Designing inclusive interactions

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The Cambridge Workshops on Universal Access and Assistive Technology (CWUAAT) are a series of workshops held at a Cambridge University College every 2 years. This Special Issue entitled “DESIGNING INCLUSIVE INTERACTIONS” comes from the 5th in this series of highly successful events. CWUAAT ‘10 was the latest of a workshop series started in 2002 that represents research in the international inclusive design community. It was a unique multi-disciplinary workshop, where designers, computer scientists, engineers, architects, ergonomists, policymakers and user communities were encouraged to meet and interact together.

In the context of a world where developing demographic changes are leading to greater numbers of older people and people with disabilities, the general field of inclusive design research strives to relate the quantified capabilities of the population to the design of products. Inclusive populations of older people contain a greater variation in sensory, cognitive and physical user capabilities. These variations may be co-occurring and rapidly changing, thus leading to a demanding design environment. Inclusive Design Research involves developing methods, technologies, tools, and guidance for supporting product designers and architects to design for the widest possible population for a given range of capabilities, within a contemporary social and economic context.

This UAIS special issue contains a selection of papers that have been extended and developed from their original contributions presented at the workshop. The workshop

theme, *Designing Inclusive Interactions*, responds to the recent changes in the research landscapes in the fields of Human Computer Interaction, Computer Science, and Engineering and Healthcare as a result of new technology and innovation. As it is evidenced by the themes of previous CWUAAT conferences, such as “Designing Inclusive Futures” (2008), Inclusive Design already brings together many of these disciplines within a context of ageing and disability. This leads us directly to the focus of the workshop on “*Inclusive interactions between people and products in their contexts of use.*”

Research into accessibility for interface design has always represented an unconventional, multi-disciplinary arena, indicating the necessity to bring together a number of pragmatic disciplines, such as assistive technology, mechanical and electrical systems design, computer interface design, and medical and rehabilitation practice. It has moved from isolated activities in disparate fields, such as engineering, occupational therapy and computer science, to the more inter-disciplinary perspective evident today in areas such as architecture and inclusive design. As a result, there is now, firstly, a need for the transfer of knowledge and techniques from inclusive design research into the HCI community; and secondly, there is also a requirement for research that can relate complex interactions with a product to inclusion. Combining the study of interaction with an inclusive approach to user-centred design will form a novel and useful inter-disciplinary framework for investigating and improving interaction with today’s product designs.

The papers included in this Special Issue show that the boundaries between traditional fields are blurring. Researchers are increasingly addressing Inclusion in Architecture, public policy, the built environment, and Healthcare.

The papers in this Special Issue address the following main themes from the workshop:

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- I. **Understanding Users for Inclusive Design** concerns research that addresses the nature of inclusive performance, such as the effect of environmental context on capability in interaction; (*Biswas and Robinson; Elton and Nicolle*).
- II. **Measuring Inclusion** focuses on the quantification of impaired capability and tools and methods to measure inclusion; (*Waller et al.*).
- III. **Inclusive Interaction** looks at research that brings together interface design and theory, with inclusive capability requirements; (*Mieczakowski et al; Hurtienne et al.*).
- IV. **Assistive Technology** is about the relationship of inclusive design to special purpose design and adaptations for specific impairments; (*Al Mahmud et al.; Wentz et al.*).

The first paper in this issue is The Cluster Scanning System by *Pradipta Biswas and Peter Robinson*. This paper represents novel thinking in the assistive technology field, as it shows how the effectiveness of simple single switch key scanning systems for the motion-impaired computer user could be extended by using fuzzy c-means algorithm for clustering of visual display elements such as screen buttons and interactive entities. The approach is tested alongside other scanning systems through a user simulation developed by the authors. The system is then validated experimentally with motor-impaired users, demonstrating both the superiority of the cluster scanning approach and the value of the impairment interaction simulator at the same time.

Allowing for the effects of environmental context on the assessments of product demand is critical to designing inclusive products for everyday environments. This may be, for example, as part of the drive to quantify user exclusion during product auditing based on an analytical inclusive design approach. The Designing inclusive products for everyday environments: The effects of everyday cold temperatures on older adults' dexterity by *Eddy Elton and Collette Nicolle* shows how a realistic European cold environment of 5 degrees Celsius can affect dexterity in older people on a number of conventional ergonomic and real-world tests of performance. This is in contrast to older normative Human Factors data.

In order to quantify the levels of ability loss that can be accommodated by product designs, product demand has to be assessed in terms of user's functional capabilities. In turn, this requires a suitable data set of functional capability measures across a representative population. Just such a data set is the basis of work reported in Visualising the number of people who cannot perform tasks related to product interaction by *Sam Waller, Mike Bradley, Pat Langdon and John Clarkson*.

This work painstakingly re-analyses the question items and scales data from respondents in a UK national survey of disability made in 1997, and creates new ordinal functional scales such as dexterity, memory, visual acuity, hearing, and walking that have utility in quantifying demand for specific product–task interactions.

Interacting with a product requires particular cognitive capabilities, including some sort of symbolic or internal representation of the product interaction. Such a representation has been likened to a mental model. The approach taken in the paper by *Anna Mieczakowski, Pat Langdon and John Clarkson* in Investigating Designers' and Users' Cognitive Representations of Products to Assist Inclusive Interaction Design has been to concentrate on the content of designers' and users' internal representations of product interactions and focus on ways of identifying overlap between them. This paper reports a factor analysis of designers' constructs extracted using qualitative methods from collated interview data.

Jörn Hurtienne, Anne-Marie Horn, Pat Langdon and John Clarkson explore the basis of technology experience and in what ways prior experience can affect interaction with technology products. In Facets of Prior Experience and the Effectiveness of Inclusive Design, they report an experimental study of the relationship between constructs of usability and prior exposure, competence and experience specificity, with a sample of elderly product users using ticket vending machines. The authors demonstrate that competence with the same or similar products may be more predictive of usability than prior exposure measures.

A good example of a paper falling easily into the category of assistive technology is Expressing through Digital Photographs: an Assistive Tool for Persons with Aphasia by *Abdullah. Al Mahmud, Yvette Limpens and Jean-Bernard Martens*. The acquired communication disorder of aphasia affects language production and understanding, leaving many people dependent on Augmentative Alternative Communication devices (AAC) for normal living. The authors discuss the development of new software using non-aphasics participants that promotes co-creation: enabling the user to annotate clustered photographs of their daily activities with time, place and narrative information without excessive cognitive load.

Finally, an important class of papers is represented by A Survey of Blind Users on the Usability of Email Applications by *Brian Wentz, Harry Hochheiser and Jonathan Lazar*. This is work that lies on the border of assistive technology but addresses issues that are central to Universal Access and the Information Society. The authors' make the case that email applications are still predominantly designed for sighted users. Despite being critical for users' participation in society, very little effort is currently made to ensure such applications are useable by the visually

impaired. This work describes a survey that brings e-mail usability into the growing set of previous studies from these authors challenging the barriers and obstacles presented by existing solutions for the visually impaired. The results illuminate the importance of calendar and contact functions and demonstrate the need for a move towards truly inclusive mainstream interactive applications.

The papers that have been included in the Special Issue were selected through peer review carried out by an international panel of currently active researchers and by reviewers for the UAIS Journal. They represent an edited sample of current national and international research in the fields of inclusive design, universal access, and assistive and rehabilitative technology. The Guest Editors wish to thank the authors and reviewers who contributed to this Special Issue. This includes reviewers for UAIS and the Editor-in-Chief. This special issue contains only a small subset of original contributions developed from the CWUAAT 2010 workshop. The remaining papers that address other workshop themes, less immediately relevant to UAIS, can be found in the book “DESIGNING INCLUSIVE INTERACTIONS” edited by Pat Langdon, John Clarkson and Peter Robinson, published by Springer.

The CWUAAT Editorial Committee
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