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Digital Tech for Inclusive Aging: Usability, Design and Policy

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Abstract

As we age, many of an individual's abilities (e.g. cognition, perception, mobility) begin to change in ways which can result in functional limitations. Although capabilities vary across the population, change also varies within the lifespan of individuals. An array of technologically based supports (e.g. traditional eyeglasses, a walker, hearing aids) have been developed to mitigate the challenges that result from such age-related changes, and ideally, enhance quality of life. Administrators in a key setting, assisted living centers and nursing homes, are constantly presented with options to adopt new technologies for use by residents and staff that could cost-effectively increase independence. However, lack of awareness, as well as public policies to encourage technology awareness and training not only affects older individuals directly, but, extends to the resources available to senior living facilities. When the end user is not included in the design and development process, suboptimal outcomes are inevitable due to a disconnect between the product, the user, and the context of use. We present an inclusive development /adoption approach based in four core areas: the engagement of stakeholders, improved design standards, integrated policy streams, and updated privacy policies.

Keywords

Aging, disability policy, accessibility, inclusive design

Introduction

Full social engagement, active participation, and maintaining independence are critical social objectives for all individuals but can be especially challenging for the aging and people with disabilities. As daily activities become more difficult, so do the decisions an individual and their families make on how and where to live. The number of older individuals making up the general population is approaching levels that will match the number of young. The resulting increase in the economic impact of aging, particularly healthcare costs, becomes of greater concern (Harper 587; Kulik et al. 929). Recent digital and information-based (ICT) advances such as voice assistants, chatbots, the implementation of faster wireless networks (e.g. 5G), and the Internet of Things (IoT), provide new technologically mediated avenues that can help maintain independence in individuals as they age.

Much of the thinking in the areas of disability and the characteristics of aging, particularly as people develop functional limitations, relates to technologies (e.g. design, accessibility, usability, etc.) and the ways in which they function in an assistive manner. Digital technologies can enhance inclusion and increase engagement for the aging. IoT and 5G networks, for instance, applied in healthcare settings, necessitate integrating relevant policies surrounding these technologies with health information and design policies. Designers, developers, and policymakers often operate independently, resulting in products that do not meet the needs of the users, lack interoperability, or are hindered by obstructive policies (Baker et al. 18). By incorporating policy design, early technologies are more likely to both meet regulatory requirements as well as be more closely aligned to the needs of the target audience (Ratwani et al. 743). Such systematic change will also result in future applications of these technologies facing less challenges moving forward. But, the success of these technologies depends on the

effectiveness of their design and modes of adoption.

The manner in which organizational technological adoption and diffusion occurs is a critical consideration that is too frequently ignored during the design process. This poses particularly challenging conditions for successful technology adoption in structured living environments such as senior housing. Assisted living centers and nursing homes are constantly presented with options to adopt new technologies for use by residents and staff which could potentially help combat the rising costs of senior housing (Sudo). However, lack of technology awareness and supporting training not only affects older individuals directly, but, extends to the resources available to senior housing. Administrators focused on managing complex living environments are not typically aware of advances in assistive and enabling technologies or how these technologies would enhance quality of life, reduce cost of operations, or potentially reduce health risks among residents. Furthermore, economic constraints pose significant challenges on the diffusion of new technologies. Recent shortages in available staff (Bryant) place significant constraints on facilities which do not have time to properly evaluate candidate technologies thoroughly. Particularly when working with vulnerable populations, when the end user is not included in the design and development process, suboptimal outcomes are inevitable due to a disconnect between the product, the user, and the context of use. Barriers to adoption and unaddressed challenges to the user result in a loss of customer base for potentially good and useful products. Regardless of the function or design of a product, if adoption hinderance of any form is present, the use of that product will not spread because it cannot thrive according to the demands of stakeholders and target customers. Stakeholders will not engage with products that are difficult to use or disseminate.

Adoption is further challenged by user specific concerns: usability, privacy issues, data

ownership, and lack of trust in technology or its developers (Coughlin et al. 1811). With these concerns in mind we discuss a number of factors influencing technology adoption and offer a number of approaches to advance effective technology adoption practices for assisted living centers and nursing homes. We propose that principles of inclusive design, based on the incorporation of input from all stakeholders and policy streams, offer a valuable approach to developing products and services that enable independent living. Mainly, we are interested in the development of processes that recognize the interdependence of cultural context, public policy, and stakeholder engagement with the goal of maximizing the efficacy and inclusivity of technologies that are applied in living contexts aimed at aging populations from senior retirement communities through assisted living facilities and nursing homes. We present an alternative approach based in four core areas: the engagement of stakeholders, improved design standards, integrated policy streams, and updated privacy policies.

Discussion

Usability Guidelines, Approaches and Policy

One of the greatest barriers to adoption of any new technology is lack of usability (Marchibroda 52). While usability testing is fairly well established, consumer product development, user testing focused on aging adults and those with accessibility needs, is not always performed robustly. Technology that is untested across demographic groups may be too complex for some, hindering usability that could have been developed during the design process with proper user testing policies (de Witte et al. 470). Effective and affordable dissemination of usable technologies places consumers in a better position to benefit from newer technologies.

Privacy Concerns and Trust in Innovation

Of all the digitally related technologies, health and physical monitoring devices carry a

significant potential to keep residents in assisted living and nursing care centers safer and healthier. However, lack of clearly articulated privacy regulations for use of these technology at such centers may pose an immediate risk to the privacy of residents and their families. Establishing a clear understanding of the role of the consumer, caregivers, and families have in controlling and access rights to these technologies is essential to their safety and success (McFadden and Indulska 5). Accessibility and usability extend to the interoperability of a product, ease of setup, and available user guidance for individuals of all populations to utilize the full functionality of a given piece of technology (Moon et al. 3).

At their core, assisted living facilities can include major healthcare components yet boundaries have not been established whereby residents have control over their digital privacy. Significant concerns over data ownership therefore exist. Independent living facilities may gain great benefit as service providers through their use of monitoring data to improve services, understand their market, establish easier communication with outside doctors, and ensure resident safety with less staff interaction. However, if a resident or their family is unaware of how the data are used then poor design decisions result in privacy and ethical concerns. Informed consent is an essential component of rendering health services.

A Solutions Model for Adoption

We propose an inclusive implementation model consisting of four primary approaches to facilitate systems that reduce barriers to adoption, increase knowledge flow, and improve trust in new technologies (Figure 1). Throughout these approaches we suggest that assisted living facilities and nursing home systems should outsource evaluation of technologies assuming that the assessment is conducted across all stakeholders and throughout the design process.

Accessibility Assessment - One of the most efficient methods for evaluating the viability

of a product for use in assisted living and nursing home settings is by employing internal testers to evaluate products throughout the design process rather than waiting for barriers to arise due to premature adoption. In doing so, it is also crucial that the various stakeholders be included in the testing process Small scale and controlled user testing can also be performed to tailor products early in the design process while avoiding premature adoption

Context-Driven Design - One of the key flaws in testing of technologies to be used in assisted living and nursing centers is the lack of in-context design and user-testing. Technology developers ideally should meet the aging consumer where she/he is living in terms of varying health, social needs, and understanding. Evaluating a new technology to be used in these settings thus depends on successful testing not limited to the immediate consumer but also to all those involved in their care and life decisions.

Regulatory Impact - Within the context of aging populations and assisted living facilities, the intersecting needs of the different stakeholders (administrators, support personnel, families, the inhabitants) is not always clear to technology designers or developers. Regulators and policymakers can address this by proactively soliciting input, and aid in collecting, accessing and developing guidelines and approaches to enhance overall usability. This can be accomplished via a variety of regulatory mechanisms. Alternatively, a voluntary standards-based approach could allow more room for innovative design solutions and could be used as part of marketing and outreach efforts. This latter approach, which, on the face of it, provides less protections, might conversely generate novel or more personally tailored solutions.

Testing and Evaluation - Testing of products can be accomplished on a number of levels from small-scale beta testing by residents and families to implementation testing by larger nursing home and assisted living facility networks.

Successful adoption of technologies requires multi-level engagement of stakeholders throughout the process from needs assessment through testing and adoption. Industry and practitioners ideally would jointly develop best training practices across service providers and populations, bridging the gap between designers and users and facilitating testing of products across markets. Educational institutions that develop and design technologies have the ability to prepare stakeholders by providing relevant training resources and transparent information. Training organizations and organizations that serve aging populations (e.g. AARP), can provide ancillary assistance to guide training and disseminate information to help consumers and living centers understand their needs and how to use a given technology. Larger nursing home networks may carry out small-scale beta testing across multiple markets and communities, enabling testing across regions. This type of widespread testing provides relevant information to properly tailor technologies for specific regions, populations, and increase the likelihood of honing technologies prior to dissemination.

Conclusions

Policies updated according to the context of aging populations have the potential to improve the management of chronic disease and improve care through increased access, efficiency, and reduced costs. However, simply making technology more intuitive for users, be they system implementors, or end-users such as older adults, will not improve the overall landscape of usability. It is essential to engage all stakeholders including the user, their families, and care facilities understanding the characteristics of technology use, the context of use, and larger social issues as part of the design/development process. Regulatory, economic, technological, social, and awareness issues impact the development, diffusion, and adoption of technologies. Through policies that encourage accessibility, usability, transparency, and

trustworthy privacy solutions, the adoption of new technologies in assisted living and nursing care centers will have a positive impact on the lives of aging populations and their families

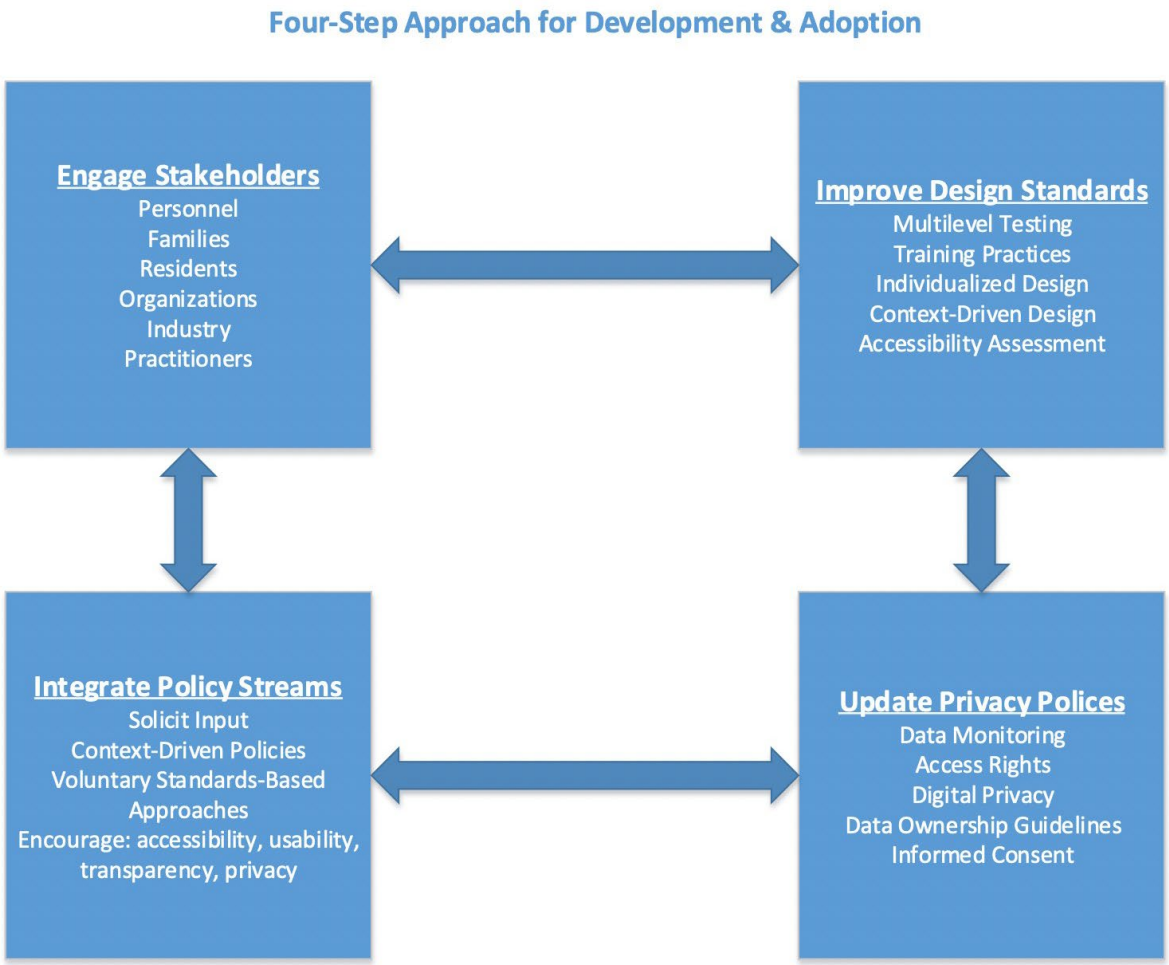

Fig. 1. Diagram outlining proposed inclusive development/adoption model

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