

Guest editorial

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The number of older adults, worldwide, is increasing rapidly, and this demographic shift puts an increased level of stress onto healthcare systems. The vast majority of older adults wish to age-in-place as independently as possible (van Hoof *et al.*, 2011). Nevertheless, there is a significant group of older people who require long-term care services, including home care, rehabilitation services, or support within an aged-care facility or nursing home. Nursing homes provide an alternative place of residence with 24-hour care and assistance offered by professionals to people who can no longer reside in their own home environment due to increasing need for assistance with activities of daily living, complex health care needs, and vulnerability. Nursing homes, thus, have a dual nature: as a site for delivery of care and as a place to live. With advances in digital and assistive technologies, the domain of engineering and design offers a wide range of solutions for such aged-care facilities that support daily functioning, leisure activities and participation and the provision of healthcare.

Too often, however, end-users of technological solutions are not included, or only consulted in a tokenistic way in the design processes and implementation of technology solutions in practice. On the other hand, studies show that the inclusion of end-users in these processes is paramount to the success of engineers and designers in their efforts to improve aged-care (Nieboer *et al.*, 2014; Peek *et al.*, 2016).

This special issue includes five articles which cover a diverse range of issues related to recent advances in the design of technologies used in aged-care facilities and the built environment in general.

The first paper by Martens and colleagues is based on a small-scale investigation of how bedfast nursing home residents experience their quality of life, and how the bed and connected technology may improve their sense of control, well-being and independence. The work studies a frail group of nursing home residents who experience a self-reported low quality of life due to their physical and mental dependence on others, and the limited control options they are given. Martens and colleagues show that by making technological adjustments to the bed and the person's direct surroundings, their quality of life can be much improved. Many of these solutions are relatively simple to implement, for instance, the use of modern IT devices to support people to engage in social contacts and to control the bed itself, as well as the environment around the bed. Thus, the proposed solutions included in the paper have important and readily transferable implications for practice which could be achieved relatively easily.

The second paper by Oude Weernink and colleagues provides an overview of real-time location systems (RTLS) in health care. These technologies can help improve process efficiency and the quality of care. Such systems are designed to determine and monitor the location of assets and people in real-time through the use of wireless sensor networks and are often used in hospital settings. The nursing home is a relatively unexplored context for the application of RTLS and offers opportunities and challenges for future applications. Oude Weernink and colleagues describe the specific healthcare applications of RTLS, including asset tracking, patient tracking and personnel tracking. These overviews are followed by a forecast of the implementation of RTLS in nursing homes in terms of opportunities and challenges. By comparing the nursing home to the hospital, the RTLS applications for the nursing home context that are most promising are asset tracking of expensive goods owned by the nursing home in order to facilitate work flow and maximise financial resources, and asset tracking of personal belongings that may get lost by the residents. The paper provides a glimpse of the future of aged-care as an enabling environment.

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The third paper by Verkerk and colleagues deals with housing and technology-related needs of older people with dementia. For this special group of older people, various design principles exist. Verkerk and colleagues propose a new approach to such principles, and outline a simple yet sophisticated model, with a firm foundation in neurology, for designing environments for people with dementia. A general design model is presented consisting of three principles: designing for ageing people, designing for a favourable state and designing for beautiful moments. The design principles are translated into design specifications to show what might be possible in practice. Philosophical concepts are introduced which are required to understand the design through a collection of case studies from Dutch nursing homes. These case studies show how the theory of modal aspects of the philosopher Dooyeweerd can be used to map design specifications in a systematic way. This systematic mapping is important because it connects the various aspects of human functioning to actual design solutions, and helps designers identify the best solutions for their target group.

The fourth paper is an opinion paper by van Zaalen and colleagues, discussing the implementation of technology in the delivery of healthcare to older people, and how the least-voiced in society can be heard. As technology has a mediating role in determining the possibilities for quality of life, the concept of assisting older people through the use of technology to avail of health care has enormous potential. However, technology use can also have its downsides and risks, for example in relation to the privacy of the older person. Van Zaalen and colleagues take the reader on a journey along important ethical and judicial themes related to technology and the older adults. Different consecutive phases in technology design and allocation are discussed from a diversity of perspectives, and illustrated using cases from practice. The explorations in the people help designers consider the needs of the most frail and vulnerable of target groups, and help tune design solutions to better suit the end users' needs.

The final paper in this special issue is by Loy and colleagues on rethinking technology-enhanced aged-care environments. The paper provides an overview of design-led research into digital technology across disciplines for the personalisation of health care environments and is informed by the authors' ongoing hospital-based research. The work is based on a design anthropology framework providing insight into designing for changing the experience for older patients in current healthcare contexts and future focused strategies, integrating digital technologies and human-centred design across scale and disciplines. The study proposes future care scenarios with technology and human experience as key drivers, in which individualised and personalised solutions cater for diversity. Given the ageing population noted above, and the substantial heterogeneity of needs amongst older adults, such personalised solutions will become ever more important and so this paper makes for vital reading for those working in relevant fields.

In summary, the papers provide an overview of new technologies for long-term care and aged-care, promising a lasting contribution to the domain of enabling technologies, both for the vulnerable end-users in the case of bedfast nursing home residents, and for system engineering in the case of RTLS. This special issue also provides engineers and designers with models and tools to design and implement technology for nursing home residents including those with dementia, older hospital patients, and other people in our society who are among the least-voiced.

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