

Enhancing the contributions of older people to interface design

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D. Hawthorn, Enhancing the contributions of older people to interface design, Gerontechnology 2006; 5(1):4-15. A large part of the design of a recent successful email application for older users came from carefully managing the designer's interactions with the older people who participated in requirements gathering, prototype development and interface testing. The application is briefly described and the results of usability testing are reported to support the claim that the application is successful. The ways of working with older people that made useful contributions to the project are then discussed with the aim of making these approaches available for other designers interested in interface design for older users.

Keywords: aging, interface design

It is argued that there are considerable differences between the experiences, knowledge and capabilities of young or middle aged designers and older computer users. Hence, to bridge this gap, interface design for older users requires ongoing contributions from older people during the design process. The aim of this paper is to discuss ways of enhancing this contribution from older people. This is based on reflections on the author's work with older people during the design of an email application for older users. This involved extensive input from groups of older people during development. The email application, known as SeniorMail, will be briefly outlined and results from usability testing will be presented to indicate that the design succeeded in its aims. The core of the paper then follows looking at ways of managing interaction between designer and older contributors. Here the paper looks at techniques for tempering the designer's assumptions about older people's capabilities, accurately obtaining older people's responses to design prototypes and improving com-

munication between younger designers and older design contributors. The paper concludes by summarizing the recommendations made.

OVERVIEW OF THE EMAIL APPLICATION

The SeniorMail interface incorporates over 100 adaptations designed for older users. These adaptations came from existing work on how aging affects interface design^{1,2,3}, and from observing older people's problems with using Microsoft Outlook Express (MSOE) and prototypes of SeniorMail. The author took a dual role as researcher and designer. Potential solutions to the problems were tried with older users who were part of the design team. After observation and discussion the best solutions were retained and refined in further testing. The email system that emerged from this work with the older design team members emphasized providing a sufficient feature set within a conceptually simple context. A short tour of the SeniorMail system follows, an extended description can be found in a previous paper⁴.

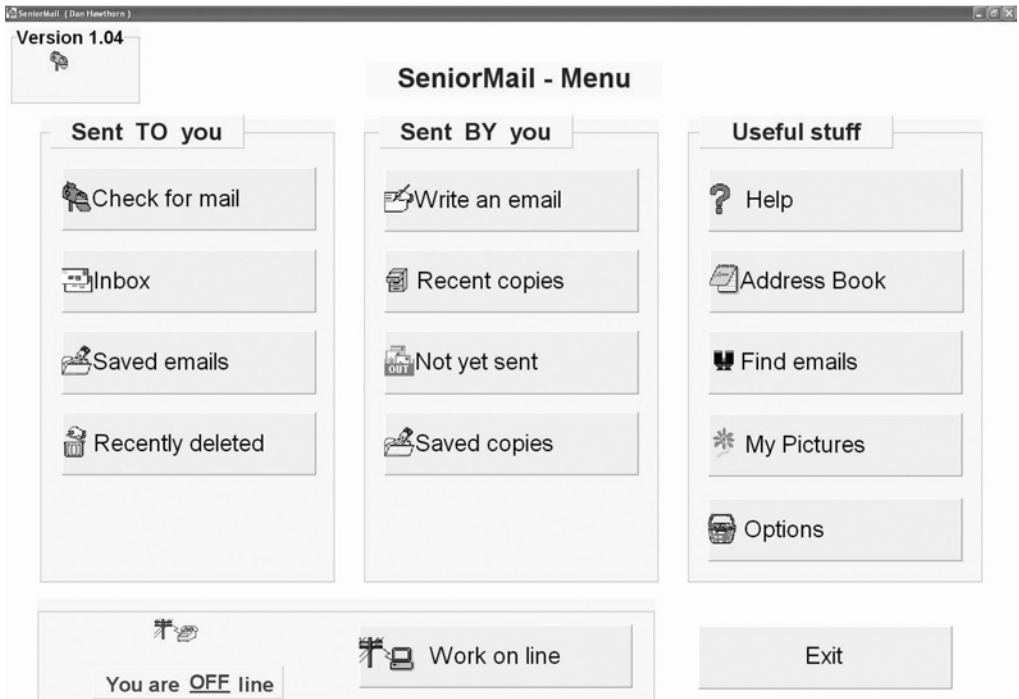


Figure 1. The SeniorMail main menu

Key design differences from MSOE are: A restricted feature set, toolbars designed as memory aids, predefined lists of stored emails rather than user defined folders, simplified and restricted navigation, no drag operations, no double clicking, large fonts and light backgrounds for button text. All the main windows are full screen so that older users did not need to manage window resizing and z-order issues. Windows style menus were not used because of difficulties observed when older users worked with them.

The main screen shown in Figure 1 provided a command button menu, users typically start by using the [Check for mail] button at top left. All lists of stored emails are presented in the format shown in Figure 2.

All screens apart from the main menu used a simple toolbar with a restricted number of options and large toolbar but-

tons. The buttons had large font tool tip information available. This reduced the amount of learning needed in using the system, if one forgets what to do, the overall rule is to move the mouse along the toolbar looking for a suitable button.

Emails were not previewed but opened in a separate viewing window (Figure 3). Navigation was linear, users typically moved outwards from the main menu to an email list, then to the viewer followed by the editor and then back to the list and then the menu. The [Back] or [Menu] button at the right of every toolbar ensured the user could always return to the starting point.

WAS THE DESIGN SUCCESSFUL?

The research design of the SeniorMail study was quasi experimental. The hypothesis was that an interface design that took account of some of older people's known difficulties with perception, motor control and cognition, would

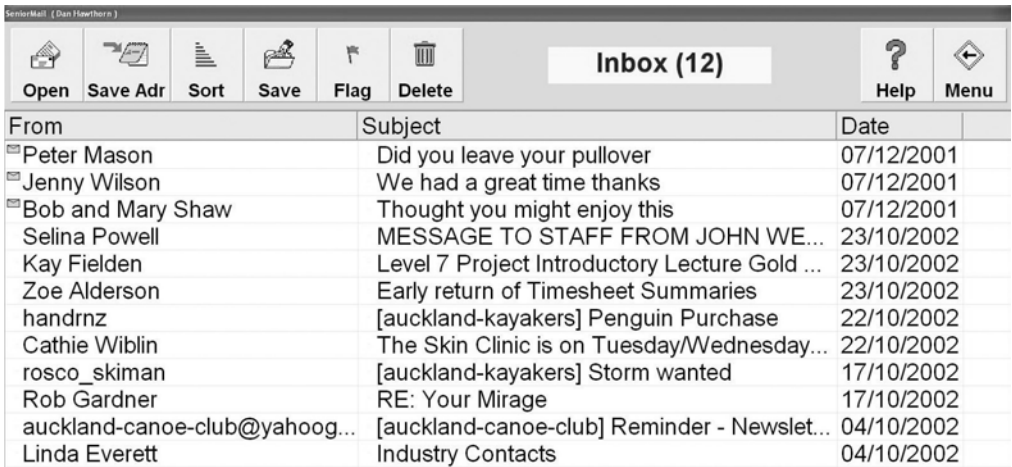


Figure 2. The SeniorMail Inbox showing the tool tip for the [Open] button

achieve a system that allowed older people to be more effective than they are on standard software. Testing of the final system was done with older people who were unable to use MSOE effectively. If testing with this group showed them to be successful on the new system, then since the test subjects provided their own controls, the new system would be shown to be a more effective email system for older people. The implication would be that overall, the interface design approach used and the interface design process adopted were useful in designing for older people. MSOE was chosen as a basis for comparison since, among the older people worked with, it was found to be a universal first choice for attempting to learn email.

After the system satisfied the development group, a usability test was conducted with a group of older people who found MSOE difficult and had not previously been exposed to SeniorMail. Test subjects came from older volunteer staff at a Citizen's Advice Bureau (CAB) who had difficulty in undertaking the part of their job that required dealing with emails using Microsoft Outlook Express. This was in spite of email use being covered in CAB training. The CAB manager identified a group who either avoided the email part of their work or

whose erratic email use caused significant problems. People from this group were asked to take part in evaluating the current version of SeniorMail. The 22 volunteers ranged in age from 60 to 82 (average age 72). 13 did not use email, 9 used email from 1 to 6 times a week but only opened and sent emails, ignoring attachments.

A set of scenarios dealing with basic email tasks was constructed. Tasks included opening and sending attachments and forwarding emails. These tasks went beyond what the usability testing group had previously achieved.

Each test subject was given a five minute introduction to SeniorMail covering the steps of getting emails, reading an email and replying to it. The subject could then ask questions about the use of the system. After this the subject was then asked to carry out the tasks from the scenarios while the researcher observed. Success, failure, time taken and the level of prompting required were recorded. Subjects were asked to rate the email system for ease of use.

Of the 22 subjects in the usability tests, 19 stated that they found the SeniorMail system easy to learn and rated it as excellent. These 19 all completed all

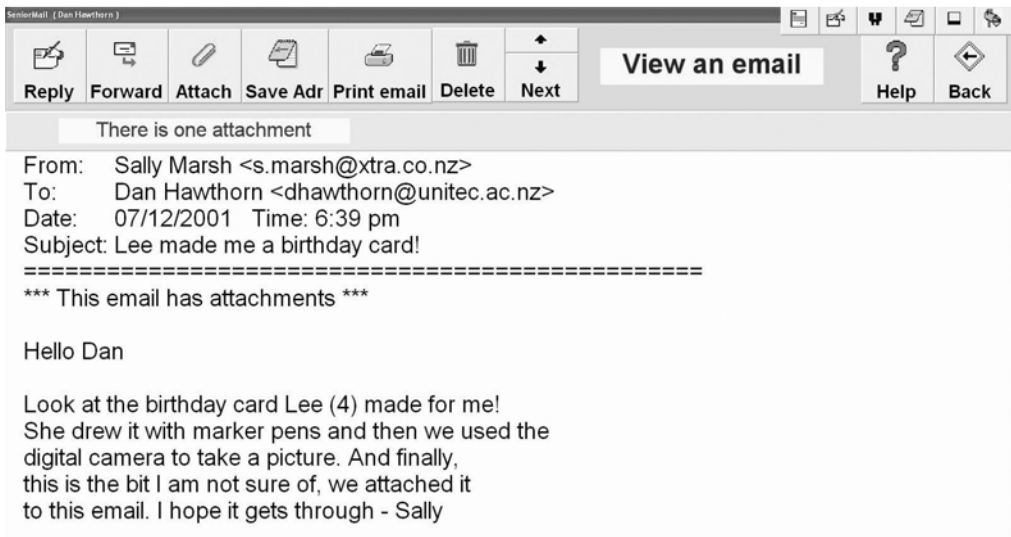


Figure 3. The SeniorMail Viewer Window

the usability tasks with only non-specific prompting in under 40 minutes. Three subjects required extensive directions and would have been unable to proceed independently. Non-specific prompting was where a user did not know how to proceed and the researcher responded with a statement such as, "You want to delete the email, do you see anything that might help you do this". These prompts were deliberately stated in a way that did not direct the user to specific features.

It is argued that these results indicate that the SeniorMail design was effective for older users and hence that the process involved in achieving this design is of interest. It should be noted that previous email training had not worked for the usability test group. Given the very limited initial training in the usability testing sessions, it would seem that the usability test results are due to the application design and not to the additional training provided.

THE ROLE OF OLDER PEOPLE IN THE DESIGN PROCESS

There are at least three components of a successful design for older people; the way in which the design incorporates ad-

aptations to the effects of aging, the way in which those design adaptations are derived and the way in which older users are trained on the application. This paper focuses on deriving design adaptations to aging from the contributions of older people. What we are concerned with here is that designers working in isolation are unlikely to envisage what older people need but that designers may also find it problematic to gain such information from older people. In what follows we are concerned with ways of enhancing the contributions of older people to an interface design.

The process for developing SeniorMail was one that depended on detailed and frequent consultation with older people. The issues involved in making this interaction fruitful may be of interest to other designers in this area. Useful discussion of the involvement of older users in design projects is also to be found in Eisma et al.⁵.

Bridging the designer / user gap

The middle aged author found a significant gap between himself and the older people he worked with. It is likely that similar gaps will also be present for other young or middle aged interface de-

signers. A key concern in the SeniorMail design process is bridging the gap between the designer and the intended older users. The issues that arise include; breaking down one's assumptions of what older users will be capable of, interacting with older people in a way that lets the older people express their ideas, avoiding overloading the older people with interaction that is driven at a pace and with content determined by the designer and making use of appropriate tools for allowing older people to explore possible designs.

In spite of the strictures of User Centered Design, designers still typically design on the basis of an intuitive idea of someone whose knowledge and capabilities are not unlike their own. With older people this implicit assumption of similarity to the designer breaks down. Each of the hundreds of differences between older and younger groups reported in the literature on aging represents a departure from the assumptions a younger designer could reasonably make when designing for young and middle aged people.

However, designers, it seems, do not let go of their implicit assumptions lightly. The experience of those working on the Cybrarian Project⁶, was that *telling* designers of the needs and limitations of older users did not persuade designers to let go of this assumption of a user who would be within their experience of average users. It was only when the Cybrarian designers were exposed to actual older people that the designers' approach changed and it is telling that the designers were shaken by the gap between the older people that they imagined and the actuality. Bluntly, words do not change designers' behavior, experience with older people needs to be a key part of the process for designing for older users.

As a designer one needs some background understanding of the limits that age is likely to put on older user's perceptual, motor and cognitive capabilities. Unfortunately there are so many aspects of aging that, as a set of guidelines, they are likely to overload rather than assist a designer. Further the literature on aging does not generally spell out the consequences of the differences found. Knowing about older people's problems with motor control does not necessarily direct a designer to expect that older people will have difficulty with particular interface features such as Windows menus, scrollbars or double clicking. On the other hand, having observed older people having difficulty with such problems, the research literature helps considerably in interpreting what has been observed. It should be noted that there are now useful summaries of the effects of aging likely to be relevant to designers^{3,4}. These summaries include information about interface design features that older people have trouble with. However, such knowledge does not remove the need for active involvement with older people by designers.

Establishing simple requirements

The SeniorMail project began with requirements analysis. This involved observing older people using standard email systems such as Microsoft Outlook Express as well as talking to them about their successes and difficulties. The picture that emerged was of very limited mastery of a minute part of the available feature set coupled with frequent frustration. In designing for older users the standard techniques such as large fonts and targets, screens with minimal content and a simple system model are easier to achieve if applications provide limited numbers of features. Therefore it was reassuring to find that the older people in the require-

ments phase, used and wished to use, a reasonably small set of features.

The context within which older people use particular applications is also useful information so that the initial investigation was extended to include focus groups with relatives who were supporting older email users. These focus groups indicated that the support burden was much greater than initially expected by the relatives and led to feelings of guilt from both supporters and supported. From this, one of the design aims of SeniorMail was to reduce the amount of support the older users would need. Evidence from groups of long term users of SeniorMail, not reported in this paper, indicates that this aim was achieved.

THE NEED FOR A CREDIBLE INITIAL PROTOTYPE

One of the experiences during this scoping and requirements gathering stage was attempting to discuss possible forms of email systems for older users with small groups of older people in a rest home. These rest home residents were a separate group from the older people the rest of the study is based on. It became very clear that low fidelity prototyping did not work for the rest home residents. In part the details of screen presentation such as font, color and exact location that are typically ignored in low fidelity prototypes can be vital success factors in design for older people. But in addition the older people failed to visualize low fidelity designs as potential programs that they might work with.

When high fidelity designs were tried the rest home residents had a clearer picture of the designs as possible programs but further issues arose. Inevitably the initial designs were not ideal, containing features the rest home residents did not like and features they did

not understand. The older (and slightly confused) people in the rest home groups responded to the experience with the high fidelity designs with the belief that they would be asked to switch to these less than ideal programs. They did not want to do this.

Another aspect of difficulty with this group was where the researcher had to perform additional work to change from one part of a high fidelity prototype to another. The older people did not distinguish between action the researcher/designer took to bring new parts of a high fidelity prototype into view and the actions that would be part of using the eventual system. In spite of being told that the actions by the researcher would not be part of the final system, what the older people saw was that to get from screen A to screen B one had to do some complex and fancy fiddling, the older people wanted no part of this.

A final issue in the rest home group was strong reluctance to let go of the familiarity that they had with the email systems they used, this was in spite of the fact that their level of achievement with these systems was negligible. Typical was one man who had never at any stage been able to send an email using MSOE without full, step by step, assistance, who none the less was unwilling to abandon Outlook Express because, "That's the one I know". Further work with the rest home groups was not pursued because of the resistance to involvement with the new system caused by these initial impressions.

The rest home groups had done valuable service in winnowing out bad design ideas but one does not want to do this essential step at the cost of alienating a group of older volunteers. It may be that it is unwise to do initial design work with older people at this

level of impairment or it may be that with more experience a designer could develop better skills in managing the impressions that these older people gained about the likely project outcomes. It was decided to work with more able older users but the issues of needing high fidelity prototypes and being uncertain of the difference between prototype manipulation and the content of the final system were still observable with this group.

After the work with the rest home group it was possible to construct a basic working prototype and subsequent work with older volunteers was used to refine this. Numerous writers on interface design such as Preece et al.⁷ correctly point out that designing from working prototypes in the early stages of design restricts the designer and reduces the range of design possibilities they can explore. Creating a working prototype slows the designer as code is much, much slower to write and to modify than are low fidelity designs. There is also the concern that designers using a working prototype are likely to be captured by pride in the product that they have created and by concern that changes will involve the developer in further extensive re-coding. As Cooper and Reimann⁸ argue strongly, both premature pride in a prototype and interest in coding ease indicate that the design process is being captured by concerns that do not relate to the needs of the users of the interface.

The author's experiences in the Senior-Mail project and previous projects for older users suggest that, when designing for older users, having older people use an initial credible working prototype in the early stages of design is valuable, having older users imagine their use of even high fidelity, code free, designs is problematic. The designer's difficulty is that because older people are very different from the designer, it is precisely at

the early stages of design that the designer needs clear feedback on how older people will perceive and interact with proposed designs. Regrettably it appears that working prototypes, with all their rigidity and slow development, are needed in order to get useful feedback when designing with older people.

USE OF IN-HOUSE TESTERS

Given the high programming cost of doing design from working prototypes, early detection of design flaws before they became inbuilt was essential. In each of the projects for older users that the author has carried out, the development team has included at least two older people, known as the in-house testers. These people were recruited because they wanted to learn computing skills and because they were located close to the development site so that they could be asked to examine new proposals on an almost daily basis. The early feedback provided by the in-house testers was critical to the success of the project. Even with relatively wide reading about aging and previous design experience on designs for older people, the author was repeatedly surprised when design features that the author thought appropriate were found to be difficult or unusable by older users.

The in-house testers were younger and more able than the rest home residents. They could distinguish between prototypes and the activities required to manipulate prototypes but they did not become comfortable with simulating long task sequences on code free high fidelity prototypes, nor did they become comfortable with low fidelity prototypes. The approach that was adopted was to provide some high fidelity mock-ups but to use mainly working prototype fragments with limited functionality for each new part of the design. The in-house testers would then be observed trying out the new parts of the

design and they would comment on it. This was usually done on a daily basis with the designer accumulating a number of small issues needing input from older users and then running them past the in-house testers over a short testing session. In this way the in-house testers could contribute without having their own time too disrupted while the overall project could make progress with sufficiently frequent input from the in-house testers as representatives of the eventual older users.

There was some concern about the in-house testers becoming too knowledgeable about the SeniorMail project and perhaps being captured by a sense of ownership in the emerging design. There was also concern about the degree of representativeness of older people in general that could be achieved with only two in-house testers. For these reasons additional small groups of older people were recruited from older adults who had difficulty in using standard email systems. This involved 8 independently living individuals, aged between 72 and 79, with an average age of 76. These groups were asked to try out and critique the design at approximately 2 – 3 week intervals. Useful new design ideas came from these groups but they seldom disagreed with the in-house testers.

POWER, DEFERENCE AND COMMUNICATION ISSUES

The process of working with older people as usability testers brought about a number of issues with power and accurate communication.

Repeatedly in the studies the author has been involved with, older people have reported problems with the way that younger people communicated with them about computing and other technical skills. There was a high degree of consensus about the problems the older

people encountered. Younger people tried to give older people too much knowledge, too fast, without anticipating that the effect would be to overload the older learner. The older people reported that younger people would repeatedly make incorrect assumptions about what would be easy for older people to do and to remember. Again while younger people tried to be tolerant and patient, the older people perceived them as restraining underlying impatience when the older people failed to learn as fast as the younger people expected or repeatedly forgot a skill that they had managed to temporarily learn and demonstrate while working with the younger person. Younger people tended to use jargon, assuming incorrectly that it would be understood, and often being at a loss for how to express concepts without jargon. These are all potentially communication traps for a designer. In the SeniorMail project there was a need for the author to carefully counter the negative expectations that older people had developed about their likely experiences when working with younger people and technology in combination. It was found to be useful to deliberately use slower, clearer communication with repeated opportunities for older people to try out the actions being talked about.

On the other hand, it was observed in previous studies that the older participants tended to self blame, to defer to younger people as having higher status in technical settings and to keep silent rather than be critical (and impolite). When this was discussed with the older participants they suggested that partly older people can be grateful to the younger person for regarding them (the older person) as useful and worth talking to, for trying to help them personally with computers and for being concerned with the worthy aim of helping older people. The participants indicated

that older people may censure negative responses as being ungrateful or indicators that the older person has failed to understand things yet again and the younger researcher / designer should not be pestered with this. So older people working with a younger designer can tell them what it is thought that they want to hear, "this is a wonderful design, it's very clever and it should be very good for older people" (<unspoken> "except for silly old me"). Since this is in fact exactly what a designer is likely to want to hear, as distinct from what the designer needs to hear, this message is seductive.

USE OF ALTERNATIVE DESIGN FRAGMENTS

Presenting alternative design fragments to older people to explore and comment on was found to be successful in countering older people's reluctance to criticize and older people's lack of awareness of the possibilities available from changing interface designs. Given a single design example older people tended to respond in terms of I can or I cannot use this. Given examples of several designs for allowing the user to do a task, the older people were more likely to respond with comments about what they found easy and what they had difficulty with. They were also more likely to make suggestions for changes and innovations in the design. It seems likely that one reason for this increased readiness to comment was that comments in this setting implied less criticism of the researcher / designer, they were clearly aimed at particular designs and by contributing several alternative designs the researcher implied that it was expected that some would be better or worse than others thus making criticism not only allowable but in fact desirable. It was also evident that seeing alternative design fragments led the older participants to think of design ideas that were not present in the alternatives presented. It may be that the presenta-

tion of alternatives provides the older people with concrete evidence of the malleability of design, which they can then take advantage of.

USING GROUPS TO OBTAIN USER RESPONSES

Working with small groups of older people who already knew each other was another very effective technique for improving the power balance and flow of communication between older contributors to the design and the designer.

Often these groups were conducted in the home of an older couple who invited friends to come over and visit to try out the software. There is a certain resemblance to the social gatherings in people's homes used in some countries to sell certain commercial plastic products, known as 'Tupperware parties', so these get-togethers became known as 'Computerware parties'. The aim, however, was not to sell the software but to allow the older people to explore the software in a supportive setting. The rationale was that the home setting gave the older people more authoritative roles as hosts and as old friends while the researcher was deliberately placed in a less dominant role as 'guest'. In addition the older people were supported by working in a familiar setting in contrast to the potential stress and less authoritative roles that would result from the older people coming to, and working in, the researcher's setting. The comment has been made that in some cultural settings older people would be most unlikely to be comfortable with inviting other people into their homes. However, alternatives such as having small groups of friends get together in their social club can perform a similar function.

The enjoyment that the older people took in being part of a small group try-

ing new software or learning new skills was evident. They were empowered, judging by the increased willingness to voice criticisms and to try out new actions with the software. The older participants seemed to benefit from working in a setting where the limitations of aging were accepted and understood. Discussion also apparently benefited from the fact that the direct recipients of remarks were the friends rather than the researcher, "look what happens when I do this...I don't now how to get out of here...have you seen how?...", etcetera.

It could also be observed that, within a group context, the attitude to the software to be tested changed dramatically. In one-on-one testing with older people the author always observed a degree of anxiety, "Will I do it right?" Older people can be reassured, can be told of the value of finding problems, can be told that the problems are due to the software design, but to an extent the anxiety seems to remain. In the 'Computerware' parties in contrast the software became the basis for a social game, akin to Pictionary or similar games where trying (and then succeeding or failing) was met with laughter and, "Can I try now?" This was a marked contrast with the atmosphere of the CAB usability tests conducted at the end of the project. The CAB usability testing was conducted one-on-one with the researcher and in spite of the standard assurances that the software, not the person was being tested, the older people approached the usability test with some anxiety and expressed surprise and relief when they were successful. Although the CAB usability test subjects were asked about useful changes they did not suggest extra features or changes to features. This contrasts with the volubility of the suggestions from the in-house testers and the "Computerware party" groups. It seems to provide

more evidence of the way that one-on-one settings may suppress comment while group settings and settings where the role of the older person encourages comment (the in-house testers) lead to much greater contribution.

In the group work while developing SeniorMail, conversations were tape recorded and the researcher took notes on difficulties and expressed preferences. The groups in both the SeniorMail study and in earlier studies in designing for older people were further motivated when they saw on later encounters with the developing software that their ideas had been taken up and translated into useful parts of the design. While this form of usability testing lacks the ability to capture the sort of detailed information that comes with a usability lab it does appear to capture natural behavior and to be effective in finding design problems as well as eliciting important contributions from the older people involved.

SAMPLING ISSUES

In general people who volunteer to participate in research tend to be better educated, have higher status careers and be more intelligent than the general population. This effect can be increased in the older population where problems with mobility, vision, hearing and cognition can all reduce the likelihood of older individuals volunteering and so further bias samples when working with groups of older volunteers⁹. In an earlier study on design for older people¹⁰, some of the volunteers brought along friends who wanted the training provided as part of the research but would not normally have taken part on their own. These people were noticeably less confident, less educated and had had less prestigious careers than the other participants. What was also notable was that these "more population typical" volunteers found more of the

design flaws in the system than the higher status participants. The flaws found by the "more population typical" group were different in kind, identifying parts of the design that reflected the designer's assumptions and required unrealistic levels of self-reliance, computing knowledge, use of inference or willingness to try things out. Design errors of this sort were usually not reported by the high status volunteers, who worked around the problems. This meant that the "more population typical" group was disproportionately valuable in capturing design problems and widening the range of older people who would be able to benefit from the final design. It is therefore recommended that designers plan to obtain a set of older participants and usability testers who include members of the 'more population typical' group.

CONCLUSIONS

Successful interface design for older users in the SeniorMail project involved several departures from standard design approaches for younger groups. These approaches appeared to be of use in this project but there is still a need for research examining the assumed gap between younger designers and older users as well as for more reports on the value of similar ways of working with older people in the design area. The discussion of working with older users in this paper provides a step in this direction.

Older people needed to be involved in the design process from an earlier stage and more frequently, the assumption here is that humans understand the other partly at an unconscious level of assumed similarity to the observer. Where this assumption breaks down, as it does for younger or middle aged designers trying to anticipate older people's capabilities, the designer needs frequent feedback from older people to prevent

design error being layered upon design error.

A wide background knowledge of aging and previous experience with older people were found to help the researcher/designer interpret what was observed when working with older people and to accept the validity of observed differences that the designer did not anticipate.

Code based prototypes allow older people to interact with a design in ways that provide clear feedback as to its suitability. Non-working prototypes, particularly low fidelity prototypes, do not serve this purpose. Therefore it is desirable to evaluate the emerging and ongoing design using working prototypes, despite the well founded objections to doing this when designing for younger people.

Older users in this project and other projects the author has worked on have had mainly unsatisfactory experiences with software, they understandably bring negative expectations to involvement in a software project. There is an advantage in older people meeting an initial credible and usable prototype (for older users) that needs some improvements rather than an initial design that shows basic misunderstanding of their needs as older users. Given a suitable initial credible prototype the older users are more likely to remain motivated in continuing with the project, with a belief that there is the possibility of a product emerging that they and other older users will find useful.

Obtaining accurate feedback and motivated involvement from the older participants requires that the younger designer be sensitive to the problems that are likely in communication between older and younger people. This is especially so when the topic is technology

that the younger designer is highly familiar with. It becomes important to create settings that increase older user's willingness to comment and explore. Groups of friends interacting with each other in a familiar environment were found to provide good working environments for evaluating prototypes. It was also important to shift the role of the older people from "research subject" to "participant in the design team". Exploring working alternative designs was found to be very useful. It appeared that this both gave older people more insight into the malleability of design and it gave them a context in which critical comment was seen as allowable.

It is also strongly recommended that the older people who contribute to design development include older people whose education and career achievements are representative of the general older population. It was found that these people captured design problems that high status older volunteers worked around.

All of this means that designing for older users is effortful and time consuming. It also means that design methodologies that younger designers may have learnt and may have considerable investment in adhering to, are not appropriate when working with older people or indeed any group that breaks the designers' inbuilt assumption of, "users somewhat like me". However, in the SeniorMail project the process resulted in software that older users responded to by saying "Can I have a copy?" and "Why can't other software be like this?".

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