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User Sensitive Design for older and disabled people

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Summary

Successful design requires designers both to achieve an empathy with their potential users, and have access to sufficient relevant human factors knowledge about their needs, wants and capabilities. A range of design techniques have been suggested to assist in this process. The need to be fully informed about the characteristics of users is particularly important when the user group is poorly represented in the design community - such as older and disabled people. This chapter considers designs techniques and methods appropriate in the field of development of products for older people and people with disabilities, and outlines how they are different from those used within traditional technological research.

Introduction – User Centred Design

The design community has been aware of the importance of focussing on users' needs, wants and capabilities for many years. "User Centred Design" is a popular approach to this challenge.
User Centred Design is a set of techniques and processes which enable developers to focus on the users within the design process (Preece,1994, Shneiderman,1992, Newman & Lamming, 1995, and Hellander et al. 1997). The British Standard (ISO 1999) states that "(User Centred Design) is characterised by the active involvement of end users and that the multidisciplinary team should include end users". Users should be "involved in" the process - the contribution of such users varies with their skills and experience and is also dependent on the particular phase of the research or development. Some parts of the process involve very intensive interaction with users (e.g. in evaluations of prototypes), others almost none (e.g. writing computer code, or designing electronic circuitry). Figure 1 (adapted from Hartson & Hix (1989)) shows a model for user centred design where the latest implementation/idea is evaluated with users both before and after each stage of the design process .

Users, however, are not normally involved in the activities shown at the periphery of the diagram and need not always be involved in some of the evaluation procedures.

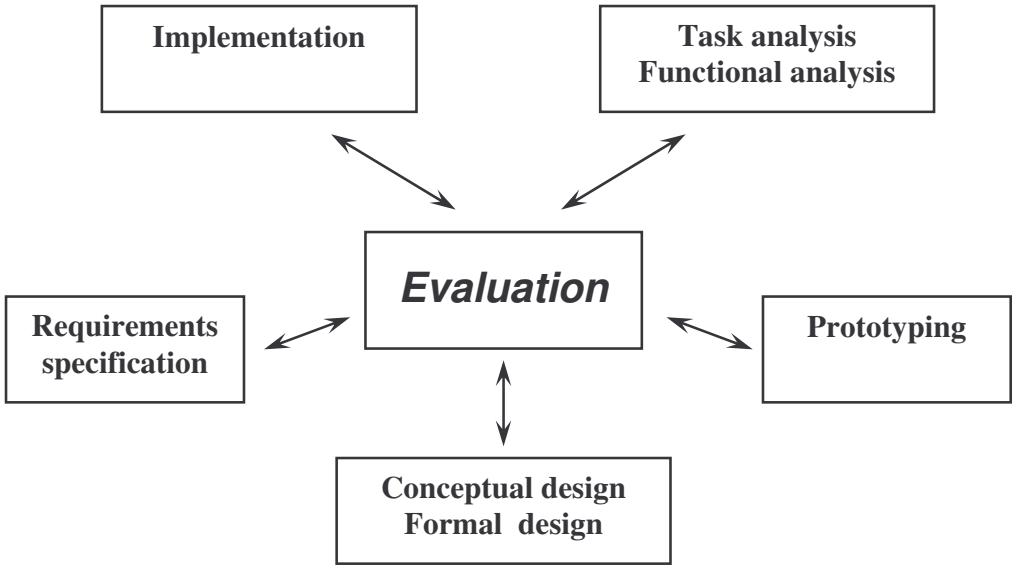

Figure 1: A model for the user centred design process.

Participatory Design, (Muller, 2002 and Kyng and Mathiassen, 1997) is also a design technique which proposes a focus on the users, and includes both the pragmatic approach of direct collaboration between designers and users and a more conceptual approach that incorporates complementary perspectives to help designers come up with better solutions.

Ethnography involves users within the design process (Blomberg et al. 2002), but, in this case, the ethnographer acts as an intermediary between the users (usually in their own environment) and the designers. The ethnographer's role is to present as full a picture as possible of the user, their culture and their environment to the designers. These are often in the form of a written report, but other ways can also be used such as "experience models", "opportunity maps", profiles, scenarios, mock-ups and prototypes,

The inclusion of older users and users with disabilities, however, can impose significant changes to these design philosophy and needs to be carefully considered (Newell & Gregor 1997, Newell 1995, Newell and Gregor 2002). Currently there tends to be (possibly artificial) distinctions between:

- Mainstream design (which often seems to be exclusively for able-bodied people),
- The design of systems exclusively for people with disabilities (products of rehabilitation engineering - sometimes called "orphan" products) and, more recently

- “Inclusive” design.

Inclusive Design

A number of initiatives have been launched to promote a consideration of people with disabilities within the user group of mainstream product development teams. These initiatives have had a number of titles including: “Universal Design”, “Design for All, “Accessible Design”, and “Inclusive Design”. Examples of such initiatives include the i-design project jointly with Cambridge, York, Dundee Universities and the Royal College of Art, http://www-edc.eng.cam.ac.uk/idesign/ the INCLUDE project within the European Union (http://www.stakes.fi/include), and, in the USA, the Centre for Universal Design at North Carolina State University (http://www.design.ncsu.edu/cud/ud/ud.html), and work at the Trace Centre in Wisconsin-Madison (http://www.trace.wisc.edu). Newell and Gregor (19997) also proposed the concept of "Ordinary and Extra-ordinary human-machine interaction which is a different approach to including older and disabled people in the design process.

The i~design project seeks to provide tools to improve quality of life for the wider population. It focuses on enabling industry to design products that can be used effectively by the population as a whole, including those who are older and/or disabled. Clarkson et al. (2003) propose that, in order to maximize the usability for the largest number of possible users, the appropriate information on users should be available to designers. They suggest a structured design approach, including the concept of an “Inclusive Design Cube”. The axes of the cube represent motion, sensory and cognitive capabilities of the users. The overall cube represents the whole population, but is subdivided in the “ideal” population of users for a particular product, and the population which can actually use the product. This cube can provide a way of assessing the proportion of the whole population which is excluded from using any particular device.

The INCLUDE project produced a methodology for “Inclusive Design” for telecommunication terminals (Hypponen 1999), which was based on standard textbooks for user centred design and usability engineering (such as Neilson, 1993 and Ulrich and Eppinger, 1995), and on an extension of the International Standards for human centred design (ISO 1999). They underlined the importance of the design not being linear, but iterative, with constant reference back to evaluation with the users (Wood 1998) {also indicated in figure 1 above}. They suggested that one approach was “to compromise slightly on the product design so that, while the design retain the functionality required by people with disabilities, it still appeals to a wider audience”. They also commented that “there were many different methods of choosing how to collect user needs and integrate them into product development, and that the suitability of this approach to accommodating a range of disabilities into the design process (in an effective and efficient manner) is unclear”. They recommend “guidelines as a good cheap basis for integrating needs of people with varying abilities into design at an early phase”. Examples of such guidelines can be found at their web site and within (Hypponen 1999), and other literature on “Design for all”.

The INCLUDE project recommendations are similar to general user centred design principles. They include: Flexibility in Use, Simple and Intuitive Use, Perceptible Information, Tolerance for Error, Low Physical Effort, and Size and Space be Provided. They remind the reader to be aware of the needs of people with disabilities when following these guidelines. Their philosophy, is based on the underlying premise of "Equitable Use", that is: "the design should be useful and marketable to *any* group of users" (my emphasis)". If taken literally, however, this imposes very substantial requirements on the designer, which may not always be appropriate. It should be remembered that, in its full sense, and, except for a very limited range of products, "design for all" is a very difficult, if not often impossible task. The use of term thus has some inherent dangers. Providing access to people with certain types of disability can make the product significantly more difficult to use by people without disabilities, and often impossible to use by people with a different type of disability. Also the need for accessibility for certain groups of disabled people might not be required by the very nature of a product.

Ordinary and Extra-Ordinary Human-Machine Interaction

The concept of "Ordinary and Extra-ordinary human-machine interaction was developed by Newell (1995). It addresses the relationship between the functionality of users and the environment in which they may operate. This draws the parallel between "ordinary" people operating in an "extraordinary" environment (e.g. high work load, adverse noise or lighting conditions), and an "extra-ordinary" (disabled) person operating in an ordinary environment. It made the point that the characteristics of both the environment and the users' functionality can change substantially from minute to minute, and from day to day, in addition to very long term changes due, for example, to ageing and to changes in the physical environment and social situation (Newell & Gregor 1997). They said that designers need to be explicitly aware of these concepts and understand how they can be used to the greatest benefit of everyone, including people who are either temporarily or permanently disabled. They gave a number of examples of designs which were specifically focussed on older and/or disabled people which led to very successful main stream products. These include the cassette tape recorder (first developed by a company producing talking books for the blind), the predictive coding system available in mobile telephones (first developed to allow people with physical disabilities to use very large keys to input text), and the Ford Focus automobile which was designed to cope with the mobility restrictions which occur in older people, and became the best selling car in the UK Ford range). Newell and Gregor (1997) recommend that there are significant advantages in first considering the challenges of older and disabled people and then extending the design to be appropriate for non-disabled people, rather than taking a main stream product and attempting to modify the design to make it more inclusive.

"User Centred Design for older and/or disabled people

There are some important distinctions between traditional User Centred Design with able-bodied users, and UCD when the user group either contains, or is exclusively made up of, people with disabilities. These include:

- Much greater variety of user characteristics and functionality,
- The difficulty in finding and recruiting "representative users",
- Possible conflict of interest between accessibility for people with different types of disability,
- Conflicts between accessibility, and ease of use for less disabled people ("temporary able-bodied") (e.g. floor texture can assist blind people but may cause problems for wheel chair users),
- Situations where "design for all" is certainly not appropriate (e.g. blind drivers of motor cars),
- The need to specify exactly the characteristics and functionality of the user group, and
- Provision for accessibility via the provision of additional components.

If the design process is to be focussed on older and/or disabled people, either for specialised products or as a way of developing inclusive products, the design process should include interaction with older and/or disabled users. Newell and Gregor (2000) have pointed out the increased usability challenges of this group, and the difficulties in finding and recruiting 'representative' users. They conclude that traditional methodologies do not cater well for these groups.

Older people can, very crudely, be divided into three groups:

- Fit older people, who do not appear – nor would consider themselves - disabled, but whose functionality, needs and wants are different to those they had when they were younger,
- Frail older people, who would be considered to have a "disability" - often a severe one, and in addition have a general reduction in many of their other functionalities, and
- Disabled people who grow older, whose long-term disabilities may have affected the ageing process, and whose ability to function can be critically dependent on their other faculties, which will also be declining.

This taxonomy serves to illustrate the fact that capability and disability are not opposites. Designers should recognise the whole range of capability levels, and understand that these are continua rather than binary (able bodied - disabled). Other major characteristics of older people, when compared with their younger counterparts, include:

- The individual variability of physical, sensory, and cognitive functionality of people increases with increasing age,
- The rate of decline in that functionality (that begins to occur at a surprising early age) can increase significantly as people move into the "older" category,

- Problems with cognition, e.g. dementia, memory dysfunction, and the ability to learn new techniques appear more widely,
- Older people may have significantly different needs and wants due to the stage of their lives they have reached, and
- The environments in which older people live and work can significantly change their usable functionality – e.g. the need to use a walking frame, to avoid long periods of standing, or the need to wear warm gloves.

As people grow older their abilities change, with, in general, a decline over time in cognitive, physical and sensory functions, each declining at different rates relative to one another for each individual. In addition, any given individual's capabilities vary in the short term (Gregor and Newell 2001).

Current technology, however, produces a static artefact with no, or very limited, means of adapting to the changing needs of users as their abilities change. Even the user-centred paradigm (e.g. ISO 1999 , Neilson 1993, Preece 1994 Shneiderman 1992) assumes that the user has characteristics which are invariant with time. Thus the methodology of research and development must bring into focus, not only the substantial variability which exists in user characteristics, but also the changing nature of the functionality they have, over both short and long time scales.

Many older users of computer systems can be affected by multiple disabilities, and such multiple minor (and sometimes major) impairments can interact, at a human computer interface level to produce a handicap that is greater than the effects of the individual impairments. Thus, for example, poor eyesight can be accommodated in computer systems by increasing font size, but this reduces the information on the screen at any one time and thus provides greater cognitive load on the user, and, if memory function is slightly impaired, this may mean that the swapping from screen to screen is impracticable. Blindness can be accommodated by using a speech synthesizer to read out the text, but all older people have reduced hearing, and many find the additional cognitive load of interpreting synthesized speech, and remembering what has been said offer substantial additional barriers to understanding. Thus research into accessibility which is focused on single impairments may not always provide appropriate solutions for older users.

There are additional specific challenges when older people and people with disabilities are part of the formal user group within a product development environment. For example there can be serious ethical issues related to the use of these groups as "subjects". Some of these are medically related, and can also include the ability to obtain informed consent.

Research challenges when disabled people are part of the user group can include:

- It may be difficult to get informed consent from some users,
- The users may not be able to communicate their thoughts, or even may be "incompetent" in a legal sense,
- The user may not be the purchaser of the final product,

- Payments may conflict with benefit rules,
- Users with disabilities may have very specialised and little known requirements,
- Different user groups may provide very conflicting requirements for a product,
- Conflicts of interest between user groups (including "temporarily able-bodied"),
- The lack of a truly representative user group, and how to find and recruit an appropriate group of users.

Alm (1994) and others have also considered the ethics of research with individuals with disabilities, including those with communication impairments. They conclude that it is not as straightforward to work with these users as it would be to work with disabled people who do not have communication dysfunction. Similar problems can occur when working with people with cognitive dysfunction.

In addition, the involvement of clinicians may also be needed when disabled users are involved. Their expertise is invaluable, but it is also vital that the clinicians are fully aware of the motivation and methodologies of the design process, which are very different from a normal clinical situation. Communication, between clinicians and engineers can be fraught with difficulties as they come from different backgrounds and have different jargon. A fully co-operative team of clinicians and engineers is a world beating combination, but it needs to be developed and fostered - it does not happen by chance. Also, a reliance on expert opinion rather than observations of users could compromise the very process that user participation is supposed to serve.

In order to ensure that these differences are fully recognised by the field, Newell and Gregor (2000) recommended that the technique should be called "User Sensitive Inclusive Design" The term "inclusive" rather than "universal" reflects the view that "inclusivity" is a more achievable, and in many situations, appropriate goal than "universal design" or "design for all". "Sensitive" replaces "centred" to underline the extra levels of difficulty involved when the range of functionality and characteristics of the user groups can be so great that it is impossible, in any meaningful way, to produce a small representative sample of the user group, nor often to design a product that truly is accessible by all potential users.

Aesthetics

Aesthetics is often seen to be less important in Assistive Technology than other equipment for domestic use (Newell 2003). There have been times when areas of fashion were particularly beneficial to older users. In Victorian times, the walking stick was a fashion accessory for many (and also could even serve as a repository for hard liquor or a weapon of defence/attack). In those days a wide variety of very beautiful walking sticks could be purchased, and a walking stick was a badge of honour rather than shame. This is still true for country-walking enthusiasts, but there seems little cross linkage between design of walking sticks for outdoor pursuits and those intended for therapeutic purposes.

The fact that the typical user of assistive technology iss not usually the purchaser can have a major influence on equipment design. Assistive technology often has an institutional 'air' about it – being more suited to a hospital ward than to a living room.

The difference between 'need' and 'want' has very important effects particularly regarding the aesthetics of equipment. Those things people want are usually beautiful - in the eyes of the purchaser at least. In contrast, those products which others have determined that people 'need', are not perceived to have the same requirement to be beautiful - their functionality being considered to be of primary if not exclusive importance. However, this need not be the case. There is no absolute reason why assistive technology devices should be ugly, other than possibly a lack of motivation to produce beautiful products for the rehabilitation market, or a reluctance to employ designers with visual awareness, or to allow such designers to consider aesthetics as an important part of their remit. There are moves towards efficient artificial legs as a fashion statement, rather than the design being compromised in an attempt to make them 'cosmetic' (i.e. conceal that they are artificial), and 'cool' wheelchairs for younger people, but most current assistive technology is not considered to be a fashion accessory. Demographic changes, however, are likely to produce the need for incorporating aesthetic design within products. This will favour those assistive technology designers who are fastest to respond to the true needs and wants of the users.

The questions that the assistive technology industry needs to address include:

1. Should assistive technology 'delight' the user (and their friends and companions)?
2. Why can assistive technology not be a fashion statement ?
3. Why should assistive technology for the home look as if it was designed for a hospital ward?
4. What is most appropriate way to do market research in this field?
5. What is the best way to market assistive technology products to a wider group?
6. How can one best obtain accurate feedback from current users (including but not exclusively their professional carers)?

Involvement of disabled users

Users with disabilities and clinicians can make a tremendous contribution both to research and to the commercial products that have grown from research in this area.

There are two major ways in which users can be involved:

- As disabled consultants on the research team, where they act essentially as "test pilots" for prototype systems,
- By the traditional user centred design methodology of having:
    - User panels,
    - Formal case studies, and
    - Many individual users who assess and evaluate prototypes.

Within research in the School of Computing at Dundee University (Gregor and Newell 1999), disabled consultants are full members of the research team, and are chosen with great care, and make many very important contributions to the research (Waller et al 1996, Alm et al 1992, McGregor & Alm 1992). The rewards for the disabled consultants on the research team have come from being internationally known in the field, attending

international conferences and giving lecture tours (McGregor 1995). From time to time, this group has employed researchers who happen to be disabled, but they are employed strictly on merit as researchers.

The panels of users at Dundee have enjoyed working with the group and their reward has been to take part in a project, which may be useful to older and disabled people in the future. Some of them have been able to obtain the commercial products which have grown from our research, but it was made clear to them at the start of the research that the provision of such long term support was not the responsibility of the project.

Dundee's School of Computing is one of the few Computing Departments, which has employed speech therapists, nurses, special education teachers, linguists and psychologists. By employing clinicians on research projects, rather than consulting service orientated clinicians, we have ensured that the ethos of the whole team is a research ethos, which is vital for high quality long term research. In projects which do not have clinicians on the research team, we consult with clinical colleagues as appropriate.

Involving Older and disabled people in the development process

Although most people agree on the importance of involving older people during the development of new technology, there are relatively few examples or guidelines for their successful involvement (Keates and Clarkson, 2002), and often traditional formats have to be adapted. Various researchers, however, report on the problems encountered when running focus groups with older people (Lines and Hone, 2002; Barret and Kirk, 2000). There are some case studies about design processes involving older people (Gheerawo & Lebbon, 2002) which give valuable pointers as to how information can be elicited from this age group.

The cultural and experiential gap between designers and users is especially large when developing Information Technology products and other new technology for older users. Many older people have had little exposure to computers, while for younger people (especially those who develop new technology) much technology is an integrated part of their lives. They find it difficult to imagine life without it, and technical terms or metaphors, which may seem like normal words to younger people ('monitor' or 'windows'), can be difficult to avoid or to describe. Computing conventions such as visual language and interface metaphors used in computer systems can also cause confusion. A scroll bar is an example of a whole repertoire of "widgets" of which older people have limited or no experience. The approach of many older people is based on a fundamental lack of trust and a very limited understanding of the underlying concepts in the system, leading to a reluctance to experiment. Also "time to complete the task" is often not as important to older people, as "getting the job done" (see also Hardy & Baird 2002)

In addition (Eisma et al 2003A) have found that older people, in can be reluctant to complain, or criticise products, and they can experience more computer anxiety, and be

more negative about the amount of effort required to learn to use them. This characteristic is often fuelled by the assumption that they have no use for them (Marquie et al. 2002).

Challenges can be caused by decreasing abilities, for example in sight, hearing and short term memory. In particular, traditionally structured focus groups have been found to be less than satisfactory when attempting to elicit information from groups of older people. Age related cognitive deficits can also make self reporting inaccurate (for example, in a questionnaire), with recent research showing that there are age differences in the ways in which people respond in self-reports (Park and Schwarz 2000). In addition, challenges may arise because older people tend to tire more quickly (Kayser-Jones & Koenig 1994), and this can severely limit the duration of sessions.

Some of the information which designers are trying to elicit can be particularly sensitive, and care needs to be taken to carefully choose topics and appropriately introduce sensitive topics. For example, Russell (1999) found that many older people may not want to talk about topics such as social isolation, "because such an acknowledgement challenged their identity as independent people"

In addition, motivations behind user participation should be considered, "If people are lonely, do they consent to be interviewed because of the social interaction it provides them?" (Lines & Hone, 2002 p. 25). Sensitivity and an awareness of users' motivations for participating are important considerations in working successfully with older people. For example, the author and his colleagues, and Lines and Hone (2002) have found that it is not easy to keep a focus group of older people focused on the subject being discussed. They suggest that a contributory factor to this is the motivation of the participants: many of our informants see these groups as vehicles for socializing as well as providing information to the researchers.

Mutual Inspiration

Eisma et al (2003B) proposed the concept of mutual inspiration to avoid the researcher /designer divide which often threatens the effective communication of requirements to the design team. An essential part of this methodology is building a diverse user-base, forming a long-lasting partnership with older people, and developing approaches for effective interaction with this target user group. They propose that both the users and the designers should be involved in the initial requirement generation and prototype stages of the project, so that both sides are aware of the various criteria that shape the project, and both can influence early design choices. For this to be successful, however, a common ground must be established where both parties are willing and able to talk about their expertise in language comprehensible to the other party, and both have to be prepared to challenge suggestions, but always to respect the other's contribution and expertise. This is facilitated by making focus groups, or other activities, into pleasurable social events, by providing refreshments and, crucially, time for social interaction, both among the participants and between participants and researchers. Mival et al (2002) report that the enjoyment that people get from learning about new products and technologies is an important motivation to participate, and to participate again. Hands-on sessions, where

older people experience new technology, have proved more successful than verbal explanations or demonstrations, and these can often lead to spontaneous suggestions for improvements or for new products . This was also found by Inglis et al (2002) who, after passing PDAs round to older people as part of a user-centred design process for memory aids, commented on the responsiveness the participants showed to the new technology. They also report that older people were less likely to ask for functionality than younger, technically-aware users. This underlines the need to spend time to transfer knowledge to the users involved in the design process to enable them to contribute. Mival (2002) also reports that hands-on sessions allow researchers to observe the difference between what people report and what actually happens. For example, some users reported that they had no problems with using the systems despite the fact that observations had showed that this was not the case. Gheerawo and Lebbon (2002) describe a similar process which they called 'empathic bonding' to stimulate creative thinking and user-facilitated innovation.

Questionnaires

Questionnaires can be a very valuable way of gathering data, , but research shows that there are age differences in the way older and younger people respond in self reports Older respondents use the "don't know" response more than younger respondents, and are also likely to use the "don't know" option to questions that have complex syntax or are semantically complex. Older respondents are generally also more "cautious" in their behavior, and need to "have higher threshold levels of certainty" before responding to questions (Park & Schwartz 2000, p.238). Eisma et al (2003A) specifically excluded a "don't know" response, but even this was thwarted by some respondents, a number of whom penciled in their own "don't know" column. These researchers found that the best way of addressing this reluctance was for a researcher to administer the questionnaire directly. This had the advantage of leading to spontaneous excursions into users' own experiences, and demonstrations of various personal devices were relatively common, and provided many useful insights.

Interviews

Older people, particularly those who are disabled or frail, are likely to spend more time in their homes. Care thus needs to be taken to avoid potential negative effects of inappropriate technologies, as this can dramatically alter the life of a vulnerable older person, especially if the installation of the equipment is time-consuming and disruptive (Reed 2002). Dickinson et al (2003) showed that in-home interviews produced many stories about how the equipment in the home was obtained, how people learned to use it, who supported them, and the reporting of a variety of both good and bad experiences. Monk and Baxter (2002) have suggested the concept of examining "seriously bad outcomes" (SBOs), like loneliness, as part of in-home observations and interviews. These methods allow the researchers to see the users in context, to observe them using their current technology, and to note unexpected points, together with providing background information about the hardware and software used.

The use of theatre

There are thus major challenges in interacting with older and disabled users. Newell and his colleagues therefore have investigated methods other than direct contact with users, and have examined the use of theatre as a technique for transmitting important messages to an audience (Newell, Morgan, et al. 2006). They studied the ideas of "Forum Theatre" as described by Boal (1995). Boal's work was developed within his "Theatre of the Oppressed" movement in Brazil. It was devised to ensure substantial interaction between the audience and the actors, and to enable the actors to portray the views of the audience about the particular issues which were being addressed by the theatrical presentation. In order to take full advantages of the theatre, Newell and his colleagues explored the use of theatre professionals who were experienced in Forum Theatre techniques - actors, script writers and directors.

A script writer conducts detailed research on the subject area and produces a series of short plays which address the important issues to be discussed, but within a narrative style, with the emotional content and tension essential to good drama. In general, these scripts have a 'beginning' and 'middle' but no 'end'. In live Forum Theatre, the play is performed and, when it reaches the end of the scripted section, the audience encouraged by a trained facilitator to address the issues of the character's different motivations and emotions. The ideas that the audience - the "forum" – produce are then instantiated by the actors, who extemporize on the basis of suggestions from the audience. In this way, the audience essentially direct the rest of the play, and can see the effects of their suggestions acted out. Live theatre also allows replay of scenes - should the audience change their minds on the basis of what has occurred.

In collaboration with the Foxtrot Theatre Company, McKenna et al (2003) used a version of this technique within the requirements gathering phase of a project developing a video camera based 'fall' monitor and detector for older people in their homes. The script writer (now Leverhulme Artist in Residence in the School of Computing at Dundee University). produced four short scenarios, two involving an older person falling,and two which addressed the issues of false alarms. The scenarios were written in a narrative rather than documentary style. They thus contained 'human interest', humour, and dramatic tension as well as illustrating how the system may work, the errors which could occur in its use, and the effects of these errors on the participants. Each scenario lasted approximately five minutes, which typically leads to about twenty minutes of discussion. Videos were produced of various scenarios using professional actors. In the style of Forum Theatre, the videos contained 'stopping points' where the video was stopped and discussion among the audience encouraged.

McKenna et al (2003), reports that that the dramatized scenarios provided an excellent way of setting a shared context for discussions between potential users and designers, focused discussion on specific scenarios of likely system usage, and were very effective in provoking discussion of relevant details because elderly users could imagine themselves within the scenarios shown in the video.

These results confirm the comments made by Sato & Salvador (1999) that human centred stories lead to a more detailed discussion, and that the drama provides a point of contact which makes their evaluative task much easier. Strom (2003) also comments that human centred stories, which explore problems via conflict, can lead to a more detailed discussion. He reports that he found it difficult to combine large or dramatic consequences with the exploration of an interface, but this was not an issue with McKenna et al (2003)'s research. Similar techniques were used as part of the UTOPIA (Usable Technology for Older People: Inclusive and Appropriate) project, whose primary aim was to develop techniques for changing the mind sets of designers concerning the needs of older people. (Dickinson et al. 2002). This project culminated in the production of the UTOPIA Trilogy, a series of videos addressing issues of older people's use of technology (Carmichael et al. 2005). Overall these videos were found to be a very useful method for provoking discussion and one which potential users find interesting and enjoyable. This ensured that user requirements were explored effectively early in the design cycle.

Newell, Carmichael et al. (2006) believe the success of these experiments were in large part due to the videos being narrative based – that is they illustrated how the equipment would work within interesting story lines, with all the characteristics of a good narrative - and to the quality of the actors, who were all professions experienced in Forum Theatre. This confirms the claims made by Grudin (2006) that "(actors) build representations of fictional people whose responses one wishes to anticipate through immersion in realistic detail", that "theatre encourages discussion on a 'what if' basis, that "models of fictional people can be as engaging as models of real people", and that "fiction, based on research, can communicate useful knowledge".

Although these videos were very successful, Newell, Carmichael et al. (2006) suggests that that live forum theatre could be a very appropriate methodology for a wider range of tasks within user centred design. Although video is re-usable and thus a cost effective way of communicating with a large number of people, Sato & Salvador (1999) comment that video is neither quick nor inexpensive to produce, and that live theatre involves a larger part of visual field of audience, and the audience themselves can become the authors. In addition they comment that "Live performers cast a spell over the room; there was a heightened awareness and tension, and live actors can produce engaging and interactive experience". They reported that the audience answered questions more effectively and efficiently, than if the session focussed on technical details. Dishman (2003) and others have used actors in unscripted live drama to address design requirements for older adults. Dishman calls this "informance design",

Newell and his colleagues are thus experimenting with live performances and in Newell, Carmichael et al. (2006) discuss the pros of cons of this activity. Although the use of actors may not be wholly appropriate for very detailed evaluations of user interface, they describe the advantages both when a more holistic approach is required, and for very novel design briefs where an entirely new technology is being developed. They comments that script writers and actors are trained as professional observers of human behaviour and their skill is presenting that behaviour in a way which engages the

viewer/audience. In addition, they suggest that actors could also be valuable in usability testing by encouraging dialogue between the audience. Wixon (2003) notes that "it is no accident that most usability testing involves encouraging entire design teams to watch the test, and it is well known that much of the effectiveness of the test comes from this active participation". In traditional usability laboratories, however, a two way mirror provides a major barrier to any communication between users and designers. The use of actors also removes the ethical problems of "protecting the users", and it is possible to envisage a situation where the designers and the users have can verbally attack one another as part of addressing the usability issues of a particular system – a situation which would be impossible, and probably unethical, in a traditional usability laboratory. Actors can also present a more generic picture of a user and can change their personas in response to requests from the designers (e.g. what would happen if you were older, if your sight/hearing was impaired, if you were under pressure?).

Finally theatre encourages a creative approach to design, involving users as well as designers, rather than the traditional view of focus groups and usability testing being solely a method of eliciting users views and opinions and to determine their abilities to use specific interfaces and systems

Conclusions

It is essential that the voices of users are heard in the design process, but this provides significant challenges when the user population contains older and/or disabled users. Not only does this provide a much more diverse population than most traditional user groups, but there are also communication challenges caused, not only by sensory loss, but also by, culture, language and attitudes to technology. In addition there can be major ethical problems in dealing with such groups. All these effects can lead to the data from such interactions being flawed.

There are ways in which such effects can be minimised, and it is recommended that the users are considered to be part of the development team rather than subjects who views are sort without any real engagement in the development process, or are merely monitored in their user of equipment. In addition, for older users in particular, it is important that the interactions between them and the designers are set within an enjoyable social experience.

The use of professional actors and live theatre should also be considered as a way of facilitating discussions with users, or in those cases where it is too difficult or inappropriate to involve real users in experiments and dialogues. Although not an inexpensive option, the value which can be brought to the interaction by theatre professions can be very significant.

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