AEM-cube design

van den Bouwhuijsen, W.J.M.J.; Dijkman, R.

Published in:
Gerontechnology

DOI:
10.4017/gt.2012.11.02.567.00

Published: 01/01/2012

Please check the document version of this publication:

• A submitted manuscript is the author's version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

Citation for published version (APA):

General rights
Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

• Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
• You may not further distribute the material or use it for any profit-making activity or commercial gain
• You may freely distribute the URL identifying the publication in the public portal

Take down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.
Symposium: Active aging and architecture

Participants: F.J.M. VAN GASSEL (Netherlands), W.J.M.J. VAN DEN BOUWHUIJSEN (Netherlands), R. DIJKMAN (Netherlands), D. COMPAGNA (Germany), K. KOHLBACHER (Germany), P. SCHMID (Netherlands), G. PAL-SCHMID (Netherlands). ISSUE Over the coming five decades the 15- to 64-year-old population in Europe will decrease from about 333 to 283 million persons, over the same period the median age of the total population will increase from about 40 years to 48 years1. Globally, the median age of the population will increase with about 5 years between 2005 and 2025. Supporting active aging in the construction sector plays a key role in a number of application domains of gerontechnology: housing, mobility, communications, leisure and work according the European Construction Technology Platform (ECTP)2. The World Health Organization (WHO) describes active aging as a process of optimizing opportunities for health participation and security in order to enhance the quality of life as people age. Active refers to be physically active or to participate in the labor force. In the domain of housing construction it asks for two different approaches: (i) robotizing the workforce of construction workers, and (ii) providing the built environment with robot technology to facilitate independent living for the elderly. Both approaches are complex building assignments and call for a new way to assess user-needs and societal values. In this symposium we will focus on the last approach. Technologies to enhance user-needs for aging-in-place are available but users do not accept the applications by and large. A better understanding of the user-needs of the elderly can help. CONTENT Findings, methods, and expected developments are the focal points in this symposium. Drivers and barriers are discussed from both housing and a gerontechnology point of view. STRUCTURE Four different ways to better understand user-needs will be presenting. First, Frans van Gassel will present a method to analyze and improve problematic activities of daily living for aging-in-place. Next, Wim van den Bouwhuijsen will explain the ‘AEM-Cube design’ that categorizes diversities among residence users. The AEM-cube gathers data on 3 scales: attachment, maturity, and exploration. Then Diego Compagna and Florian Kohlbacher will present an approach entitled ‘Scenario-based design for user-centered development of care robots’. In the last presentation Peter Schmid will talk about integral design aids for ‘age-proof’ housing with some easy-to-follow models. After these individual presentations Frans van Gassel will moderate an open discussion on how to improve the current situation and how to foster a better understanding of the issues. CONCLUSION With the number of aging people rapidly growing in the (developed) world, it is not enough to develop tools and equipment to support people. Society needs an inclusive design of the whole built environment with an infrastructure that supports people’s mobility. The challenge for automation and robotics is to support the domains of architecture and civil engineering. This support must create an “inclusive” built environment for economical, health and societal reasons (ECTB).

References

Keywords: aging-in-place, user-needs, active aging, scenario-based design, design aids

Affiliation: Eindhoven University of Technology, Eindhoven, Netherlands;
E: f.j.m.v.gassel@tue.nl

Purpose Aging-in-place is an accepted concept in our aging society. Older adults prefer to stay in their own environment to enjoy their independence and take part in social activities. In short, they want to maintain full citizenship: physically, mentally and socially. However, our current built environment is commonly ill-suited to aging-in-place. Think for instance of the barriers when shopping with a walker. Activities of daily living (ADL) and instrumental activities of daily living (iADL)
Symposium: Active aging and architecture

were categorized. Scales were developed to assess older adults’ needs and capabilities. In the
domain of construction engineering a working method was developed to improve unsafe and
unhealthy production activities on the construction site1. We modified the method for ADLs. The
aim is to test the working method for analysis and improvement of ADLs for older adults in their
3rd age2. Method The method was tested with 12 groups of international novice designers (MSc
students Built Environment, Building Services and Human Technology Interactions) from 2009 to
2011. Students observed participating older adults when performing an (i)ADL-task they consid-
ered difficult. Students were requested to: (i) analyze and (ii) improve the problematic ADL-
1

(i)ADLs were studied by the students. Results were reported, presented, and discussed with the
fellows students. After completion, student groups reflected on the value of the resulting design in
terms of efficacy and technical and economic feasibility. Students also each wrote a structured
personal reflection concerning their learning experience, failures and successes, and to suggest
better ways to tackle the problem. Results & Discussion Participating older adults (m=77 years,
range 65-83 years) were healthy, except for one who was diagnosed with Parkinson disease.
(i)ADLs and problems encountered: (i) bus and train travel: hard to board with luggage, (ii) dish
washing in a private apartment: hard to bend down to the lower cabinet, (iii) preparing food in a
private apartment and assisted living facility: problem with mashing potatoes and with opening
packaging, (iv) grocery shopping: hard to reach top and bottom shelf without assistance, (v)
descending the stairs: fear of falling down, (vi) vacuum cleaning the residence: balance problems,
and (vii) computer mouse use: problematic for the person with Parkinson’s disease. The im-
provements designed by the students included: (i) a retractable ramp to get in and out of the
train, (ii) an adjustable cupboard, (iii) a processor to cut vegetables and fruit into tiny pieces, (iv)
movable shelves, (v) a movable rail in front of the user of the stairs (Figure 1), (vi) a battery-
powered vacuum cleaner with adjacent wall storage equipment and docking station, and (vii)
touch screen instead of computer mouse. The proposed improvements show that the design
method can help solve ADL-problems. In their personal reflections, the students stated: ‘very
useful and broadly applicable’, ‘to do observations make you real aware of the problem’ and
‘take time to formulate the problem and the solution’.

References
1. Gassel FJM van, Maas GJ. Mechanising, Robotising and Automating Construction Processes. In: Balaguer
2. Gassel FJM van, Bronswijk JMEH van. Working method to enhance end-user value for aging-in-place. Proceedings of the
27th International Symposium on Automation and Robotics in Construction (ISARC), Bratislava; 2010: pp 627-633
3. Vos B, Wesselink M, Willems C. Descending the stairs with age related disabilities. Report course Robotics and Home Au-
tonomation at TU/e, Eindhoven; 2011

Keywords: analyzing work processes, methodical design
ADL, user driven design

Affiliation: Eindhoven University of Technology, Eindho-
ven, Netherlands; E: f.j.m.v.gassel@tue.nl

Full paper: No

W.J.M.J. VAN DEN BOUWHUIJSEN, R. DIJKMAN. AEM-cube design. Gerontechnology
2012;11(2):111-112; doi:10.4017/gt.2012.11.02.567.00 Purpose Basic principles of design are aesthetics,
functionality, and regulations. Our physical and instinctive characters hardly change1. People, especially
the elderly, will feel better if a design is based on their culture and behaviour,
because they have more difficulties to accommodate new situations. Method ‘The AEM-Cube’2:

1 is one of the models to compose effective teams based on the diversity of team members during
the growing phase of an organization. The model is based on the need of an organization (S

Figure 1. Descending stairs safely with a removable rail in front of user3
Curve) and next the nature of team members. At first sight this has nothing to do with the design of homes for seniors and the environments where they feel happy. We used only the half of the model that typifies the individuals. The model has three axes, the attachment axis (X axis), the exploration-stability axis (Y axis), and the maturity complexity axis (Z axis) (Figure 2). The attachment axis differentiates between matter and people and reflects the inner stability and safety of people. The exploration-stability axis reflects the difference between stability and exploration of people. The complexity maturity axis reflects the expression of people, and their focus on ‘me’ or ‘we’. The model has 64 possible nuances. With a short test designed by the companies Human Insight International and GITP International BV., participants were assessed, resulting in a classification in the AEM-Cube. The next step is translating the assessment results—the true nature of a person—into characteristics of living.

Results & Discussion
Location in the model situates the nature of people and requirements for design can be derived from this. SUPPORT: this group has a need for safety and attachment with other people and at the same time a stable and safe surrounding. These people are characterised by being conservative/traditional considerate, flexible and sensitive to atmosphere. CHANGE: this group has a need for safety and attachment with other people but a surrounding which they want to change if new circumstances arise. These people are characterised by being contemporary/sophisticated inspiring, imaginative, connective. CONTROL: this group has a need for safety and content attachment, activities and safe and stable surroundings. These people are characterised by being conservative/efficient high quality, cautious, critical. INNOVATION: this group has a need for safety and content attachment, activities they want to change if new circumstances arise. These people are characterised by being contemporary/effective challenging, sceptical, rational. For designers this information together with the basic principles of design could be transformed into building specifications such as e.g. large rooms, possibility for easy contact, close situation of space, many small rooms, large windows, zoning of regions.

References
2. GITP; www.GITP.nl; retrieved April 5, 2012
3. Human Insight; www.human-insight.com; retrieved April 5, 2012

Keywords: management and social issues, housing and daily living, design, nature of people, AEM Cube

Affiliation: Eindhoven University of Technology, Eindhoven, Netherlands;
E: w.j.m.j.v.d.bouwhuijsen@tue.nl

Full paper: No

D. COMPAGNA, F. KOHLBACHER. Scenario-based design for user-centered development of care robots. Gerontechnology 2012;11(2):112-113; doi:10.4017/gt.2012.11.02.301.00 Purpose This paper focuses on assessing the suitability of the scenario-based design method to accomplish a user-centered development approach of care robots for use in institutional settings of care facilities for the elderly. Method The scenario-based design approach was adopted, evaluated, and refined in an empirical research project with the goal to realize a user-orientated development approach for gerontechnology. Results & Discussion We performed an empirical research project (carried out between 2009 and 2011) with the aim to accomplish a user-centered development approach of two different robots to be integrated in a care facility for the elderly by adopting the scenario-based design as its core method. User-centered design methods have been applied to product development and design for older people, but mostly in household settings. The main conclusion consisted of an overall positive assessment of the ‘scenario-based design’ approach; by adopting this method it was possible to include all relevant user-groups (inhabi-
tants, care workers, and management of the facility) in the development process. Regarding the main functions and capabilities, the two robots were mostly developed already: a service robot with a manipulator, capable to fetch and transport little to medium sized, relatively light goods, and also able to identify persons; and an automated guided vehicle capable of autonomously navigating through the whole facility and transporting medium to large sized goods up to 100 kg. By integrating the user we aimed to clarify three main aspects. First and foremost: what tasks should the robots perform; second: how should they carry out those tasks; and third: what should the external design (appearance) look like? The research findings show that scenario-based design is a meaningful and effective approach for the development of gerontotechnologies despite significant variations in the rate of participation between the relevant user groups of the chosen institutional setting. Based on the findings of the abovementioned project the implementation of rapid prototyping and iterative short-term pilots could avoid the difficulties related to the inclusion of the elderly and should be considered when adopting user-centered developments of gerontotechnologies. The project results also suggest that further research should be done for a better understanding of the relevant criteria that lead to a more satisfying participation of the elderly.

References
Keywords: robotics, scenario-based design, user-centered development
Affiliation: University of Duisburg-Essen, Duisburg/Essen, Germany;
E: diego.compagna@uni-duisburg-essen.de
Full paper: No
abovementioned design development methods were successfully used. We chose to focus on the principal conditions that determine the quality of sound architecture in relation to health, sustainability, and aging of residents and users: aging of architecture is an historical objective in terms of interior, room, building, and town; aging within architecture deals with the residents as principal participants. We conclude our systematically devised research approach by deducing models that can be used as check instruments and integral design aids for ‘age-proof’ housing and that offer practical applications in the housing design process as well as being a useful topic for multidisciplinary discussion.

References

Keywords: ‘age-proof’ housing, architecture and aging, integral design aids, models
Affiliation: Eindhoven University of Technology, Eindhoven, Netherlands
E: peter.schmid.ps@gmail.com
Full paper: No

Figure 3. Basic pattern = principle form for various design aids related to physical, psychological, and spiritual expectations and needs of aging occupants to be used by architectural designers for developing “age-proof” housing. A number of design aids - based on the above pattern - will be treated in the full paper