Not just a matter of design: Key issues surrounding the inclusive design process

Joy Goodman, Engineering Design Centre, University of Cambridge (jag76@cam.ac.uk),
Phil Gray and Stephen Brewster, Department of Computing Science, University of Glasgow (pdg, stephen@dcs.gla.ac.uk)

Keywords

Inclusive design, issues, older people, technology

Abstract

In order to create effective inclusive designs, we need to address many questions - not only issues of design itself, but also questions surrounding the design process: methodological, ethical and practical. If we are to address these effectively, we need to identify them, consider the options and think through their implications. Nowhere is this more true than in the development of technology for older people, an increasingly important area in the light of the increasingly aging population.

   This paper presents some first steps in the exploration of these issues in this context, mapping out a space of the issues and discussing each of them in greater depth. We report on views expressed at workshops on inclusive design and the older population held during 2004, particularly one run at HCI 2004, involving 24 participants from academia, industry and the older population.

An issue space

   The design of technology for an aging population is becoming an increasingly important area of inclusive design as the proportion of older people rapidly increases (US Census Bureau, 2004). As this group grows, so will the numbers needing support for daily activities, support that can be effectively provided by technology, as long as such technology is appropriately designed and introduced.

   In common with the target users of inclusive design as a whole, older people are often vulnerable and products can have great effects on their daily lives, for both better and worse. What is more, in today's youth and ability-oriented society, older people are liable to be ignored in design, particularly of technological products.

   These, and other similar factors, mean that it is essential that inclusive design connects better with daily life, commercial enterprises and with the rest of the world. To facilitate this, it is important to consider not just the design process itself but how it relates to other areas, addressing issues surrounding, and on the edges of, the design process.

If we are to address these issues effectively, we first need to identify them. The next section therefore proposes a "space" of these issues to assist in organising further discussion. Subsequent sections look at individual issues in greater detail. We consider those issues particularly relevant to technology and older people but also consider how they relate to inclusive design as a whole.

Methodology

To identify and investigate the key areas of concern, we examined issues raised in panels and papers on inclusive design and the older population at workshops and conferences in 2004, such as CWUAAT, CHI and HCI. We also studied papers published in this area in 2004. The resulting set of issues was categorised into main areas of concern. These were refined and explored through discussions with others from academia, industry and the older population, through referring to our experience in investigating technology design for older people, particularly on the Utopia project (Eisma et al, 2004) and by reviewing the literature in these areas.

In particular, we held a set of discussion sessions at a workshop on "HCI and the Older Population" at HCI 2004 (Goodman and Brewster, 2004). 24 participants from academia, industry and the older population with an interest in inclusive design responded to questions from all eight areas of concern, unpacking the key questions, suggesting solutions and discussing the advantages and disadvantages of different approaches. They also discussed three of the areas in greater detail: ethical issues, involving users and characteristics of suitable technology.

In this paper, we report on information from all of these sources but references to "the workshop" and "workshop participants" refer to this latter workshop.

Overview of the space

As a result, we identified eight key areas of concern, as shown in Figure 1.
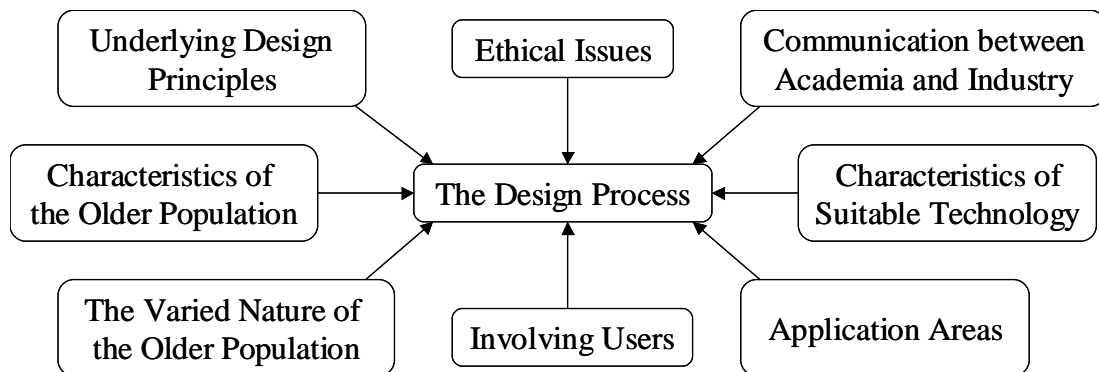

Figure 1: An issue space: eight key areas of concern

To structure the space, it is helpful to relate these areas to aspects of the design process. The lower right of Figure 2 shows a model of the IT design process, based on the City Design Method (Sutcliffe, 2003). The remainder of Figure 2 shows how the eight areas of concern relate to this model.
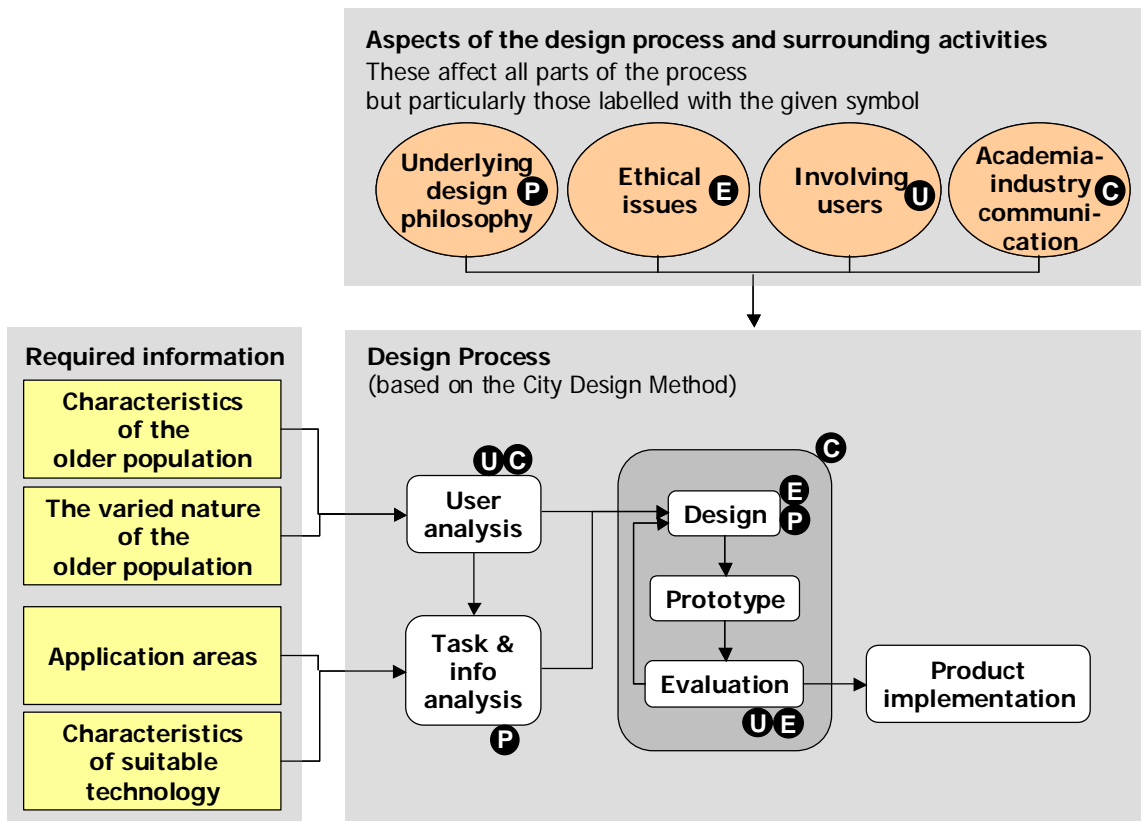
Figure 2: How the key areas of concern relate to the inclusive design process

Exploring the issue space

We turn our attention to each of the key areas in turn, identifying and discussing the main questions and possibilities. This section is not comprehensive but helps to set the scene for further discussion in these areas.

Underlying design philosophy

There are two main design philosophies that tend to underpin design for older and disabled people – assistive technology (AT) and universal (or inclusive) design (UD). These are sometimes seen as being at odds with each other, leading to debate over which should be adopted.

The AT approach aims to design specific products for specific needs and abilities, so they can meet those needs in optimum ways. However, it can cut users off from mainstream products, disadvantaging and stigmatising them.

Conversely, UD aims to design products that are suitable for everyone to use. In theory, this reduces stigmatisation, increases equality and maximizes market potential. It does indeed lead to more usable mainstream products, but the goal of usability by everyone is hard to achieve. When designing for people with very different needs, it often necessary to make compromises resulting in suboptimal solutions for some. Therefore, some variations on UD seek to maximize the user population rather than actually design for everyone.

But these approaches needn't be in conflict - Newell (2003) argues that they can be complementary. He says that there is "always going to be a need for specialised accessibility features and equipment" but that AT can learn from UD about broadening its market and reducing stigma. More work is needed to combine these approaches effectively.

Ethical issues

Ethical issues are important in any design but even more so when designing for vulnerable people, such as the elderly and disabled. Some of these issues were identified as of particular concern:
- Control – how much control does the user retain over their lives?
- Privacy – how private is user data?
- Undermining independence – are we making users reliant on products and less capable of coping by themselves?

Workshop participants suggested some principles to help tackle these:
- Choice – provide the user with choice over what problem should be tackled, what solution to use and how to configure that solution.
- Transparency – make it clear what data is collected and how it's used.
- Trust – establish trustworthiness and allow time to develop trust in the system.
- Individuality – remember that every user is different. A solution that works for one may not work for another.

Further work is needed to investigate how these can be best implemented and to evaluate their efficacy.

Issues of user involvement

Involving users in the design process is particularly important in inclusive design due to "the cultural and experiential gap" between designers and older and disabled users (Eisma et al, 2003). However, doing so can be a complicated task. In particular, workshop participants identified three main areas of concern: participant recruitment, methods suitable for older people and ethics.

Participant recruitment

Workshop attendees described several fairly successful methods used to recruit participants. However, they also emphasized that they found recruitment difficult and time-consuming and expressed concerns about sample representativeness as participants are often self-selected. To combat this, they felt it is important to contact more diverse groups and take more care in choosing participants from these groups. However, this is likely to make the process even more difficult and time-consuming. To address this challenge, the community needs to share successful methods and strategies and pool ideas to create better ones.

Methods

Traditional user-centred methods are often used in inclusive design, although they may need adaptation in response to particular challenges from older and disabled users. However, workshop participants felt that these methods are not enough - more innovative, entertaining and engaging techniques are needed, so that, by providing more value for participants, they will be able to give more back. Novel qualitative methods were considered to be promising as it was believed that they could be more fun, less constraining and help participants to feel less self-conscious. Various innovative methods already exist, but more work is needed to develop and evaluate such methods in the context of inclusive design.

Ethics

User-centred research has the potential to harm participants, both physically (e.g., motion sickness in a VR simulator) and psychologically (e.g., by destroying a user's confidence in technology). This is particularly an issue for inclusive design where participants are often frail and vulnerable and is compounded by the difficulty of knowing in advance what will cause harm. Further difficulties occur when involving those with dementia and others who may no longer be able to give informed consent (Bartlett and Martin, 2002).

   While general ethical guidelines exist for user research in areas like psychology and HCI (e.g., UPA, 2004), more specific guidelines for this area are lacking. Workshop participants suggested that the community should share its experiences and draw up guidelines together.

Communicating with industry

Despite some notable successes, there are still many barriers to the widespread uptake of inclusive design in industry. Among other things, we need to communicate more effectively information about older and disabled users and methods and tools for designing for them (Dong et al, 2003). Workshop participants identified various possible communication methods and tactics that could be adopted but they were unsure about their effectiveness. More work is needed to develop and evaluate such methods.

Information issues

The remaining four areas in the issue space describe information that is needed to generate effective requirements. We have identified these areas in particular because they have generated a sizeable amount of interest and discussion.

Characteristics of the older population

When generating requirements, it is important to understand the characteristics of the target user group. While there is a lot of information available about the nature of the older population and some on how their characteristics might affect IT use (e.g., Hawthorn, 2000), the picture is incomplete.

Information is often scattered across a wide range of sources so that it is hard to see the complete picture. More information is also needed on how population characteristics affect product use, particularly when it comes to psychological and social characteristics, such as life experience, living conditions and emotional state.

When considering the older population, difficulties also arise because many older people have multiple minor impairments rather than a single easily identifiable disability (Gregor et al, 2002). The impact of this on design is poorly understood.

One particular characteristic of the older population is its variability. This has sufficient implications for design that it merits its own section.

The varied nature of the older population

One of the key challenges when designing for the older population is its hetereogeneity. People do not all age in the same way or at the same rate, leading to an increase in individual variability with age, affecting not just physical and cognitive but also social and behavioural characteristics. This variation is compounded by the broad definition of "old age" (which usually includes at least two generations). The diversity within any one individual with time, due to factors such as illness and changes in the environment, also increases with age. (Gregor et al, 2002)

Once we recognise this diversity, there remains the challenge of how best to address it. A mix of specialised assistive technology and universal design, as discussed in the section on "Underlying Design Philosophy", appears promising. Workshop participants also highlighted the importance of using participatory design with a range of users and the possibilities offered by customisation. However, improved methods of tackling these issues need to be developed and better incorporated into inclusive design as a whole.

The issue of diversity raises another key question: if the older population varies so much, is there anything, apart from chronological age, that distinguishes it from the population as a whole? Should we even talk about the "older population" or just subsume this investigation into inclusive design? There are advocates for both sides of this argument and the issue has yet to be resolved.

The changing nature of the older population

One aspect of this variation is the fact that the older population is changing. Workshop participants identified several ways in which tomorrow's older people are likely to be different from today's. In particular, they will be more familiar with technology in general and computers in particular. Changing demographics mean that many will have fewer relatives and will live longer. Better healthcare will limit some types of decline or delay their onset, at least in wealthy countries.

However, some aspects will stay the same. Older people will still experience age-related decline, although maybe to a lesser extent. Rapid technological change will mean that they still face unfamiliar technology and interaction paradigms, just as familiarity with radio and telephones did not adequately prepare today's older people for computers and ATMs.

As we look towards the future, we need to make sure that our research doesn't just focus on today's older people and so prove useless for those of tomorrow.

Application areas

There are a wide range of areas where technology (and other kinds of products) could prove useful to older people. However, much of the work has focused on just a few areas, such as basic home-based support, information access and communication (c.f., Goodman and Brewster, 2004). It is important to identify a wider set of potentially valuable applications to avoid missing important opportunities.

We built on responses from workshop participants to outline the beginnings of such a set, shown in Table 1. Although incomplete, we hope that it will prove a useful framework for discussions on this topic.

Topic	Examples
Specific high-risk groups	housebound individuals people without family
Healthcare	health information home medical equipment to prolong and/or improve home-based care
Activities of daily living	hygiene walking
Independent living	memory aids managing finances
Work	work software and equipment
Education	books educational courses
Communication	managing social networks staying in touch
Entertainment	games hobbies
Travel	public transport booking holidays
Ideologies and beliefs	access to places of worship volunteering

Table 1: Possible application areas

Characteristics of suitable technology

There are many characteristics that we would like our products to have – it would be nice if they were usable, elegant and fun, for example. But what characteristics are actually important for technology for older people and how should these be prioritised when there are trade-offs between them?

To help answer these questions, workshop participants drew up a list of what they felt were the most important of characteristics (see Table 3).

```
1. Usefulness
2. Reliability
3. Cost
• Usability
• Functionality
• Aesthetics
• Customisation
• Enjoyment
• Upgradeability
• Flexibility
• Branding/Market image
• Extendability
• Well-integrated
```

Table 3: Important characteristics of technology for older users (drawn up at the workshop). Later entries are not numbered to indicate that their relative importance is undetermined and varies from situation to situation.

This list is compatible with factors that have been identified as important by researchers from associated disciplines. For example, in the context of marketing, Lunsford and Burnett (1992) found that problems with usability, perceived usefulness and market image, together with risk (physical, economic and functional) formed key barriers to new product adoption among older people.

Conclusions

This paper has presented a space of eight key areas of concern surrounding the inclusive design process, particularly as it relates to the design of technology for older people. These are areas in which the answers are not known and in which further investigation is necessary if inclusive design is to be effective in practice. We have identified key questions and started to uncover some possible answers. We hope that mapping out what the issues are will encourage discussion and further research in these areas.

Acknowledgements

References

Bartlett, H and Martin, W (2002). Ethical issues in dementia care research. In The Perspectives of People with Dementia. Wilkinson, H (ed.). London: Jessica Kingsley Publishers Ltd

Dong, H, Keates, S and Clarkson, PJ (2003). Inclusive design in industry: motivations and barriers. ACM SIGCAPH Computers and the Physically Handicapped, vol 75, 9-10

Eimsa, R, Dickinson, A, Goodman, J, Mival, O, Syme, A and Tiwari, L (2003). Mutual inspiration in the development of new technology for older people. Presented at Include 2003, London

Eisma, R, Dickinson, A, Goodman, J, Syme, A, Tiwari, L and Newell, AF (2004). Early user involvement in the development of information technology-related products for older people. Universal Access in the Information Society, 3(2), 131-140

Goodman, J. and Brewster, S (eds.) (2004). HCI and the Older Population, Workshop at HCI 2004, Leeds, UK. Proceedings available at http://www.dcs.gla.ac.uk/utopia/workshop/hciworkshop04.html

Gregor, P, Newell, AF and Zajicek, M (2002). Designing for Dynamic Diversity - interfaces for older people. Presented at Assets 2002, Edinburgh: ACM Press

Hawthorn, D (2000). Possible implications of aging for interface designers. Interacting with Computers 12(5), 507-528

Lunsford, DA and Burnett, MS (1992). Marketing Product Innovations to the Elderly: Understanding the Barriers to Adoption. Journal of Consumer Marketing 9(4), 53-63

Newell, A (2003). Inclusive Design or Assistive Technology. In Inclusive Design: Design for the whole population. Clarkson, J, Coleman, R, Keates, S and Lebbon, C (eds.). London: Springer, 172-181

Sutcliffe, AG (2003). Multimedia and virtual reality: Designing multisensory user interfaces. Mahwah NJ: Lawrence Erlbaum Associates

U.S. Census Bureau (2004). International Data Base (IDB). http://www.census.gov/ipc/www/idbnew.html, updated Sep 2004

UPA (Usability Professionals' Association) (2004). Code of Conduct for Usability Practitioners: Trial Version, Sep 2004. http://www.usabilityprofessionals.org/upa_projects/body_of_knowledge/code_of_conduct.html