LONG PAPER

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Early user involvement in the development of information technology-related products for older people

Abstract The UTOPIA project (Usable Technology for Older People—Inclusive and Appropriate) is focused on developing effective methods for the early involvement of older people in the development of information technology-related products for people aged 60 and over, and on providing industry with tools to assist in the development of information technology products for such older people. 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. Our experiences with eliciting information from groups of older people about technology is described, together with a report on seminars for Scottish industry designed to raise an awareness of these issues.

Keywords Older people · Technology ·
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1 Introduction

Information and communications technology (ICT) is increasingly used by, and perceived as useful for, a diverse group of "non-typical" users, including older and disabled people. Although the vital importance of ensuring that the technology produced is both usable

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and appropriate for these groups has been widely researched, recognition of the importance of such factors is only now beginning to influence mainstream usability studies [26].

An exploratory phase is essential in the development of new ICT products; during such a phase, the need for products and solutions is identified, and appropriate concepts addressing this need are developed [35]. Eliciting requirements from older people, who often have limited experience of ICT, for products which do not yet exist, poses unique problems. Established technology-development techniques, such as methods used in HCI or user centred design, address some but not all of these problems, while existing human-centred research methodologies, such as those used in psychological and social research, address others. The adaptation of some such techniques to address the special issues involved in developing ICT for older people is explored in this paper.

1.1 Background

The 2001 census shows that, for the first time in the UK, people aged 60 and over outnumber those under 16 [31]. The trend of an ageing population is predicted to continue [14], and has important social and economic repercussions, which have been recognized by the UK government and the Scottish Executive (see, for example, [7, 8, 22, 36, 39]).

The social and economic pressures caused by the increasing numbers of older people will present both challenges and opportunities for those involved in technology development. Firstly, there is the challenge to make products accessible to, and usable by, older people; secondly, the increasing numbers of active older people provide opportunities for the development of specialized systems for older people, who have more leisure time than most of the rest of the population. In addition, the number of the "oldest old" (those over 80) is growing more quickly than that of all the other segments of the population. This growth will cause a large

increase in the cost of social care, unless technological solutions can be found to enable people to stay in their own homes for longer. Finally, there are legislative requirements for systems which are accessible to older and disabled people. The UK Disability Discrimination Act requires that "reasonable steps" are taken to ensure that systems are accessible to people with disabilities [34], and similar legislation has been enacted in the USA and other countries.

The need to develop technology for older people is driven by practical economic considerations, as well as moral and legal necessities. Many of the over-60s possess significant wealth, with people over 60 on average having more wealth than people under 40 regardless of income [1], and this distribution of wealth (which peaks in the late 60s) remains true when pensions and housing wealth are disregarded [2]. Some research also suggests that older age groups are more inclined to spend their money than younger cohorts [38]. Although there is considerable inequality within the over-60 age group, these figures indicate the existence of a large and wealthy potential market currently neglected by industry. In addition, as the number of "older old" increases, there will be a growing market, driven by government and private care providers, for assistive technologies [3].

Despite these economic realities, industry has not yet realized the significant benefits of accessible design [19], and most organisations continue to produce products that are primarily aimed at the youth market. This may be due to ignorance of the demographic realities, but also to the genuine difficulty of developing appropriate technology for such a target group. Keates argues that the typical researcher or developer finds it easier to design for someone like themselves [18], and young developers may find it difficult to fully understand the day-to-day impact of age-related impairments. In addition, older people may also have significantly different needs, priorities and expectations than young people.

If we are to design products which are suitable for, and usable by, older people, it is essential that researchers and developers are aware of effective methods for interacting with, and obtaining high quality data from, older people. Such methods will enable us to learn from older people what functionality and attributes are important to them in new products, what motivates them to use a product, and what factors would hinder the usability of a proposed product, as well as to conceptualise how parts of older people's lives could be improved by technology. It is also important to be aware of the context provided by older people's lives, and to discover when technology should be introduced and when its introduction would have a negative effect on the older person's quality of life.

Existing methodologies are only partly appropriate for achieving these goals. Traditional methods of user centered design need to be adapted if they are to enable researchers to effectively elicit requirements from older people. Similarly, many HCI methods focus more on gathering requirements for a specific project, and are less useful when the product has not yet been defined. Ethnographically-informed methods provide the researcher with vital data about people's lives and help to identify niches for new products, but they contribute less in an area like ICT because for many older people this is a wholly unfamiliar area. Methods from the social sciences and psychology provide guidelines for eliciting information from a wide range of people, but cover few of the specific issues relating to the development of ICT products.

The cultural and experiential gap between researchers and older people can be especially large when developing information technology products and other new technology [6]. While research exists that recognizes the difficulties of communication between researchers and users (for example, [29]), these problems can be much more acute when the target users are older people. Many older people have had little exposure to computers, while younger people may find it difficult to imagine life without technology. Also, people who are accustomed to older technologies also may not be aware of the possibilities of new technologies, which can severely limit their ability to contribute actively to a discussion. Such a culture gap can lead to the situation where developers make products solely based on their own interpretation of the older person's needs, a solution that can be ineffective and patronizing.

Classifying "older people" as a single separate group also implies homogeneity, and may lead to a narrow stereotyping of the potential user. In fact, diversity among older people is larger than among other age groups, and abilities may vary widely through time, even for the same person [12, 13]. Newell and Gregor [25] thus suggested that a "user sensitive inclusive design" process would be more appropriate than a conventional user centered design process for those seeking to develop products for older people.

Recognizing the need to address the challenges of designing information technology equipment for older people, a group of four Scottish universities (Dundee, Abertay, Glasgow and Napier) have established the UTOPIA (Usable Technology for Older People: Inclusive and Appropriate) consortium. The purpose of the consortium is:

- to alert academia and industry to the necessity of designing accessible and useful technology for older people,
- to develop tools for including the needs and wants of older people in the development of information technology products, and
- to ensure that these tools are widely disseminated.

1.2 The approach

The UTOPIA project addresses two central questions:

- How can we include older people most effectively in the development process?

– What is different about older people and their relationship with technology?

The provision of tools to enable others to design usable and appropriate technology for older people involves several aspects requiring research:

– The development of a methodology to instantiate a "user sensitive inclusive design" process with older people, which includes identification of techniques for eliciting information from the target user group, and strategies for involving older users throughout the development process.
– The exploration of older people's lives and how they relate to technology, and using the resulting information to inform design processes.
– The identification and evaluation of appropriate applications and application areas, together with detailed information about how older people relate to these areas.
– The production of guidelines, patterns or advice for use when designing products and interfaces for older people.

1.3 Strategies for working with older people

User sensitive design requires the successful recruitment of an appropriate group of older people, but this can provide different challenges to that of recruiting cohorts of younger people. Many older people live a relatively isolated existence; they may have significantly reduced mobility, and spend much more time in the home than most working people. It is necessary to commit a great deal of effort to recruiting potential older users. The process of recruiting UTOPIA volunteers involved developing particular avenues through which to reach potential participants, including contacts via old people's clubs and day centers, as well as chains of personal contacts. Because of the diversity of the user group, care needs to be taken in the sampling process to ensure that a particular characteristic, such as a poor representation of housebound people, does not unintentionally bias the responses.

2 Forming a research partnership with older people

The UTOPIA project has made contact with a diverse range of older people and developed a database of over 160 individuals and 24 groups. We focused on ensuring diversity in aspects such as demographics (age, gender, class), experience with technology (for example, computer users, novices), and inclusion of specific groups (individuals who have specific difficulties, for example, mobility, speech problems). Our cohort is thus a diverse and representative sample including people from many different backgrounds, with various life experiences, ranging from information technology literate people

living at home to people in day centers who have never used a computer. The process of forming a research partnership with older people has several stages, and it is important not only to contact and gain access to a wide range of potential volunteers, but also to interest them in the project and to maintain this interest in the longer term.

2.1 The initial contact

The first stage of the development of a research partnership was the contacting of older people; we began this process by contacting a range of Scottish organizations who work with older people and who were able to distribute our letters to their members or contacts. The organizations contacted included:

1. Charity organizations, for example, Help the Aged (http://www.helptheaged.org.uk), University of the Third Age (http://www.u3a.org.uk), Alzheimer Scotland (http://www.alzscot.org), Age Concern (http://www.ageconcernscotland.org.uk)
2. Educational establishments, for example colleges and universities with special classes for older people
3. Community organizations, for example neighborhood community centers and libraries
4. Sheltered housing complexes/residential homes
5. Church groups, for example women's guild groups
6. Social clubs, for example, over 50 clubs, stroke groups
7. Day centers

Initial contact with these organizations was made through mail shots and telephone calls. These initial exchanges were backed up with UTOPIA publicity material, and followed up by a visit to the organization, where concerns such as the aims and length of the project, the members' involvement and what the project could offer that would be of benefit to members were discussed.

Other more opportunistic methods of contacting older people were also used, for example a researcher attended an "Old People's Club Coffee Morning" in a small town with a large population of older adults. The resulting contacts were excellent. Through this initial contact, the researcher gained access to a sheltered housing day center (which provided access to the frailer, oldest old age group), a local women's guild group and to the old people's club which had organized the coffee morning.

Most organizations and groups were enthusiastic about giving the project team access to their members. They commented that being asked to contribute to the project would serve a useful purpose of introducing a new and interesting topic to the group's program, as well as providing opportunities for individuals to interact with outsiders. The organizer of a stroke group, for example, commented that "I am always happy to meet people who would like to come along to the groups.

I think that it is very important that people with disabilities are not excluded and also, that they are kept informed about what is going on in the 'real' world. I believe that it is very good for their self-esteem and self-respect to be asked their opinion and that to be included actually benefits their self-confidence." Enthusiastic and interested organizers encouraging active participation by their members were very valuable to the research.

Introductory presentations were used to promote the project to potential participants. These presentations focused on the aims of the project, the preliminary ideas for research projects and how people could get involved. Several "tailored" presentations were produced for use with groups with different abilities or interests. The standard presentation for a group of inactive "older old" focused on how technology could assist older people, using examples of technology including memory devices and sensors under the floor in residential homes. These examples were not used in presentations for active older people, as they were not perceived as relevant by such groups and, indeed, were sometimes perceived as inappropriate. This emphasizes the need to carefully match discussion topics to particular groups. A shortened presentation was prepared for stroke groups because of concerns about concentration problems. Presentations to computer-literate groups elaborated more on the technical issues. Due to logistics and other aspects, such as the age and impairment of individuals, Microsoft PowerPoint presentations were not always feasible, and more informal information exchange was used. An interactive presentation format, with researcher putting questions to the group during the presentation, was often more satisfying for the audience.

2.2 Maintaining and extending the relationship

It was extremely important to nurture contacts with organizations and individual users, as disillusionment and waning interest could occur if there was a delay between the initial contact and any particular project activity. We thus distributed a quarterly newsletter to all contacts, which generated a number of requests for help with technology. Personal visits were made to these individuals. This kept users interested, and helped in the development of loyalty to the project. Although these personal visits could be time-consuming, both researcher and user benefited, with the user solving the technological problem, and the researcher gaining insights into problems and issues of concern for the older adult. Contact with organizations was maintained by occasional visits to establishments, and in some cases small contributions were made to the group (money or a gift, for example, a prize for bingo, biscuits at Christmas).

The care taken with promoting good relationships with users had the advantage that some users became involved in the project at a higher level. For example, one lady was very pleased to speak on behalf of older users at a seminar for Scottish industry. Another user volunteered to administer one of the project's questionnaires to her contacts.

2.3 Methods of eliciting information

Once older users have been recruited, they need to be involved in the design and development process, but traditional methodologies are often inappropriate [21, 26]. Challenges arise due to participants' decreasing abilities and lack of technology-related knowledge, and modifications may be necessary to address sensitive topics and different motivations.

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 these reports [28]. In addition, challenges may arise because older people tend to tire more quickly [17], and this can severely limit the duration of sessions.

Some of the information we 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 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" [32].

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?" [17]. Sensitivity and an awareness of users' motivations for participating are important considerations in working successfully with older people. For example, we and Lines and Hone [21] have found that it is not easy to keep a focus group of older people focused on the subject being discussed. We 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.

Thus, following the initial contact, a variety of interaction formats were employed to gather data. These included methods such as those described in the literature on human computer interaction (for example [29]), ranging from paper questionnaires to one-to-one interviews, but we often had to adapt "traditional" methods to create more effective strategies for eliciting information from our target audience. The use of a wide range of strategies allowed us to evaluate the methods in terms of their efficacy and appropriateness. These methods were initially exploratory, gathering quantitative data through questionnaires, and more qualitative data through questionnaires, interviews and focus groups.

2.3.1 Questionnaires

A questionnaire about experiences with technology (the technology and lifestyle questionnaire) was distributed to older adults across Scotland. We used various methods of convenience sampling, including distribution through organisations and chains of personal contacts. The questionnaire was designed to obtain both quantitative data, with questions on issues like the use or non-use of technologies, and qualitative data with open questions on problems and experiences with technology. The questionnaire therefore comprised both closed multiple-choice and open-ended questions on the use of a range of everyday technology and computers, and space was available for comments. In total, questionnaires were received from 353 participants over the age of 50; 74% of these were self-administered, while 26% were administered in a semi-structured interview, where the researcher was able to discuss issues more in-depth. [10].

When questionnaires were personally administered by researchers, spontaneous excursions into users' own experiences and demonstrations of various personal devices were relatively common, and provided many useful insights. For example, those in the oldest age group would often talk about the safety alarms they carried around, reporting design problems, such as their being too bulky or showing through their blouses.

Other, smaller, questionnaires were used in conjunction with focus groups and workshops (see below) to gain background information on users and measure changes (e.g., in attitude) on the basis of their experience of the group meeting. These were distributed at the beginning and end of workshops, and, where necessary, facilitators assisted in their completion.

In addition to the above questionnaires, we are developing a "computer attitude scale" for older people. Although there are many validated computer attitude scales available, many of these have been developed with student populations and contain items which are irrelevant or inappropriate for older adults. The UTOPIA computer attitude scale combines appropriate items from existing scales with new items derived from discussions with older adults, and will be a more reliable measure of attitude.

Recent research shows that there are age differences in the way older and younger people respond in self reports [28], such as questionnaire surveys. 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 [28]. In order to encourage participants to select a positive or negative response, we specifically excluded a "don't know" response. This was thwarted by some respondents, who asked why there was no "don't know" column, and a number penciled in their own "don't know" column. Other evidence of "cautious" behavior included respondents refusing to offer any response to questions.

We have found that the best way of addressing this reluctance is for a researcher to administer the questionnaire directly. This solution is clearly unrealistic for large-scale surveys. Potential solutions may include increasing the documentation sent to each user with the survey questionnaire, explaining each question more fully. A more powerful solution would be computer interviewing, where additional support and information can be given to the respondent as they need it, and respondents potentially could be prompted with additional information if they answered "don't know" to many questions.

2.3.2 Focus groups

Seven focus groups have been held at a range of locations, including a day center, a lunch club, a church coffee morning and at locations within the universities involved. Groups varied in size from five to seven participants. The topics covered included technology, memory, leisure activities, shopping, transport and falls.

Other difficulties involved in successfully eliciting requirements from focus groups of older people have been described in detail in [21].

The lack of confidence felt by many older people about technology meant that it was important to provide an atmosphere within focus groups encouraging participants to value their own opinions, express themselves honestly, and enjoy their experience. At the beginning of focus groups, we explained the research process to everybody involved, and clarified the role of the different parties. It was important to make the participants aware of their expertise (for example, life experiences), and of how valuable their contribution was to the project.

We presented the focus group activity as a social event by providing refreshments and time for social interaction, both among the participants and between participants and researchers. We found that the enjoyment that people get from learning about new products and technologies is an important motivation to participate, and to offer to participate in the future. Designated social times also ensured that the discussions themselves were more focused.

2.3.3 Workshops

Two workshops have been conducted in which the participants were able to examine and experience new technology through a combination of hands-on activities and information presentation. The first workshop had 12 participants and concentrated on computer games. This included experience with current games together with one-to-one chats about design styles, using a number of paper designs. The second workshop, with

two groups of three to five participants, focused on instant messaging. This workshop started with a focus group which discussed participants' current modes of communication, non-technological as well as technological. This focus group further explored participant's communication networks, that is, who they communicated with, with what frequency and with what mode of communication. This was followed by a presentation on communication technologies in which the participants were able to try out these technologies for themselves.

As with focus groups it is important for researchers to emphasize the need for honest and critical evaluation. Older people were often reluctant to complain or criticize products and participants often asked if the researchers themselves had developed the software before making a negative comment.

2.3.4 Interviews

Older people, particularly those who are disabled or frail, are likely to spend more time in their homes than do most younger, working-age people. This group, for whom suitable and usable home-based technologies may be of tremendous use, are also more vulnerable to potential negative effects from the introduction of inappropriate technologies, and thus the stability of the home environment is of particular importance. The introduction of inappropriate technology into their home can dramatically alter the life of a vulnerable older person, especially if the installation is time-consuming and disruptive [30]. Monk and Baxter have suggested the concept of "seriously bad outcomes" (SBOs), like loneliness or discrimination in this context [24].

A useful tool to overcome many of the problems of "traditional" requirements gathering with older people, and to ensure that any technology introduced is appropriate, is in-home observations and interviews [5]. 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.

Eighteen semi-structured interviews were held, usually with a single person in his own home. They lasted between 30 and 90 minutes, and, where appropriate, were followed by a longer informal chat. While some interviews were carried out independently of other information-gathering techniques, others developed from the administration of the questionnaire on technology use described above, followed by discussions on a wide range of topics including general technology, computer use, learning and support issues, memory, transport and leisure activities. These in-home interviews were found to be an excellent means of discovering information about general issues, as the interviewer could tailor the approach to the individual concerned. Where interviewees knew little about technology, specific examples of the relevant technology were sometimes demonstrated to avoid confusion caused by unfamiliar terms.

In-home interviews also 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. For example, a closed question about mobile phones would, on occasion, evoke further discussion with a demonstration of the user's own mobile phone. The researcher would then observe the user in action with their mobile, and see, for example, if they used all of the functions available and what problems they had, and probing further, asking what they liked about it, why they did not use it or why they had felt the need to buy one.

These sessions also provided the opportunity to see how a device fitted into the user's life. For instance, one respondent only used his mobile phone when he was visiting his sister who had no land line. His use of the mobile phone was therefore confined to a very specific context, and did not replace the normal telephone. On another occasion, a woman sitting in a chair casually dropped her phone and used her walking stick to recover it from the floor, which seemed to be a very normal and recurring event for her. The same woman when handed a small modern phone, did not complain about the size of the buttons, as we would have expected, but said that she would like a smaller phone as it would fit in her pocket as her paralyzed shoulder prevented her using a handbag.

3 Older people and technology

A number of additional problems in eliciting information about technology have been noted, and these have been addressed in a variety of ways.

3.1 Inexperience with modern technologies

Evidence from the technology and lifestyle questionnaire [10] confirms stereotypes that older people are less likely than younger people to use technology. This is also true within the population surveyed: people in their fifties are far more likely to be technology users than those in their eighties. However, this pattern is not consistently true for all technologies. Radios, videos, CD players, computers, mobile phones, teletext, personal stereos, cable television, text messaging, DVDs, interactive television and the internet through television, show a significant decrease in use with age (Chi squared at $p < 0.05$ or $p < 0.01$). More "everyday" technologies, such as telephones, televisions and microwaves did not, however, show a significant decline. These data confirm other studies that have examined this age group (e.g., [20]).

The perceived usefulness of a technology is a key reason for these differences, but other reasons may include the technology's age, its cost in money and time, the amount of effort required to learn to use it, and the amount of positive feedback from others [15]. In par-

ticular, we found that a technology's age was a significant factor in the use of telecommunications and radio and TV equipment by older people. For example, among the telecommunications equipment surveyed, a significant decrease in use with decreasing technology age was observed (one-sample proportions tests at $p < 0.01$). A more ambiguous result was the effect of technology complexity. We hypothesized that this would influence use as complexity can greatly affect usability [27] and many of the comments in the questionnaires referred to psychological barriers related to complexity. The effect of complexity was harder to discern, as it depends heavily on the particular equipment and use. However, the relative popularity of videos compared to teletext and cable television indicated that decreased complexity does not always result in increased use. The relationship between technology use and complexity is a trend requiring further investigation.

3.2 Attitudes towards technology

While evidence from the survey questionnaire indicates that older people use technology less than younger people, there is also research which indicates that they are more likely to fear it. Marquie reports that older people can experience more computer anxiety, and be more negative about the amount of effort required to learn to use a computer, which is often fuelled by the assumption that they have no use for it [23]. Any such discomfort is likely to affect the contribution that this person makes to the design process if these issues are not recognised and resolved. An additional problem is that older people often regard this fear or perception of complexity as the fault of the user (themselves) and not as a failure in the design of the technology.

Qualitative data from interviews and questionnaires contain many examples of older people's negative self-efficacy and the feeling of being too old for new technology was mentioned several times. People made comments like "[I am] too old to bother with more modern things" and "I am too old to learn new tricks". Some of the older people we have interviewed have entrenched beliefs about their inability to operate new technology. An interviewee laughingly said, "Takes brains. I think my brains have gone now." During a home visit another woman demonstrated her use of television-based e-mail (which involved using a keyboard and remote control) but, when asked about using a computer, responded that she could never use a PC.

3.3 Learning and support problems

People who had had a bad experience when computers were introduced into the workplace exhibited the most negative attitudes towards computers. Selwyn describes "operational anxiety", where the anxiety of users is rooted in negative experiences with computers at a time when systems tended to be far less "user friendly" [33]. One of our interviewees was a retired teacher, with very negative feelings towards computers and general technology, who described his experiences when computers were introduced into his classroom, and reported how he had been made to feel inadequate through lack of appropriate training and resources.

The subject of learning to use technology came up spontaneously during many of the formal and informal interviews with many older people relating negative experiences with computer classes. They frequently felt left out: "everybody was clicking away and I didn't know how to use the mouse" and explained how the course failed to bring across the potential usefulness of computers for them. They also discussed the need for support; some people had relatives helping them, other people hired expertise on an ad hoc basis, and some benefited from groups such as drop-in cyber cafés for older people. It was clear from interviews and questionnaire comments that even older people who are determined to use computers often find applications and their documentation too complicated, with too much jargon and inadequate support, both during learning and ongoing use [11, 37].

3.4 Interface assumptions

The perceptions that older people have of applications' complexities may be partly explicable in terms of the mismatch between developers' assumptions and older people's knowledge of computing conventions. The cultural differences between older people and expert computer users mean that developers have to be very careful about making assumptions. For example, we found that a lot of older people were unfamiliar with the concepts, visual language and interface metaphors used in computer systems, a scrollbar being an example of a whole repertoire of "widgets" of which older people have limited experience. More specifically, in one game, participants often did not recognize the door as a door. In addition, older people often had to be told basic concepts: for example, when using a Gameboy, they did not realize that they had to steer the little running man. Another example is that of one older user of Microsoft Word who did not understand that he was working on a copy of his document, not on the file itself.

The approach of older people to many software applications indicated a fundamental lack of trust in the system, and a consequent reluctance to experiment. Even experienced older computer users would stick to a learned sequence of actions, although that meant taking an enormous detour to complete an action. This implied that they had very limited understanding of the underlying concepts and the application as a whole, although, from subsequent discussions, it became clear that they were continuously trying to make sense of the application. It was also noted that "speed" was often not as important to older people as "getting the job done" (see also [16]).

The difficulty that some older users faced in understanding the assumptions of the interface are important in enabling developers to design appropriate interfaces for older people. It is important that developers reconsider their preconceptions about what is "normal" or does not need to be stated in applications, provide extensive and accessible help and support, ensure that the interface is intuitive and direct, and maintain consistency throughout the system so that rules or actions learned in one section apply in others.

3.5 Communicating about technology

One of the most off-putting aspects of technology, especially ICT, for older people is the terminology; "computer-speak" is not simply confusing, but can act as a significant barrier both to technology use and to communication about technology. Language and cultural differences can make such communication between younger and older people difficult. Words may have different meanings for different age groups, and technical terms, which may seem normal words to younger people, can be utterly confusing to older non-computer users (e.g., "monitor" or "windows"). Older people spent their formative years when a chip was a piece of wood or cooked potato, hardware was nuts and bolts, a window was made of glass, a monitor was a school prefect and software was not even a word. It is often very difficult to avoid using such language when describing modern technology.

We thus introduced participants to new technologies in a variety of ways, discussing possibilities, and encouraging them to think about their current use of newer and older technology. Bad experiences with jargon and unfamiliar terminology had made many older adults suspicious of talking about technology. One of the ways in which we addressed this was by introducing discussions about technology with a quiz called "Guess the Decade" where participants had to categorize technologies in terms of the decade they had been introduced. This encouraged participants to think about the meaning of the word "technology" and how familiar many technologies are today; it also reminded them that currently "friendly" technologies were unfamiliar and frightening to many people when they were first introduced. This quiz format worked well, due to the fun interactive element and to the reminiscence benefits. A similar process using paper probes, with the images and dates on them but without the "quiz" element, was not as effective.

The most successful techniques for avoiding language problems were hands-on sessions, where older people experienced new technology. These experiences often led to spontaneous suggestions for improvements or for new products, and also laid the foundation for later discussions, providing the older people who took part in the sessions with the background and experience of technology use. The hands-on experience was more helpful in making participants aware of the possibilities of technology than a verbal explanation or demonstration, and often changed their attitude positively. Such sessions did not need to be complex, for example, simply handing round a personal digital assistant (PDA) during a presentation was more effective than words or images, and provoked reactions which stimulated much discussion. A further advantage of hands-on sessions was that they allowed us to observe the difference between what people reported and what actually happened when they interacted with technological objects.

4 Communicating with Industry

Given the alternative techniques described above that make the development of technology for older people more effective, and recognizing the considerable potential market which exists for Scottish industry if it should begin to design properly usable and appropriate technologies for this market segment, one of UTOPIA's aims is to communicate this to industry.

4.1 Current industry perceptions

Despite the achievements of a few companies (British Telecom, OXO—see http://www.oxo.com/home.html) who have successfully realized that financial considerations make it necessary to consider older people as well as younger age groups [4], there is evidence that these companies represent a far-sighted minority and not the average. Keates et al. report that in a survey of FTSE 100 companies fewer than a third took user age into consideration when designing a new product and only 37% "aim to produce products for the over 50s" [19].

In order to increase awareness within Scottish industry of the opportunities provided by demographic trends, the UTOPIA project ran two seminars on technology for older people aimed at industry representatives in Scotland. These seminars were designed to alert Scottish industry to the demographic and financial realities which would soon make it necessary for them to pay more attention to design for people over 60. They included an overview of demographic change, technology for older people, the work of UTOPIA, a presentation on the legal necessity for accessible design, and a presentation on the financial benefits of usable website design. Older computer users also contributed to the workshop.

A considerable proportion of the businesses contacted about these seminars declared that they had "no interest" in design for older people; others doubted there was anything new to learn about information technology, whilst others questioned that there was any validity in designing for older people who, anyway, did not use technology. A few businesses were keen to send representatives but were a small minority of those we contacted.

4.2 Feedback from Industry Workshops

The results from an evaluation questionnaire about the seminar indicate that the topics raised at the seminar had encouraged members of the audience to take action; 80% of those who responded stated that they had been "prompted to further action". It was clear, however, that the organizations, which attended the seminars, were atypical, as 88% of respondents reported that their organizations considered older people "occasionally" or more frequently.

It became clear, however, that many of the respondents had a relatively stereotypical view of older people and did not fully comprehend the diversity of this section of the population. In answer to the question "does your company subdivide the older population?" more than 60% of respondents to the question responded "no". Thus, although the organizations, which sent representatives to the UTOPIA seminars, were anxious to consider older people in design, they did not seem to have registered the diversity of the older population, suggesting that even for these progressive companies more education is necessary.

It is a hopeful sign that most attendees felt the seminar had prompted them to further action, but the most effective way we have found to communicate with industry has been through video. We have produced a video of an older lady, who had suffered a stroke, talking about her use of mobile phones and computers. This has been requested by a major mobile phone manufacturer whose representative attended one of the industry workshops, and has been shown throughout the management structure. More individual stories shown in a short, entertaining and transportable presentation like a video are likely to be more effective than many other methods.

5 Summary and conclusions

Several key results have emerged from these early stages of our investigation of technology and older people. Technology use in general declines with age, but the use of more established and, possibly, easier-to-use technology declines less rapidly. If older people have a positive attitude towards technology in general, they will be more likely to use a specific device, but this is unlikely to happen unless the usefulness of the device is clearly communicated. Negative attitudes are caused by a variety of factors: popular perception of age and technology, lack of awareness of technology, the feeling that technology is not useful to older people and the feeling that it is too difficult to use by them. All of these present challenges to product designers and developers.

This research has underlined the importance of careful consideration of the details of interactions with older people, and in particular of ensuring that:

- the purpose of events and the role of the participants is clearly explained in terms they fully understand,
- words used to describe the design process and the technologies are understandable,
- interactive hands-on elements are used wherever possible as part of the data gathering process, and,
- the social nature of group meetings is encouraged.

The approaches we have adopted to eliciting technology have been found to provide a wide variety of data which will form part of a practical tool kit to improve design of information technology products for older people. The use of these techniques often prompted people to give us answers to questions we were not asking, and to ask us for solutions and functionality we had not thought of. This information, we believed, can inspire researchers to develop innovative products that really can and will be used by older people.

By providing industry with this information in a format that is both effective and easily absorbed will encourage the development of genuinely usable ICT products. The next industry workshops will focus more on specific issues related to the provision of usable technology, and will include the development of usable mobile phones with a major mobile phone manufacturer.

In this paper the current state of the UTOPIA project has been described. The project is ongoing and the exploration of methodological approaches continues. Building on the success of hands-on methods, further methodological approaches will be explored, including "cultural probes" to attain in-depth, qualitative data about the use of specific technologies, and electronic methods of requirements gathering, comparing the data gathered using computer mediated communication with that resulting from face to face discussions.

We are extending our hands-on sessions evaluating existing technology products to a wider audience, including people who cannot travel to workshops. This will include people who are housebound, as well as small groups in sheltered housing or residential homes. The analysis of the data from the technology and lifestyle questionnaire is continuing and other smaller questionnaires are being developed, focusing on specific interface problems identified in the survey questionnaire.

Methodological approaches will be tested through the development of example systems: a navigation aid to support people finding their way through unfamiliar areas [9]; a collaborative online support and learning space for older people; artificial companionship for the frail elderly and the continued critique and iterative improvements of current personal computer interfaces.

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