Universal Usability: Healthy-Older Adults

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ABSTRACT

Older adults are rapidly becoming one of the largest user groups for information and communications technologies (ICT). In the near future, demands will be placed on HCI professionals to acknowledge the needs and preferences of this large demographic in ICT design. This report aims to provide a concise introduction to the research area of universal usability for healthy older adults. We present a description of current research methodologies, such as participatory design with seniors. In addition, several application domains are considered, including mobile phone design, web development, and game concept design. The report concludes with potential future work and open questions.

Keywords

healthy older adults, universal usability, participatory design, information and communication technology, mobile technology

INTRODUCTION

In recent years, the number of older adults using information and communication technology (ICT) has grown substantially. This includes the use of mobile phones, or the use of computers to access the internet [6]. Designing ICT for older adults can be challenging due to the heterogeneous nature of this demographic, both in terms of physical ability and in technical familiarity. This introductory section will provide some background information, which will account for some of the key research issues when designing for and with healthy older adults, which is the subject of the next section.

Background

Older adults in developed countries are now living longer and healthier lives than before, with life expectancies projected to continue to rise through to the middle of this century [2]. As a result, by 2050, 21% of the world's population will be over 60 years old [8]. In addition, today's elderly adults enjoy a great degree of independence, and a substantial amount of leisure time [3]. Many of these older adults are also fortunate have large amounts of disposable income, thanks to smart financial planning.

Unfortunately, old age is often accompanied by a gradual loss of physical and mental abilities. Since we will be focusing primarily on universal usability for healthy older adults, those with serious visual, auditory, motor, or cognitive impairments will not be considered in this report.

KEY RESEARCH ISSUES

Gradual or slight degradation of sensory or mental abilities introduces the potential for a large range in technical ability between older ICT users. However it is not the only source in variation between older adults; large differences in familiarity with current technology can also be a significant issue with older users. There is also the question as to what forms of technology older users would find useful and fun. In this section, a sampling of research efforts made to understand the desires and daily struggles of older users will be presented, followed by a discussion of how to get older users involved in the design process. Finally, this section will address the issue of getting attention from industry.

Understanding Older Users

The lifestyle of older adults is difficult to define, as it may vary considerably between individuals. In a design workshop documented by Brewster and Zajicek [2], several key research issues were discussed to help ICT designers ask the right questions when working with older users and when attempting to understand the needs of their lifestyle. These questions included how age-related impairments affect daily life and technology use, how important social inclusion was to older users, and how familiarity with

technology affected learning.

Understanding the lifestyle of older adults may require a bigger picture, one including common interests and problems. Ethnographic research aimed to shed light on the passions of older life was performed by Abeele *et al.* [1] for the purpose of generating game concepts for and with older adults. While the process of creating game concepts and prototypes is described in the next section, we will now concern ourselves with the results of their preliminary research. Older adults were asked to identify their most beloved hobbies, pastimes, and interests, or simply what they felt passionate about in day-to-day life. The researchers discovered that many of the 'passions' fell under three categories: activities that involved connecting with others, activities that involved cultivating knowledge or learning, and activities that contributed to helping others and the community. Connection activities include socializing, attending events, playing games, or visiting family and friends. Cultivation activities include cultural events and practices, travel and taking part in tour groups, attending lectures, classes, and workshops, or reading non-fiction. Finally, contribution activities include volunteering and event planning. While there is a large range in activities between groups of older people, many activities are similar in that they tend to combine aspects of connection, cultivation, and contribution. This is illustrated by Abeele *et al.*'s "Passion model" [1], in which a core activity is supported by these three aspects. While this model was used to influence the process of creating game concepts, it generalizes to all ICT design; as designers of technology for older users, we must ask ourselves if our implementation will satisfy our target user's underlying desires and passions.

While some technology can serve to satisfy desires and interests, other technology can also help older users overcome struggles and worries in their daily lives. Shedding light on these concerns is also a key element in understanding the user. Harley *et al.* [6] may have identified the most prominent concern at a recent CHI workshop on intergenerational communication,

which is threat of social isolation [6]. Loss of loved ones and friends due to death or a lack of mobility is an imminent possibility for older adults. Furthermore, it is now often the case that family members grow geographically distant as a result of economic migration. Often ICT can help mediate this issue, and yet many older adults are wary of technology due to a lack of familiarity, or they have underlying worry or fear [4], such as concerns regarding radiation emanating from mobile devices.

Involving Older Users in ICT Design

While understanding the desires and concerns of older adults is vital to the design of senior-targeted ICT, actually involving older users in the design process can yield beneficial and sometimes surprising results.

Participatory Design

While participatory design originated to facilitate the development of expert-user technology, the process has also been applied in the context of ICT for older adults. A major research issue involves defining a methodology for successfully involving elderly participants. In an effort to involve seniors in the design of mobile phones, Massimi *et al.* [8] documented several considerations for participatory activities with older adults. These considerations include:

- Providing alternate activities alongside primary activities;

- Allowing sub-groups to form during activities such that individual deficits (in ability or familiarity) are leveled out;

- Providing a rigid activity structure;

- Maintaining an appropriate pace throughout activities (based on the abilities and technical familiarity of the group);

- Minimizing cross-talk during discussions (some individuals may have auditory impairments);

- Mixing individual and group activity sessions;

They also recommended seeking participants

through existing organizations, such as community groups, social clubs, day centers, church groups, or senior housing projects. It is also a good practice to maintain a good social relationship with older users, such as by paying seasonal visits, or by sending newsletters containing updates regarding the status of the research project.

Mutual Inspiration

A design process which is more general than participatory design is the concept of mutual inspiration, which was pioneered by Eisma *et al.* [4]. Mutual inspiration also involves older users early in the technology design process. Activities are carried out in a focus-group setting, in which discussion was encouraged, especially with regard to worries, fears, and familiarity concerns with existing technology. A goal of mutual inspiration was to make older users aware of the potential of technology and inspire them to elicit further design ideas. The activities were structured such that a common ground was established between participants, which served to build confidence and foster peer support. Furthermore, many hands-on activities are encouraged, in which participants explore existing or prototyped devices. This relaxed atmosphere can elicit excellent feedback from participants, especially pertaining to difficulties experienced or enjoyment had while using technology. In brief, while mutual inspiration is usually less structured and on a smaller scale than participatory design, it provokes creative thinking and user-facilitated innovation.

Convincing the ICT Industry

The previous section illustrated the importance of gaining an understanding of the desires and concerns of older potential ICT users, and demonstrated the potential for involving older users in participatory design processes. Despite these advances and a growing older demographic, consumer ICT devices are rarely designed with older users in mind.

In a series of seminars prepared for ICT industry organizations in the UK, Eisma *et al.* [5] hoped to convey the usefulness of working with older target users and their early involvement. Industry attendance and response was disappointing, with those in attendance claiming that they were generally reluctant to designing for an older demographic. It was revealed that the older demographic was typically treated as a homogeneous group; with the potential for immense variability in physical ability and technical familiarity between older adults, having this perspective is an error on the part of industry. Despite these and other efforts to promote working with older adults, making and impact on industry practices remains an open research issue.

ACTIVE RESEARCH AREAS

Work in the following research areas demonstrates the value of understanding prospective older ICT users, in terms of their desires and concerns. Examples are given which demonstrate ways to include older adults in the design process.

Mobile Communication

Designing 'senior-friendly' mobile phones runs the risk of creating interfaces that are too oversimplified or make use of re-purposed hardware. Some phone designs focus on a single type of impairment, such as diminished sensorimotor skills or dementia. These examples stress the importance of acknowledging the heterogeneous nature of this demographic, and to design devices accordingly.

Massimi *et al.* [8] carried out a participatory design project for mobile phones with senior volunteers. Several hands-on guided activities were carried out in order to perform needs analysis, requirement engineering, and paper prototyping. Critique of existing mobile phone interfaces included comments on form factor, interaction styles, aesthetics, and undesirable features. These activities resulted in a list of considerations for hardware and software design. Hardware considerations included the use of large buttons, including a clearly-marked home state button, and no buttons on the side or rear of the device. Furthermore, devices should have a large bright screen, an appropriate grip and weight, hearing aid compatibility, allow for several input

modalities, and make use of a jog-wheel selection mechanism (rather than directional buttons). Additionally, slide-out components should be avoided: "candy-bar" or "clamshell" devices were preferred. As per software and interaction considerations, soft keys were discouraged, as were modifier keys. Naming conventions should also be given careful consideration due to a range of familiarity with technical terms.

Unfortunately, these considerations are not as concrete as design guidelines, due to the small group of volunteers used in these activities, so they may not generalize well to the larger population of older adults. Nevertheless, such considerations should be acknowledged in the design of mobile devices.

Web Development
Older adults are the fastest growing user group on the internet [6]. Socialization, special interest groups, personal finance management, online shopping, and news sites are some of the reasons behind this shift. Kurniawan and Zaphiris [7] have developed a set of design guidelines for web sites that take into account older users. This was done by accumulating guidelines from previous studies, merging and categorizing them, testing their effectiveness by means of heuristic evaluation, and finally reviewing them with older adult volunteers. This process resulted in web design 38 guidelines under 11 categories, ranging from the display of text and graphics to content layout. Of course, this effort also runs the risk of not generalizing well, due to a small number of older adult evaluators.

Alternative ways for older adults to browse the internet have included using voice input and output interfaces. Zajicek [9] performed research to develop voice-feedback web kiosks for older adults, with an emphasis on the creation of a set of considerations for interaction dialogues. These considerations generalized to a pattern language for ICT devices requiring a range of dialogue patterns.

Game Design
While older adults may be a non-traditional player group in terms of computer games, many older adults enjoy playing games in a general sense. Abeele *et al.* [1] explored the potential for computer games with this user group. Ethnographic research generated the "Passion model" (see above), which was used as the basis for participatory design activities and successfully resulted in the generation of original game concepts and paper prototypes.

FUTURE WORK
Results from working with older adults in the application domains discussed above may not generalize due to small population samples. Further work with large, heterogeneous groups of older adults is necessary to generate consistent and appropriate guidelines for mobile device, web, and game design.

A currently active research area within user-centered design for older users is intergenerational communication. The goal of this technology is to alleviate the pains of social isolation, described above. A workshop at CHI 2009 was held to discuss the types of interactions that currently exist, social issues and possible generational stereotypes that factor into design, as well as accessibility issues. Harley *et al.* [6] summarized these discussions and posed several questions pertaining to how we should design, evaluate, and use intergenerational communication technology.

CONCLUSION
This report introduced the topic of universal usability with respect to healthy older adults. The large amount of variability within this demographic in terms of user ability and product requirements places a demand on HCI professionals to form unique approaches to working with users, thus rethinking traditional user-centered design practices. This report presented considerations and guidelines for mobile device design, web development, and game concept design, which were derived from working directly with older adults. Also discussed were implications for future work and the problem of making the ICT industry aware of this growing demographic, and how to involve them in the design of new products.

REFERENCES

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(3) Dix, A., Finlay, J., Abowd, G. D., & Beale, R. *Human-Computer Interaction (3 ed.)*. Pearson Education Limited (2004), Essex, UK, 390-391.
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This workshop was dedicated to exploring the opportunities and obstacles faced for the design of intergenerational communication. Poses questions as a means to define the current state-of-the-art and what design/accessibility/social issues factor into design for ICT.

(7) Kurniawan, S. & Zaphiris, P. Research-derived web design guidelines for older people. *Proc. ASSETS 2005*, ACM Press (2005), 129-135.
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(8) Massimi, M., Baecker, R. M., & Wu, M. Using Participatory Design with Seniors to Critique, Build, and Evaluate Mobile Phones. *Proc. ASSETS'07*, ACM Press (2007), 155-162.
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(9) Zajicek, M. Successful and available: interface design exemplars for older users. *Interacting with Computers 16*, 16, (2004), 411–430.
This paper discusses the usefulness of a pattern language in interaction design for older users, with an case study in the domain of voice input/output web kiosk. Generalizes to all interfaces used by older users.