Designing with the Digital Divide to Design Technology for All

JENNA MIKUS
Queensland University of Technology, Brisbane, Australia

Abstract Recent practice articulates the proven value of technology in older adult lives, and the interest and ability of older adults in technology use. As Director of the Design Age Institute Colum Lowe states in the 2020 Design Week article, "Technology has the power to change people's lives more than anything else in human history" (Long, 2020, p. 3). However, of the technologies that have been studied and considered successful, many have not been accepted by older adults. This is not because the users are uninterested or incapable. Instead, research and practice contend it is because they tend to be left out of the originating design process.

Design professionals and academics, including Bernard Isaacs, Alan Newell, Ann Light, and Don Norman, extol the virtues of designing for the old to design for the young, rather than designing for the young to exclude the old. This paper explores Isaacs, Newell, Light, and Norman's collective assertion that by designing with and for this group of what is defined as members of the Digital Divide—people who are often outside of the more frequently designed-for user groups—it may be possible to design for other demographics. That is, it may be possible to use it as a mechanism to design for all.

This position paper presents a problem that demands further research and is therefore considered to take a problematisation approach rather than a gap-spotting approach (Sandberg & Alvesson, 2011). By positioning this subject through the lens of problematisation, this paper provides the foundational rationale for an ongoing research project that considers the role of technology in future ageing-in-place home health design. Most importantly, it allows for the potential to contribute sound scholarship relating to if, why, and how design done with older adults might result in better gerontechnology (or older adult-focused) design and potentially enhanced technology design for all.

Keywords: Design for All, Co-design, Aging, Digital Divide, Built Environment, Technology, Problematisation

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Population Ageing

According to the United Nations, the percentage of people in the world aged 65 and up is expected to increase from 9.3 percent in 2020 to 16.0 percent in 2050 (United Nations, 2019). This unprecedented growth is associated with a concept introduced by the World Health Organization (WHO) as population ageing—that is, older adults accounting for a larger percentage of the global population due to decreasing fertility rates and longer living adults (WHO, 2018). It is important that they remain disease-free and physically, socially, and mentally healthy as they age to ensure optimal health, happiness, and well-being.

"Living arrangements of older people are an important determinant of their well-being" (United Nations et al., 2020, p. 3), and it is believed that "people can live longer independently if things are designed around their needs" (Long, 2020, p. 2). Given that people spend over 90 percent of their time in buildings, with a majority of that time spent at home, when considering older adults (delosteam, 2018) it is important that home living arrangements be understood and designed for to ensure health and well-being for this growing demographic.

There is a clear preference for Australian older adults (GCMA, 2020) and others globally (AARP, 2011) to stay at home as they age. To date, homes have not been designed to facilitate this transition, and occupants have not planned ahead to make this desire to age-in-place a reality (GCMA, 2020). It is critical that researchers and practitioners understand how to design to support healthy ageing-in-place.

Considering Technology when Designing for Older Adults at Home

One possible way of addressing this design need is to understand not only what people require spatially in their homes as they seek to age in place, but also what they require technologically. Groups such as the British Society of Gerontology (BSG) in the United Kingdom (UK), AARP (formerly called the American Association of Retired Persons) in the United States (US), and the Global Centre for Modern Ageing (GCMA) in Australia; researchers (Choi et al., 2019; Kim et al., 2017; Wang et al., 2019); and practicing designers (Long, 2020; Norman, 2019) have asserted that technology could be a key enabler to enhancing health at home for older adults.

Given the rising number of older adults globally due to population ageing and the ever-changing needs, requirements, and abilities of this group, technology is likely to play a role in future home design (Tech-enhanced Life Editors, 2021) and older adult futures in general (Long, 2020). Recent scholarship points to the promise in incorporating technology for health-based design at home especially for older adults (Petermans, 2019). It is imperative that these groups be included in the design process to result in more effective and beautiful design.

The technologies considered in the ongoing study to which this paper relates are Smart Home Technologies (SmHTs) (Choi et al., 2019), sometimes referred to as home automation systems, smart building technologies, or domotics. These include Google Home and Amazon Alexa suites of products, such as smart speakers, door locks, lights, thermostats, cameras, and more. In this context, smart refers to programmable technologies that can execute tasks (e.g., turning something off or on) based on pre-set rules and personal preferences. Today's SmHTs have the capability to create most environmental conditions and experiences, but they have only been explored superficially and have primarily focused on average user application. They have not considered older adult needs and wants.

Taking a Problematised Approach to Gerontechnology Design to Design for All

Scholarship proposes that by designing with and for this older adult demographic (Chamberlain et al., 2017; Wang et al., 2019) and by taking their lived experience into account (Light, 2011; Light et al., 2015), it may be possible to design technology effectively for them as users but also for other user groups. That is, by designing with older adults—

commonly referred to as members of the Digital Divide (or people who are often outside of the more frequently designed-for user groups)—it may be possible to design for all.

This paper examines this proposed foundational belief from academia and industry and presents it as a problem that demands further investigation for pragmatic application. It challenges the assumptions of older adult-focused technology, or gerontechnology, and critically builds on best practices suggested by leading practitioners and researchers to result in pragmatic application. In taking this approach, the paper employs problematisation as a means of rich exploration, as defined by Sandberg and Alvesson (2011). By using this problematised approach to research question creation, it is likely that the derived questions will be more informed, the approach more rigorous, and the results more "influential and significant" (Sandberg & Alvesson, 2011). First, it is important to consider how gerontechnology design has been done ineffectively to date and how it might be done better in the future.

Ineffective Historical Tech Design for Older Adults

Recent scholarship articulates technology's value and potential in older adult lives (Wang et al., 2019) and the interest and ability of older adults (Orlov, 2019) in technology use. However, of the technologies that have been studied and considered successful, many have not been accepted by older adults (Task Force on R&D, 2019). This is not because the users are considered "laggards" on Rogers' Diffusion of Innovation Theory curve (Rogers, 2003). Instead, practice states it is because they tend to be left out of the originating design process (Bjering et al., 2014).

Most technologies are designed for average user needs, most commonly 18 to 35-year-old white males (A. F. Newell, 2011; A. F. Newell & Cairns, 1993), thus overlooking older adult wishes (Norman, 2019) and using ineffective "top-down design [processes that create disparities] between technologies and older adults' needs" (Wang et al., 2019, p. 1) rather than designing meaningfully for the edges, per Jeremy Myerson (DOGA, 2018). This has led to technology that meets these limited average user specifications but is deemed ineffective for edge demographics due to "significant mismatches between the needs and preferences of the users and the products that are developed to fulfill their needs" (Wang et al., 2019, p. 2).

The Myth of the Digital Divide

To date, there has been significant debate over older adults' affinity for and interest in using technology. This has led to the group being identified as members of the Digital Divide and considered uninterested or unaffected by tech (A. F. Newell, 2011). Oftentimes, this has led to them being designed out of solutions, especially those that are tech-based (Moreira, 2016; A. F. Newell, 2012; A. F. Newell et al., 2006; Shahrestani, 2017), due to assumptions that members of this user group were uninterested or represented minimal market opportunity (A. F. Newell, 2011).

Considering that the older adult population is experiencing fast-moving growth, there is a larger number of older adults worldwide with a wider array of diverse interests (Sugar, 2019). Many of these interests relate to technology. Older adults have the education, ability, and desire to understand, apply, and procure digital devices (DOGA, 2018; Norman, 2019; Orlov, 2019). Their generational wealth and therefore purchasing potential is particularly impressive. According to a March 2021 US Federal Reserve generational wealth study, the

Silent and Earlier (born before 1946) and Baby Boomer (born between 1946 and 1964) generations account for 19.23 and 64.72 trillion American dollars, respectively, while the GenX (born between 1965 and 1980) and Millennial (born between 1981 and 1996) generations represent 33.06 and 5.89 trillion American dollars, respectively (Glasspiegel, 2021; The Federal Reserve, 2021). Thus, in an American context, people over 57 years of age account for more than double the generational wealth of those aged 25 to 56.

"Given their record-breaking purchasing power and their willingness to spend, seniors are the most powerful consumer group" (DOGA, 2018, p. 28). It is important that they be well designed for and, when possible, included in the design process to avoid more missed opportunities.

A Missed Opportunity

Knowing that older adults have the financial means to obtain and the cognitive interest and aptitude to utilise technology, it is surprising that poor design continues to occur. This bewilderment is echoed by design academics and practitioners whose collective research provide the baseline for this problematisation.

In an effort to thwart poor designs of the past, a range of researchers and practitioners have advised on the benefits of designing with and for older adults to achieve better design for the targeted user group and for others. Well known Human Computer Interaction (HCI) design academics Don Norman, Alan Newell, and Ann Light as well as Inclusive Design academics such as Bernard Isaacs are recognised for extolling the virtues of designing for older adults to design for all. Each point of view is represented below, chronologically.

- Bernard Isaacs: Isaacs was a professor of geriatrics in the UK. He was the founding director of Birmingham's Centre for Applied Gerontology and was famous for his belief stating, "design for the young and you exclude the old; design for the old and you include the young" (DOGA, 2018)—a position he shared often in his work up until 1995 when he died.

- Alan Newell: Alan Newell was one of the first HCI researchers to suggest the value of better design for older adults from a tech-focused point of view (A. F. Newell, 2008, 2012; A. F. Newell & Cairns, 1993; A. F. Newell & Gregor, 2000). His work from the 1990s until today explores the physical (e.g., computer ergonomics) and digital (e.g., readability and useability of website design) access of HCI application.

  As Newell's research progressed through the course of his career, he began to assert that designing for high functioning older people could result in designs appropriate for most of the population (A. Newell, 2006; A. F. Newell, 2011). Newell's *Functionality vs Age* diagram illustrates this concept, paralleling high functioning older adult capabilities to those of medium functioning middle aged adults and therefore representing how *"design that is appropriate for older people will be appropriate for most of the population, whereas design for younger and middle-aged people will exclude significant numbers of older people"* (A. Newell, 2006, p. 5). Now an Emeritus Professor at the University of Dundee who spends most of his time at home, Newell continues to promote the value of this suggested approach in tech-related design.

- Ann Light: Ann Light is a Professor of Design at the University of Sussex in the UK, and a Professor of Interaction Design, Social Change, and Sustainability at Malmo University in Sweden. Light elaborates on this concept, suggesting that by designing for the lived experience of an older adult group, there is additional potential for the resulting design to benefit demographics other than the targeted older adults group (Light et al., 2015).

  In her studies, based in Australia and the UK, Light observed that "We can point to older people's rich potential for informing the design of devices and networks for *all* populations, not just the old, bringing familiarity with and acceptance of change, insight into shifts in technology, felt engagement with what younger people regard as history and many other qualities" (Light et al., 2015). Therefore, it is important to garner and consider lived experience when designing with older adults.

- Don Norman: In May 2019, Don Norman penned a Fast Company article in which he wrote that "the world seems designed against the elderly" (Norman, 2019). As a former Apple executive, a professor and director of the University of California-San Diego Design lab, and an older adult himself, he was horrified by what was considered to be user-friendly design. Norman asserts that older adults are "not a niche market", are "good customers…often with more free time and discretionary income", and should be valued for the smart, decisive "crystallised intelligence" they offer (Norman, 2019).

  Norman makes his ideas actionable by highlighting a 2017 Fast Company article by Katharine Schwab entitled "Why You Should be Designing for Your 73-year-old Self" which discusses a 2017 exhibition at London's Design Museum "[urging] designers to think about how they want to live as they age" and suggests that "at its heart, designing for the elderly is designing for our future selves" (Schwab, 2017). Norman appreciates this notion and ends the article by beseeching his design community:

  > *"Every ailment that I described that impacts the elderly is also present in people of all ages. Designs that make it easier for elderly people often are of equal value for younger people. In fact, for everyone. Help the elderly, and the results will help many more, including yourself, someday."*
  >
  > (Norman, 2019)

Together, these academics and practitioners highlight why it is important to design for older adults and how that design can be done better for a variety of user groups. Considering this scholarship, it seems worth problematising research questions that consider first, if design done with older adults (considering their lived experience) is an effective means to gerontechnology design and second, if this approach proves a viable means to design technology for other demographics.

Potential Tangential Benefits

Despite the potential to derive better design results with this paper's related research that contributes to understanding technology's role in enhancing health-based ageing-in-place—a subject matter of particular interest at a time when population ageing and COVID-19 physical distancing continue as global issues—the problematised approach of this research may result

in an additional benefit. It also has the potential to encourage members of the design community to have a better understanding of and appreciation for designing for this demographic (A. F. Newell, 2011; A. F. Newell & Cairns, 1993).

To date, designers have primarily focused on creating technology designs with young white males (aged 18 to 35) in mind (A. F. Newell & Gregor, 2000). Studies that build off of this position paper and promote design to truly engage, listen to, and amplify older adult thoughts, preferences, and voices have the potential to prove the value of designing for this demographic. Assuming that occurs, designers are likely to develop a better understanding of, appreciation for, and motivation to design for this demographic (A. F. Newell, 2011; A. F. Newell & Cairns, 1993), whether they simply exercise design empathy or whether they consider their future 73-year-old selves in the process as Schwab suggested (2017) and Norman emphasised (2019).

Conclusion

This position paper builds on arguments by Isaacs, Newell, Light, and Norman and initiates a problematisation-based take on understanding why and how design done with and for older adults might be a mechanism to design for all. This problematised approach offers a different way of considering research and practice-based design conducted to date, calling for additional research scholarship and practical experience that would introduce rigour to the much-needed field of gerontechnology design and increase the probability of developing "more interesting and significant theories" (Sandberg & Alvesson, 2011, p. 41). By positioning research using a problematised approach, it may indeed be possible not only to design technology effectively for older adults but also to employ such an approach as a mechanism to design for all, while also promoting an understanding as to why such an approach might be valuable and how it might be done best.

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