

## Designing inclusive futures

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The Cambridge Workshop on Universal Access and Assistive Technology (CWUAAT), held at Fitzwilliam College, Cambridge in April 2008, was the fourth of a series of workshops that are held every two years. This UAIS Special Issue contains a selection of papers that have been extended and developed from their original contributions presented at the workshop. The theme “Designing Inclusive Futures” reflects the need to explore, in a coherent way, the issues and practicalities that lie behind design that is intended to extend future active life. This encompasses design for inclusion in daily life at home, but also extends to the workplace, leisure activities, and products that are used within these contexts.

The philosophy underlying inclusive design extends the definition of product users to include the elderly and disabled and others who are excluded by new developments in technology. It emphasises the role and value of extreme users in innovation and new product and service development. It also addresses the physical, social and psychological context of use and fosters the understanding of the complexity of inclusive interactions between products, services and interfaces in specific scenarios, such as those of independent living.

Since the inception of the current CWUAAT series in 2002, the scope and specific areas of focus of the workshops have changed, reflecting new directions in both the social and research context. From the start, research in inclusive 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 practise. Hence, it has moved from isolated activities in disparate fields, such as engineering, occupational therapy and computer science, that were incorporated in the first workshop theme, “Universal Access and Assistive Technology”, via the specific integrating themes of “Designing a More Inclusive World” and “Designing Accessible Technology”, to the more unified and holistic perspective evident in the present theme, “Designing Inclusive Futures”. In the context of inclusive design, this reflects the development of theory, tools and techniques as research moves on, and also the need to draw in wider psychological, social and economic considerations in order to gain a more accurate understanding of user interactions with products and technology.

Two consequences of this are evident. First, there is increased emphasis on the transfer of mature knowledge and techniques from inclusive design research into the wider academic and industrial community as research programmes mature; and secondly, there is a requirement for connected thinking that can relate multi-product and multiple sequences of actions with a product to inclusive design principles for tasks or activities in a variety of social settings and contexts. Hence, the prior experience a potential user brings to a product interaction, their social background and corresponding attitudes, may be as important as their cognitive, perceptual and movement capabilities for their ability to use satisfactorily a specific design. Similar trends are now identifiable in mainstream HCI and interaction research, where it is now no longer sufficient to investigate user modelling or develop usability guidance for specific technology interfaces, but where researchers must, by necessity, take up the challenge of pervasive integration of computer technology with the

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wider social, psychological and design worlds, such as healthcare or mobile systems (Yvonne Rogers, BCS-HCI 2008; <http://www.hci2008.org>, December 2008).

Reflecting these issues, the papers included in this Special Issue of UAIS have been specifically selected to address the intersection of particular themes of Universal Access and Information Society Technologies and those of Designing Inclusive Futures. They reflect current research into the means for increasing the accessibility, usability and desirability of products such as jars DAB radios, auditoriums and mobile devices, and the ways in which they can be designed better to accommodate the wider population. In particular, papers in this Special Issue address the following:

- *Inclusive Design*: focusing on the identification and provision of data about user capabilities and the theory of methods of understanding and reducing product demand for designers (Waller et al.; Langdon et al.).
- *Computer access and new technologies for Inclusive Design*: looking at research into ICT Accessibility and new technology for inclusion, demonstrating that these are priority focus areas for policy and innovation (Baker and Moon et al.; Sauer et al.).
- *Designing Assistive and Rehabilitation Technology for Working and Daily Living Environments*: focusing on the research frontiers of special purpose design and adaptations for specific impairments (Orpwood et al.; Bates et al.).
- *Inclusive Environments and the Context of Product Use*: examining the environmental and physical context of inclusive interaction and encompassing architecture and the technology of products for daily living (Yoxall et al.; Heylighen et al.).

The first paper in this issue, “Using disability data to estimate design exclusion” by Waller et al., examines in detail the data requirements of the process of exclusion auditing and how they may be satisfied. Intended as a method for quantitatively evaluating the inclusive merit of different products or alternative design decisions as part of an exclusion audit, this process uses a specific data set from survey data that is considered the most comprehensive for assessing design exclusion in the UK. The data set, its origins, and the methods devised for calculating design exclusion are examined, and a number of visualisation approaches for the resulting levels of population exclusion are examined with the aid of worked examples.

Following previous work on cars and digital cameras, addressing the extent to which prior experience of a product affects its use, Langdon et al., in their paper entitled “Prior Experience in the Use of Domestic Product Interfaces” examine the role of specific aspects of prior experience on people’s performance, and its relationship to

age and cognitive capability, with daily living products such as DAB radios. Using a training transfer paradigm to equalise levels of experience, they examine the effects of specific product features differences on times to complete common tasks and frequency of errors. Their findings suggest that despite rapid training, performance was hampered by misapplication of sequences learnt with the training radio and reliance on means-end-analysis for use of the test interface. This was also consistent with a general reduction of performance and learning ability with increasing age and or reduced cognitive capability.

Both these papers aim to increase the understanding of the product features that are most significant to designers in reducing exclusion, and how they may be changed to reduce difficulty in interaction for different ranges of cognitive, physical and perceptual capabilities.

Baker and Moon, in their paper entitled “Policy Development and Access to Wireless Technologies for People with Disabilities: Results of Policy Delphi Research” look at the relationship between policy research and policy change in the issues of access to wireless communication technologies by people with disabilities. Using a Delphi methodology, they examined key stakeholders opinions and established a set of significant policy issues and interventions that are likely to improve access to communications technologies. For example, retailer awareness about the accessibility features of their products and an ability to demonstrate these features and help customers with disabilities select the best products for their needs, emerged as an important issue to be addressed through policy.

Privacy and security in the use of Information Society Technologies can present considerable barriers to users with disabilities. In particular, the visually impaired have difficulty with the use of visual word identification puzzles to identify real human interactions. Sauer et al., in their paper entitled “Accessible Privacy and Security: A Universally Usable Human-Interaction Proof” look at the effectiveness of an auditory alternative and discovered that both visually and non-visually impaired users preferred a combined auditory-visual modality approach.

In the context of studying the “Design of assistive and rehabilitation technology”, Orpwood and colleagues in their paper “Designing Technology to Improve Quality of Life for People with Dementia: User-led approaches” discuss the potential role of technology to support people with dementia, now considered a form of disability. A series of initial user surveys focussing on quality of life, rather than safety or security, led to many specific design alternatives, a number of which were successfully developed to prototype. For example, a text and voice prompting approach proved to be more effective in supporting sequences of actions necessary to make a cup of tea, than

video of photographic cues and could be implemented using a “next-step” button.

In the sixth paper, entitled “Gaze Interaction with Virtual On-Line Communities: Levelling the Playing Field for Disabled Users”, Bates et al. address the potential impact of new technological innovations on disabilities resulting from impairment in people with motor-control disorders. In this case, the aim is to develop eye-gaze-based interaction and control of an avatar in a first-person perspective on-line community such as Second Life. Examining the control demands of the existing interfaces on gaze-based control, the authors conclude that users will be effectively disabled by their inability to control their on-line presence. Methods for overcoming these difficulties, such as gaze-aware on-screen assistive tools, are proposed and discussed.

The last two papers are both concerned with how understanding the detailed context of use of specific technology designs may be used to improve their inclusivity of designs even in cases where there are existing design solutions.

Yoxall et al., in their paper “Understanding the Use of Tools for Opening Packaging”, tested a large number of jar-opening assistive devices on the market and questioned users regarding pain, discomfort and liking for the tools.

Contrary to expectations, a number of devices specifically for impaired users performed poorly in terms of excessive dexterity demands for all users and were neither liked nor found effective by older users. In many cases, the individual designs had not taken into account the manoeuvres required to use the tool in real-life situations including those actions required to resist reaction forces.

Heylighen et al., in their paper “Designing Spaces for Every Listener” investigated the acoustic qualities of university auditorium spaces in Belgium, focussing on the acoustic rather than the physical accessibility issues traditionally addresses by architects. A case study examined the acoustic obstacles resulting from a specific design and the interventions and tools that can be used to overcome these obstacles and that may be applied more generally.

The Guest Editors wish to thank the authors and reviewers who contributed to this Special Issue. This contains only a subset of original contributions developed from the CWUAAT 08 workshop. The remaining papers that address other workshop themes, less immediately relevant to UAIS, can be found in the book “Designing Inclusive Futures” edited by Pat Langdon, John Clarkson and Peter Robinson and published by Springer.