AEM-cube design

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F.J.M. van Gassel (Convener). ***Assessing user-needs to realize active aging in the built environment.*** *Gerontechnology 2012;11(2):110;* doi:10.4017/gt.2012.11.02.533.00 **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 years[1]. 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).

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F.J.M. van Gassel. ***Testing a working method for designers to solve problems with activities of daily living.*** *Gerontechnology 2012;11(2):110-111;* doi:10.4017/gt.2012.11.02.633.00 **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) 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 site[1]. 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 age[2]. **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 considered difficult. Students were requested to: (i) analyze and (ii) improve the problematic ADL-element. Before starting the assignment the students were instructed and did some class exercises to become acquainted with the working method. In small groups the students structurally analyzed in an ADL-task and created solutions by using morphologic schemes. In total 7 different (i)ADLs were studied by the students. Results were reported, presented, and discussed with the fellow 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 improvements 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'.

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Full paper: No

Figure 1. Descending stairs safely with a removable rail in front of user[3]

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 change[1]. 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'[2-3] 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

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.

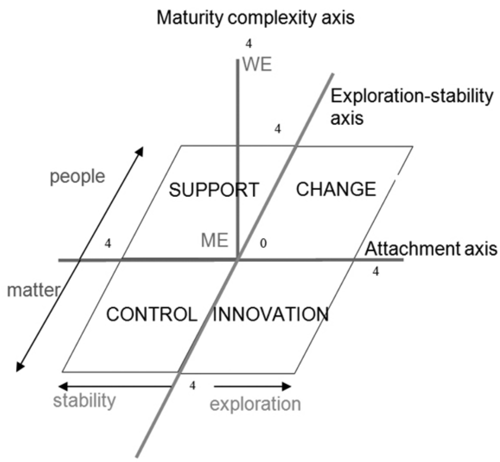

Figure 2. Schematic presentation of the AEM Cube

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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[1-3] 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[4-7], 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 (inhabitants, 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 gerontechnologies 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-termed pilots could avoid the difficulties related to the inclusion of the elderly and should be considered when adopting user-centered developments of gerontechnologies. 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[8].

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P. Schmid, G. Pal-Schmid. ***Aging and architecture, design aids for 'age-proof' housing***. *Gerontechnology 2012;11(2):113-114;* doi:10.4017/gt.2012.11.02.247.00 **Purpose** The aim was to offer integral design aids for 'age-proof' housing. The main goal is to enable architectural designers to develop housing concepts of a higher than usual quality for aging users. Easy-to-follow models as design aids were developed in the context of R&D. These models indicate what to avoid, where protection is needed, and how to improve design in order to support aging people in their home. Those models are the central theme of the paper. **Method** Systematic integral design (Integral Bio-Logical Architecture - IBA)[1] and model building, particularly for architectural concepts that develop devises[2] or means according to principles of repetition and worldwide application of method of holistic participation(MHP)[2,4]. **Results & Discussion** We focus on elementary conditions to underpin the residents staying healthy and reaching old age, based on a proper and vital built environment (*Figure 3*). We do not elaborate on possible installations of valuable mechatronics or robotics for resident welfare. We discuss some design aids where the 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.

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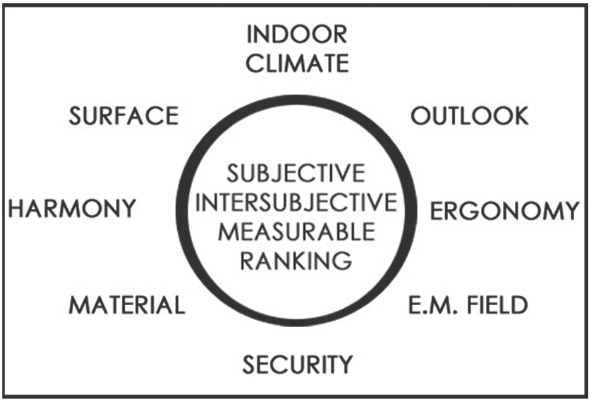

Figure 3. Basic pattern = principle form for various design aids related to physical, psychological, and spiritual expectations and needs of aging occupants to be used by architectural designers for developing ''age-proof'' housing. A number of design aids - based on the above pattern - will be treated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