Guest Editorial Preface

Special Issue on Reimagining Interfaces for Older Adults

Emma Nicol, University of Strathclyde, Glasgow, UK

Mark D Dunlop, University of Strathclyde, Glasgow, UK

Jutta Treviranus, OCAD University, Toronto, Ontario, Canada

According to the Population Reference Bureau: "The world's population is growing and aging. Very low birth rates in developed countries, coupled with birth rate declines in most developing countries, are projected to increase the population ages 65 and over to the point in 2050 when it will be 2.5 times that of the population ages 0-4. This is an exact reversal of the situation in 1950." (Haub 2011). In parallel, recent years have seen mobile technologies having a massive impact on work and social life, for example in May 2014 ComScore estimated that 60% of total digital media time was spent on mobile platforms (Lipsman 2014). Older adults should not be disadvantaged in using mobile technologies for professional, social and lifestyle usage as, increasingly, these are central to supporting work, domestic administration, community involvement and personal independence.

Unfortunately, natural ageing processes can interfere with mobile technology usage. The normal ageing process typically involves a decline in visual and auditory abilities together with a decline in working memory, selective attention, and motor control (Fisk et al. 2012). For example, many people in their 40s start to have vision changes that affect their near focus while movement can be both slower and less accurate from the mid-60s onwards (Fisk et al. 2012). Many of the physical features of mobile devices are not accommodating of these changing physical characteristics. It has also been highlighted that many older adults will experience problems with small buttons that have poor feedback, complex menu structures, overall device size and difficulty in reading small on-screen text (Kurniawan 2008) – all common features of the most widely available mobile devices. Where input is concerned, older people have been shown to be slower in text entry studies (Wright et al. 2000) and studies with older adults have shown concerns about "fat fingers" (Siek, Rogers, and Connelly 2005) since the early days of personal digital assistants (PDAs).

The physical design issues are compounded by differences between older and younger adults in their approach to using mobile devices: for example, even in pre-smartphone interaction it was identified that older adults appeared less tolerant of the trial-and-error searching style for mobile interfaces (Ziefle and Bay 2005). Furthermore, older adults do appear to be more concerned about appropriate social usage of mobiles and can be more passive in their usage of mobile technologies than younger adults (e.g. (Kurniawan 2008)). However, when carefully designed with suitable

personalisation, mobile interfaces can be more beneficial to older adults (e.g. in pedestrian navigation studies (Goodman, Brewster, and Gray 2005)).

These differences in interaction possibility and flexibility, social behaviour and attitudes are further exacerbated due to the focus of both research and product development on younger adults (Gregor, Newell, and Zajicek 2002) – the young adult market is the main target for manufacturers and the easiest group to recruit for research studies (Dickinson, Arnott, and Prior 2007). This can lead to products that have been designed without the desires, requirements and different abilities/attitudes of older adults being taken into account. With growing usage of smartphones by older adults, e.g. the U.S.A. saw 31% relative increase in smartphone usage by those aged 65+, outstripping all other age groups (Lipsman 2015), but still at levels lower than other groups, it is becoming more important to address the needs of older adults in mass market smartphone design. This is further compounded by the lack of open interoperability standards in mobile devices. Accessibility standards that benefit older adults, developed for the Web and computer platforms, do not easily transfer to mobile systems.

To start addressing these issues within the MobileHCI community, we ran a workshop at MobileHCI 2014 in Toronto (Nicol et al. 2014). The workshop brought together researchers who are re-imagining common mobile interfaces so that they are more suited to use by older adults. This special issue of the *International Journal of Mobile Human Computer Interaction* stems from that workshop and a subsequent open call for papers.

MOBILEHCI 2014 WORKSHOP ON RE-IMAGINING COMMONLY USED MOBILE INTERFACES FOR OLDER ADULTS

The workshop was organised by Emma Nicol, Marilyn McGee-Lennon and Mark Dunlop from University of Strathclyde in Scotland, together with Lynne Baillie (now at Heriot Watt University), Lilit Hakobyan (Aston University) and Katie Siek (Indiana University Bloomington). Six papers were presented at the workshop and all were reviewed by the workshop programme committee. It is intended that these papers will eventually be made available in an online archive for use by the research community.

The workshop opened with a keynote from Jutta Treviranus, Director of the Inclusive Design Research Centre (IDRC) Toronto, on her work in design for diversity (e.g. (Treviranus 2014)) and concluded with a tour of the IDRC facilities. In her keynote address, Jutta highlighted that speaking of "older adults" as a single group is actually very misleading – as we go through our lives we have different learning experiences, different skills, different levels of physical activity and different health incidents. All of these lead to a glorious diversity amongst older adults in experience and physical abilities: there is no more diverse a population than older adults. Rather than designing for older adults as a stereotyped block we need to develop designs that respond to diversity. As stated by Gregor et al in their work on designing for dynamic diversity: "*Older people* encompass an incredibly diverse group of users, and even small subsets of this group tend to have a greater diversity of functionally than is found in group of younger people" (Gregor, Newell, and Zajicek 2002).Even though many of the effects of ageing affect us all, this diversity makes designing for older adults particularly challenging.

We organised the workshop around three themes: user centred design with older adults, interaction techniques and deployment / context. The papers in this special issue focus on the first theme of the workshop: user-centred design for older adults as an approach to bringing insights into real desires and usage of older adults into the design and evaluation of commonly used mobile interfaces. The papers included in this special issue cover a wide range of approaches, but are all centred around user-centred design with older adults.

As part of a co-design process, technology probes are a key tool in understanding the needs and desires of users in a real-world setting, field-testing new technologies, and inspiring users and researchers. (Hutchinson et al. 2003). As part of a one-year study on supporting communication through photo sharing for older adults, the paper *Making Space to Engage: An Open-ended Exploration of Technology Design with Older Adults* by Güldenpfennig et al argues that "older adults might particularly benefit from the deployment of Technology Probes, because they make future scenarios sketched in technology more 'tangible', enabling older people to provide feedback that will ensure a technology is used in everyday life." Furthermore, they conclude that including technology probes in a Research through Design process might improve the design and adoption of technology by older people.

The paper *A Participatory Design and Formal Study Investigation into Mobile Text Entry for older Adults* by Nicol et al made use of related cultural probes (Gaver, Dunne, and Pacenti 1999) as part of a series of tools in a co-design process on touch-screen text entry for mobiles – a particularly challenging area given the inherent requirement for small close together keyboard buttons. This paper also made use of focus groups, paper prototyping and formal laboratory studies with working prototypes. The paper reflects on differences between older and younger adults for text entry and for study design. As discussed above, older adults are a very diverse category of users. This research focussed on mobile older adults, typically just post-retirement, who attended meetings on a university campus.

The paper *Attitudes Towards Attention and Ageing: What Differences Between Younger and Older Adults Tell Us About Mobile Technology Design* by Jenkins et al addresses the widely overlooked issue of attention-related differences between the typically young developers and designers of systems and their older users. This is a particular issue for mobile devices as they are largely intended to be used in environments where attention has to be divided between real-world and device-world. The authors conducted focus groups with older and younger adults with three major themes emerging of 'personal understanding of attention', 'attention is dependent on...' and 'impact of ageing'. One outcome strongly supporting co-design is that they found that, typically young, designers might be "prone to develop interfaces that demand their user's attention whereas, in contrast, older adults would place value on having the ability to ignore their devices".

In the paper *Let's Spend Time Together: Exploring the Out-of-Box Experience of Technology for Older Adults* by Burrows et al the focus is on how older people acquire, unpack and set up new technology and the role that other people play in those processes. The authors describe their experiences of two exploratory studies using design ethnography to understand how this acquisition and unpacking takes place. Their research focused on user experience in the home environment and in doing so, followed a rather more holistic approach than is often taken where the design of technology for ageing is concerned. They conclude that older people experience varying benefits from the input of others in these out-of-box situations.

In the paper *Understanding the Challenges and Opportunities of Smart Mobile Devices among the Oldest Old* by Piper et al, the researchers focussed on individuals age 80+ in an assisted and independent living facility. This paper presents a qualitative study describing the challenges presented by and opportunities afforded by commercially available smart phones for this group using a mixture of field observations and semi-structured interviews. The work highlights that often this group receive technology from family with consequences for the expectations of use and on-going technological support, often by relatives. Amongst other lessons, they conclude that directly acknowledging intergenerational support would be beneficial in mobile design.

FOLLOW UP WORKSHOP

Following on from the workshop in 2014 we ran a workshop at MobileHCI 2015 on *Designing with Older Adults: Towards a Complete Methodology*. This workshop widened the discussion – especially around the diversity of older adults, with a keynote from Anne Marie Kanstrup on her work in care homes (e.g. (Kanstrup and Bygholm 2015)) and on a living lab study of supporting a wide age-range of people with diabetes (Kanstrup, Bjerge, and Kristensen 2010). The workshop also included papers reflecting on how to conduct usability evaluation with older adults (Franz et al. 2015), use of cultural probes (Burrows, Mitchell, and Nicolle 2015), co-design (Malmborg et al. 2015), navigation aid design (Rassmus-Gröhn, Magnusson, and Hedlund 2015), mobile learning (Reithinger, Russ, and Schumacher 2015) and cognitive training (Votis et al. 2015).

Taking the research theme and workshop series forward we are currently forming a steering committee to oversee the workshop series – more details at http://www.olderadults.mobi/

CONCLUSION

Designing mobile systems that will be used by older adults is critical in maintaining agency and reducing isolation but can be challenging for many reasons: while many effects of ageing affect us all there is great diversity amongst older adults in their abilities, attitudes and experiences. Our workshops have shown that, if designed to consider both the general trends as we age and the diversity of individuals; and by engaging older adults in co-design procedures, older adults will make greater use of mobile devices. It is anticipated that the move toward more diversity-supportive designs (and design processes) will benefit users of all ages.

Emma Nicol
Mark D. Dunlop
Jutta Treviranus
Guest Editors
IJMHCI

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REFERENCES

Burrows, A., Mitchell, V., & Nicolle, C. (2015). Cultural Probes and Levels of Creativity. *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services AdjunctMobileHCI '15* (pp. 920–23). New York, NY, USA: ACM. doi:10.1145/2786567.2794302

Dickinson, A., Arnott, J., & Prior, S. (2007). Methods for Human–computer Interaction Research with Older People. *Behaviour & Information Technology*, *26*(4), 343–352. doi:10.1080/01449290601176948

Fisk, A.D., Rogers, W.A., Charness, N., Czaja, S.J., & Sharit. J. (2012). Designing for Older Adults: Principles and Creative Human Factors Approaches. CRC press.

Franz, R. L., Munteanu, C., Neves, B. B., & Baecker, R. (2015). Time to Retire Old Methodologies? Reflecting on Conducting Usability Evaluations with Older Adults *(pp. 912–915)*. ACM. doi:10.1145/2786567.2794303

Gaver, B., Dunne, T., & Pacenti, E. (1999). Design: Cultural Probes. *Interaction*, *6*(1), 21–29. doi:10.1145/291224.291235

Goodman, J., Brewster, S. A., & Gray, P. (2005). How Can We Best Use Landmarks to Support Older People in Navigation? *Behaviour & Information Technology*, *24*(1), 3–20. doi:10.1080/01449290512331319021

Gregor, P., Newell, A. F., & Zajicek, M. (2002). Designing for Dynamic Diversity: Interfaces for Older People. *Proceedings of the Fifth International ACM Conference on Assistive TechnologiesAssets '02* (pp. 151–156). New York, NY, USA: ACM. doi:10.1145/638249.638277

Haub, C. (2011). World Population Aging: Clocks Illustrate Growth in Population Under Age 5 and Over Age 65. *Population Reference Bureau.* Retrieved from http://www.prb.org/Publications/Articles/2011/agingpopulationclocks.aspx

Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B. B., Druin, A., & Plaisant, C. et al.. (2003). Technology Probes: Inspiring Design for and with Families.*Proceedings of the SIGCHI Conference on Human Factors in Computing SystemsCHI '03* (pp. 17–24). New York, NY, USA: ACM. doi:10.1145/642611.642616

Kanstrup, A. M., Bjerge, K., & Kristensen, J. E. (2010). A Living Laboratory Exploring Mobile Support for Everyday Life with Diabetes. *Wireless Personal Communications*, *53*(3), 395–408. doi:10.1007/s11277-010-9953-3

Kanstrup, A. M., & Bygholm, A. (2015). Monitoring Technology Meets Care Work: Challenges of Monitoring Wet-Beds in a Nursing Home. *Techno-Anthropology in Health Informatics: Methodologies for Improving Human-Technology Relations*, *215*, 157. PMID:26249194

Kurniawan, S. (2008). Older People and Mobile Phones: A Multi-Method Investigation. *International Journal of Human-Computer Studies*, *66*(12), 889–901. doi:10.1016/j.ijhcs.2008.03.002

Lipsman, A. (2014). Major Mobile Milestones in May: Apps Now Drive Half of All Time Spent on Digital. *ComScore.* Retrieved from http://www.comscore.com/Insights/Blog/Major-Mobile-Milestones-in-May-Apps-Now-Drive-Half-of-All-Time-Spent-on-Digital

Lipsman, A. (2015). Teens & Older Demos Driving Gains in U.S. Smartphone Penetration. *ComScore*. Retrieved from https://www.comscore.com/Insights/Blog/Teens-Older-Demos-Driving-Gains-in-U.S.-Smartphone-Penetration

Malmborg, L., Werner, K., Grönvall, E., Messeter, J., & Raben, T. (2015). Mobilizing Senior Citizens in Co-Design Work *(pp. 916–19)*. ACM. doi:10.1145/2786567.2794304

Nicol, E., Lumsden, J., Mulder, I., Rau, P., Siek, K., Dunlop, M., . . . Hakobyan, L. (2014). Re-Imagining Commonly Used Mobile Interfaces for Older Adults. *Proceedings of the 16th International Conference on Human-Computer Interaction with Mobile Devices Services* MobileHCI '14 (pp. 585–588). New York, NY, USA: ACM. doi:10.1145/2628363.2634261

Rassmus-Gröhn, K., Magnusson, C., & Hedlund, A. (2015). Involvement of End Users in a Navigation Aid Design Project ACM. doi:10.1145/2786567.2794306

Reithinger, N., Ruß, A., & Schumacher, K. (2015). User-Centered Interaction Design of a Mobile Learning Platform for the Generation 60 &Plus. *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct* MobileHCI '15 (pp. 924–927). New York, NY, USA: ACM. doi:10.1145/2786567.2794305

Siek, K. A., Rogers, Y., & Connelly, K. H. (2005). Fat Finger Worries: How Older and Younger Users Physically Interact with PDAs. *Proceedings of the 2005 IFIP TC13 International Conference on Human-Computer Interaction* INTERACT'05 (pp. 267–280). Berlin, Heidelberg: Springer-Verlag. doi:10.1007/11555261_24

Treviranus, J. (2014). *Leveraging the Web as a Platform for Economic Inclusion. Behavioral Sciences and the Law*. Wiley. doi:10.1002/bsl.2105

Votis, K., Giakoumis, D., Vasileiadis, M., Doumpoulakis, S., Segkoyli, S., & Tzovaras, D. (2015). Mobile Cognitive Training Games for Older Adults with Mild Cognitive Impairment *(pp. 932–35)*. ACM. doi:10.1145/2786567.2794307

Wright, P., Bartram, C., Rogers, N., Emslie, H., Evans, J., Wilson, B., & Belt, S. (2000). Text Entry on Handheld Computers by Older Users. *Ergonomics*, *43*(6), 702–716. doi:10.1080/001401300404689 PMID:10902881

Ziefle, M., & Bay, S. (2005). How Older Adults Meet Complexity: Aging Effects on the Usability of Different Mobile Phones. *Behaviour & Information Technology*, *24*(5), 375–389. doi:10.1080/0144929042000320009