. *Medisch Contact*, 67, 1427.
- Schwarz, B., & Brent, R. (2001). The architectural metamorphosis of long-term care settings. *Journal of Architectural and Planning Research*, 18, 255–270.
- Seifert, C., Kump, B., Kienreich, W., Granitzer, G., & Granitzer, M. (2008). On the beauty and usability of tag clouds. *Proceedings of the International Conference on Information Visualisation* (pp. 17–25). Washington, DC: IEEE.
- Sloane, P. D., Mitchell, C. M., Weisman, G., Zimmerman, S., Foley, K. M. L., Lynn, M., . . . Montgomery, R. (2002). The Therapeutic Environment Screening Survey for Nursing Homes (TESS-NH): An observational instrument for assessing the physical environment of institutional settings for persons with dementia. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 57, S69–S78.

- Statistics Netherlands. (2013). AWBZ-zorg met verblijf; leeftijd en geslacht [Residential long-term care; age and gender]. Statistics Netherlands, The Hague/Heerlen, The Netherlands. Retrieved from <http://statline.cbs.nl/StatWeb/publication/?DM=SLNL&PA=71568NED&D1=a&D2=0&D3=0&D4=a&D5=a&VW=T>
- Ulrich, R. S., Zimring, C., Barch, X. Z., Dubose, J., Seo, H.-B., Choi, Y.-S., . . . Joseph, A. (2008). A review of the research literature on evidence-based healthcare design. *Health Environments Research and Design Journal*, 1, 61–125.
- van Hoof, J., Blom, M. M., Post, H. N. A., & Bastein, W. L. (2013). Designing a 'think-along dwelling' for people with dementia: A co-creation project between health care and the building services sector. *Journal of Housing for the Elderly*, 27, 299–332.
- van Hoof, J., & Kort, H. S. M. (2009). Supportive living environments: A first concept of a dwelling designed for older adults with dementia. *Dementia*, 8, 293–316.
- van Hoof, J., Kort, H. S. M., Duijnste, M. S. H., Rutten, P. G. S., & Hensen, J. L. M. (2010). The indoor environment and the integrated building design of homes for older people with dementia. *Building and Environment*, 45, 1244–1261.
- van Hoof, J., Kort, H. S. M., Hensen, J. L. M., Duijnste, M. S. H., & Rutten, P. G. S. (2010). Thermal comfort and integrated building design for older people with dementia. *Building and Environment*, 45, 358–370.
- van Hoof, J., Kort, H. S. M., & van Waarde, H. (2009). Housing and care for older adults with dementia: A European perspective. *Journal of Housing and the Built Environment*, 24, 369–390.
- van Hoof, J., & Verkerk, M. J. (2013). Developing an integrated design model incorporating technology philosophy for the design of healthcare environments: A case analysis of facilities for psychogeriatric and psychiatric care in The Netherlands. *Technology in Society*, 35, 1–13.
- van Hoof, J., Westerlaken, A. C., Aarts, M. P. J., Wouters, E. J. M., Schoutens, A. M. C., Sinoo, M. M., Aries, M. B. C. (2012). Light therapy: Methodological issues from an engineering perspective. *Health Care and Technology*, 20, 11–23.
- van Hoof, J., Wetzels, M. H., Dooremalen, A. M. C., Wouters, E. J. M., Nieboer, M. E., Sponselee, A. A. M., . . . Overdiep, R. A. (2014). Technological and architectural solutions for Dutch nursing homes: Results of a multidisciplinary mind mapping session with professional stakeholders. *Technology in Society*, 36, 1–12.
- van Zadelhoff, E., & Verbeek, H. (2012). *Morgen mag ik naar het verpleeghuis! Toekomstvisie op zorg voor mensen met dementie* [Tomorrow I am going to live in a nursing home! Future vision of care for people with dementia]. The Hague, The Netherlands: Boom-Lemma Uitgevers.
- Verbeek, H., van Rossum, H. J. L., Zwakhalen, S. M. G., Kempen, G. I. J. M., & Hamers, J. P. H. (2009). Small, homelike care environments for older people with dementia: A literature review. *International Psychogeriatrics*, 21, 252–264.
- Verbeek, H., Zwakhalen, S. M. G., Schols, J. M. G. A., & Hamers, J. P. H. (2013). Keys to successfully embedding scientific research in nursing homes: A win-win perspective. *Journal of the American Medical Directors Association*, 14, 855–857.

- Verkerk, M. J., Hoogland, J., van der Stoep, J., & de Vries, M. J. (2007). *Denken, ontwerpen, maken. Basisboek Techniekfilosofie* [Thinking, designing making. Handbook technology philosophy]. Amsterdam, the Netherlands: Boom.
- Viégas, F. B., & Wattenberg, M. (2008). Tag clouds and the case for vernacular visualization. *Interactions*, 15, 49–52.
- Wiethoff, A., Wimmer, R., Richter, H., & Butz, A. Different brainstorming methods within the context of physical computing. *2010 International Conference on Technology for Education* (pp. 47–49). Washington, DC: IEEE.
- Xu, D., Kane, R. L., & Shamliyan, T. A. (2013). Effect of nursing home characteristics on residents' quality of life: A systematic review. *Archives of Gerontology and Geriatrics*, 57, 127–142.
- Zimmerman, S., Anderson, W. L., Brode, S., Jonas, D., Lux, L., Beeber, A. S., ... Sloane, P. D. (2013). Systematic review: Effective characteristics of nursing homes and other residential long-term care settings for people with dementia. *Journal of the American Geriatrics Society*, 61, 1399–1409.