

Actively Engaging Older Adults in the Development and Evaluation of Tablet Technology

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ABSTRACT

In this paper we describe a multi-faceted approach for engaging older adults in the design and evaluation of a tablet application. Our approach consisted of five key elements: 1) involving care providers in the research, 2) conducting social events, 3) supporting use of the technology through scaffolding, 4) providing multiple channels of communication between participants and researchers, and 5) progressively revealing the technology functions. We explored this approach with seven participants (aged 71-92) who used a prototype iPad application to engage in peer-to-peer communication. We found that each of the five elements contributed to successfully engaging older people in the development and evaluation process. This paper provides insights into suitable approaches for designing technologies with older users, illustrating the importance of creating a supportive environment and employing strategies that help to build participants' confidence, both in using the technology and in participating in the design and evaluation process.

Author Keywords

Engaging older users, design methods, user-centred design, touch tablet applications, social technologies

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation (e.g., HCI)]: User Interfaces – *theory and methods, user-centred design*

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OLDER ADULTS AND TECHNOLOGY

Designing usable and useful information and communication technologies for older people can be challenging, particularly given that ageing often results in deterioration in cognitive capacity and manual dexterity (Blythe et al., 2005; Hanson, 2010). The challenges are exacerbated when designing social technologies that encourage older people to *actively engage* in technology-mediated communication. Many of the social technologies developed to date enable older people to receive and view, but not to create and share, digital content (see, for example, David et al., 2011; Gaver et al., 2011). However, there is a growing body of evidence suggesting there are many social and cognitive benefits for older people when they use technologies to create content and actively participate in reciprocal information-sharing with family and friends (Karahasanovic et al., 2009; Lindley et al., 2008).

Developing technologies that enable older people to create and share content poses particular challenges for designers. Technologies for older users need to be both useful and usable (Hanson, 2010). Features that facilitate active participation and content creation will, however, add a layer of complexity to the way people interact with the technology. In this context it is particularly important to engage older people in the design process to ensure that the design is grounded in a thorough understanding of users' experiences, requirements, and preferences (Lindsay et al., 2012). Further, in order to develop both a useful and usable technology for older adults, researchers need to be aware of, and respond to, the unique challenges and new opportunities afforded by the technology. Often, these challenges and opportunities are only discovered when the technologies are used and evaluated with users in real-world settings (Doyle et al., 2010). It is therefore important for users to be actively involved in both the design and evaluation stages of the research. Consideration needs to be given, then, to the

methodological approaches that would be most successful for ensuring older adults are actively engaged throughout the research and development process.

The aim of this paper is to identify and explore strategies for engaging older adults in technology development and evaluation. We describe the approach we used during the design and evaluation of a social technology that enables older people to create and share text messages and digital photographs. This project was unique in that it: a) involved the design of a purpose-built iPad application that encourages older people to *actively create and share content*, b) invited the active participation of a group of people known as the *oldest old* (most of our participants were aged over 85), and c) employed numerous methods to engage participants in the *design and evaluation process*. The methods we used were chosen to ensure participants' voices and experiences were central in informing the iterative development and evaluation of our prototype, the *Enmesh* application.

In this paper we discuss how the approaches we used enabled us to successfully engage older people in the overall process and reflect on the lessons learned from these approaches. This paper contributes to a burgeoning literature that examines the process of designing technologies for older adults. In the next section, we review recent publications in this field, before describing our study in more detail.

DESIGNING FOR OLDER USERS

The challenges of designing for older users are well documented (e.g., Coleman et al., 2010; Lindley et al., 2008; Lindsay et al., 2012). For instance, designers must take into account limitations in the intended users' abilities, due to the many sensory and motor impairments that are associated with old age. In addition, older people are often seen to be "disengaged" or disinterested technology users, who may be unfamiliar with new technologies and have limited past experience with the features of modern computers, such as mouse and keyboard input devices. Older people will also have diverse needs, depending on their accumulated life experiences and their home and family circumstances (e.g., living at home or living in residential care).

Responding to these challenges, many researchers have reflected on their experiences of designing technologies for older users and outlined their suggestions for suitable approaches to follow (e.g., Dewsbury et al., 2007; Edlin-White et al., 2012; Eisma et al., 2003; Lindsay et al., 2012; Massimi et al., 2007; Vines et al., 2012). While these studies are broadly informative about methodological issues to consider when designing for older people, they vary greatly in terms of the technology concepts that they aim to develop. There are studies, for instance, that gathered input from users into the design of new banking technologies for older people (Lindsay et al., 2012; Vines et al., 2012), while another study focused

on the development of mobile phones for older users (Massimi et al., 2007). Other projects have focused on the development of health technologies (e.g., Edlin-White et al., 2012), while others have had broader aims, using input from participants to steer the direction of the technology development project (e.g., Dewsbury et al., 2007). These varied aims make it difficult to extrapolate general lessons that are relevant to other design contexts.

Common across all studies, however, is an emphasis on participatory design and the importance of developing productive and collaborative partnerships between researchers and participants. For instance, Edlin-White and colleagues provided an overview of the methods followed in the "MyUI" European research project, which aimed to develop accessible technologies for older people (Edlin-White et al., 2012). They advocated a participatory and collaborative approach, suggesting that designers need to work with the intended users, as co-creators. They also acknowledged the importance of involving others who have insight into the needs of the target group (e.g., carers, family members, health professionals) and suggested that opportunities for informal and social interaction between participants would make focus group sessions and design workshops more enjoyable and productive.

Similar advice has been offered by Massimi and colleagues, who designed and evaluated mobile phone prototypes for older users (Massimi et al., 2012). Based on their experiences, they identified a number of strategies for engaging older adults in participatory design activities. They found that participants in their study did not always understand what was expected of them during the research process. To overcome this, the authors suggested that participatory design activities should occur "*among community groups (who) benefit from a pre-existing sense of shared interests and responsibilities*" (Massimi et al., 2007, p. 159). They also found that a combination of both group and individual sessions worked well for their participants, and that in group settings participants benefited from being able to help each other. Other suggestions included providing sufficient structure for activities, and tailoring the length of time of the study to suit participants. These are useful insights that also emerged as important issues in our study, which we will discuss below.

Most of the studies outlined above have focused on developing suitable methods for involving older adults in participatory design activities to ascertain user requirements. These activities often involved engaging people in discussions about how they would *like* to be able to use new technologies. However, as noted above, it is widely believed that older people may be unfamiliar with new technologies and, therefore, be reluctant to engage in conversations about the potential of new technologies (Coleman et al., 2010). This presents a unique challenge for researchers wishing to use

participatory design methods with older people. Some have overcome this challenge by using alternative methods, such as cultural probes (Vetere et al., 2009) and presenting controversial concepts to initiate discussions (Vines et al., 2012). These techniques are primarily used during the initial requirements gathering stage of participatory design, to determine design guidelines for technologies that are yet to be developed. There is a need, however, for further research to identify strategies for engaging older adults in evaluation and development *beyond* initial studies of user requirements.

In this paper, we describe and reflect on the approaches used to actively engage older adults in a field study of a prototype iPad application, *Enmesh* (Engagement through MEdia SHaring). *Enmesh* was developed following an initial pilot study that incorporated several user-centred design methods to examine the communication needs of older adults (described in Pedell et al., 2010). The field study of the technology-in-use, described below, involved an iterative process of evaluating and redeveloping the prototype application. In order to ensure that any further technology developments were informed by users' experiences, it was crucial that older people played an active role in this study. In order to engage participants in the study we used a multi-faceted approach, employing complementary methods that enabled us to build rapport with participants, to learn from their experiences, and to refine the prototype based on those experiences. In the next sections we present our methods for engagement and describe the field study in more detail, followed by a discussion of the lessons learned from our approach.

ENGAGING OLDER ADULTS

We employed five strategies for maximising the engagement of older adults in our research. First, we worked closely with the participants' aged care provider. Second, we held three social events to encourage participants to talk about the technology with each other in an informal social environment. Third, we provided scaffolding to ensure participants felt comfortable using the technology. Fourth, we enabled participants to contact researchers whenever they needed to, using multiple channels of communication. Finally, we introduced the technology to participants slowly, progressively revealing new functions over the course of the study.

Involvement of Care Provider

The research was conducted in collaboration with the aged care provider, Benetas, a not-for-profit organisation that offers community-based and residential care. The seven older people in our trial were all clients of the Benetas community aged care program. That is, they lived independently with the support of a Benetas care manager, who visited them on a weekly basis. There were two care managers from Benetas and each

participant had a close relationship with one of these care managers.

Involving care managers in the trial positioned the study in the context of the care organisation and its activities. Participants did not know each other prior to the study, but they shared the common experience of being clients of Benetas. In this sense, participants benefited from existing shared interests and responsibilities relating to the organisation. This approach was advocated by Massimi and colleagues who suggested that conducting research within institutional or community contexts provides a non-threatening and familiar environment that encourages older people to participate in the research process (Massimi et al., 2007).

The care managers also played a crucial role in ensuring that participants felt comfortable about taking part in the research. The participants in the trial were selected from the case load of the two care managers who took part. Because the care managers were familiar to participants, they played an important role in facilitating participant interactions, and they were supportive in encouraging them to explore the use of the technology and share their views about the prototype. Care managers were interviewed at the end of the trial and they provided valuable information about how they perceived their clients to be utilising the technology. This aligns with Edlin-White et al.'s (2012) recommendations to consider the views of carers when designing for older people.

Structured Social Events

Participants were invited to attend three social events during the trial. These were held at a local hospitality venue, with morning tea provided. Transport was provided for those who requested it.

These gatherings pursued several purposes. Firstly, they provided the participants with the opportunity to meet other participants and to learn more about the technology through conversations with members of the research and development team. Secondly, researchers used these events to identify the challenges and opportunities that participants were facing, through informal conversations and observations of participants using the technology. In addition, concrete feedback was sought through focus group discussions to gain ideas for iterative improvement. Finally, during these events updates to the prototype could be uploaded without having to visit every participant individually. These events were intended to be enjoyable social events for participants, in line with recommendations about participatory design with older people (Eisma et al., 2003).

Scaffolding

Scaffolding is a term used to describe the mentoring and guidance provided in a partnership where one person learns a new skill with the support of another. This has been identified as a suitable approach for engaging older people in the design process (Astell et al., 2009).

According to Astell et al., there are three elements to successful scaffolding: 1) establishing joint attention between the two parties in the partnership; 2) offering suitable guidance with respect to the learner's competencies; and 3) ensuring the active participation of the learner (Astell et al., 2009, p. 55). Each of these elements were incorporated in the scaffolding we provided to help participants learn how to use the Enmesh application.

Throughout the trial, a researcher visited participants multiple times to conduct research interviews and assist participants in learning to use the technology. This support only targeted the basic functionality of the iPad and Enmesh application, such as typing and sending messages. Researchers were careful not to influence participants' use, instead helping participants to practice and execute their own ideas.

The first visit was held during the first week of the trial. Participants' care managers also attended this meeting and introduced the researcher, which helped the researcher to earn the trust of the participants. At this meeting, the researcher provided participants with the iPad, gave a demonstration of the Enmesh application, and helped to set up the technology in the participant's home. During this meeting, the researcher observed the home environment and made note of any features in the environment that would limit participants' use of the technology. For instance, there were sometimes few power points available to charge the iPad, or there was limited space to use the iPad on a flat surface, such as a table. These were important considerations because our aim was to design a communication technology that would fit seamlessly into the lives of older people. Many participants had limited mobility and this included mobility within – as well as outside – the home. Therefore, during this first visit we needed to consider where within their private space participants could comfortably use the iPad.

At this meeting, a researcher guided participants through the steps they needed to use the Enmesh application. Therefore, the researcher was not a distant observer of the technology-in-use, but played a hands-on supportive role. This provided a more natural context for participants than a typical research interview and observation. We aimed for interactions between participants and researchers to be as natural as possible to help build rapport. This approach helped us to develop a process of designing *with* – rather than *for* – our participants (Dewsbury et al., 2007; Edlin-White et al., 2012). It also helped overcome any reluctance participants may have felt about using a new technology.

Follow-up meetings in the participants' home were held during week five and week ten of the trial. These followed a similar format to the earlier meeting and provided an opportunity for researchers to learn more

about how participants were handling the application in their everyday life, to provide assistance in using the technology if needed, and to observe the participants using the technology in their home environment.

Multiple Channels of Communication

Outside of the social events and home visits, participants were also able to contact researchers through other means. They were encouraged to call researchers by telephone, or to send an email if they required assistance (although only two participants had access to email). In addition, if participants were inactive on Enmesh for several days (that is, they had not posted any new photographs or messages), researchers telephoned participants to ask about their activity and to offer help, if needed. The details of these conversations were recorded in field notes and provided supplementary data revealing some of the difficulties encountered and participants' responses to the technology.

The Enmesh application was also used by participants to send questions and feedback to the development team. In this regard the application acted as a technology probe (Vetere et al., 2009). This was useful as some participants had hearing problems and did not like to use the phone or were concerned that telephone calls would interrupt researchers.

In addition some of the participants asked their care managers for advice, as they saw them as champions of the technology. In some cases the older participants would assist each other in learning to use the technology, particularly during the social events. All these questions and discussions enabled us to uncover usability problems, but also allowed for participants to voice their suggestions for improvements to the application.

Progressively Revealing Functions

We trialled and evaluated the Enmesh application using a staged process, whereby we progressively revealed functions to participants. At each stage, participants were introduced to new functions and encouraged to extend their use of the technology. This approach, which is described in more detail below, introduced participants slowly to the technology and its environment. As Massimi and colleagues noted, it is important that researchers allow for some flexibility in the time scales used when involving older people in the design process (Massimi et al. 2007). We hoped that by gradually introducing the technology to participants, we would maximise participants' input into the research and development process. Over time, we expected that participants' confidence in using the technology and contributing to the design process would increase. In this way, the staged approach was anticipated to contribute to the development of a productive partnership with participants, considered to be an essential part of the process of designing with older people (Dewsbury et al., 2007).

THE RESEARCH DESIGN

We conducted a study to interrogate our proposed approach for engaging older adults. Participants in the study were seven older people and two care managers. The study consisted of three stages, each incorporating aspects of our approach. The technology for the study was Enmesh, an iPad application we created for supporting peer-to-peer communication between older people.

The Enmesh Application

We conducted a pilot study that identified the social and communication needs of older adults living independently (Pedell et al., 2010). Based on the pilot study findings, we created an application that aimed to facilitate *engagement through media sharing* (Enmesh). The aim was to encourage older adults to build social connections by sharing messages and photographs with each other.

In the trial reported here, the Enmesh application was used as a *technology probe* (Hutchinson et al., 2003), that is, a prototype that has limited functionality and incorporates data logging capability to be used by researchers to better understand a phenomenon and to provoke innovation. As a technology probe, Enmesh was able to embody the notion of progressively revealing functions.

The choice of iPad tablet was informed by a number of usability and practical considerations. Touch-screen devices enable direct input via touch-based gestures, in contrast to indirect input devices such as a mouse. Researchers have shown that older people find it easier to use direct (rather than indirect) input devices (McLaughlin et al., 2009). Furthermore, larger screens enable older people to achieve the same or better accuracy in executing touch-screen gestures compared to younger adults (Stöbel et al., 2010).

The Enmesh interface was designed to be as simple as possible. By pressing a + symbol at the bottom left of the screen, users were shown a dialog box that enabled them to take a photograph, optionally add a caption, or enter a text message. Captions and messages were recorded using the iPad's onscreen keyboard. When the user had recorded or entered a photograph or message, they could press 'send' to upload it to the shared display. Because we wanted to keep the interface as simple as possible, there was no option to save images and messages that were not sent to the shared display.

Once sent, the photographs and messages were stored on a server and presented in a collage-like display on the Enmesh application, which was simultaneously visible for all users in the network. In this display, the images and messages appeared and moved down the screen in a cascading motion (see Figure 1).



Figure 1. Screen shot showing the cascading display of photos and messages.

Users could manipulate the way the messages appeared by dragging them on the screen or using the standard “pinch” gesture to rotate and increase/decrease the size of the image or message. Images could be removed from the screen by flicking them off to the side of the screen rapidly; when an image was removed three times it was permanently deleted and not displayed again.

Participants

Older people

The seven older people in our trial (two male, five female) were aged 71 – 92, and were all clients of the Benetas community aged care program. All were living in their own home, had significant health and/or mobility problems, but were identified by their care managers as having the cognitive capacity to participate in the study. Table 1, below, gives the pseudonyms for the participants and provides a summary of their circumstances.

Care managers

The two care managers who took part in the study both worked for the aged care provider Benetas in the community care program. They were selected because they could anticipate some benefits for their clients and were able to choose suitable participants from their case load for the study. Both care managers were female.

Participant	Age	Circumstances
Charlotte	77	Lives with disabled daughter; several health problems
Donald	85	Lives alone; no family except a daughter living overseas
Betty	88	Lives alone; no children; sibling deceased; mobility problems and arthritis
Lynne	71	Lives alone; husband (94yo) lives in residential care; arthritis and vision problems
Sophie	92	Lives alone; nieces and nephews; visits sister in nursing home; uses walking frame
Emma	89	Lives with her husband (95yo); mobility problems
John	92	Lives alone; widower; hearing and vision problems
Janet		Care manager*
Gillian		Care manager*

*Care managers were not asked to provide their age, as this was not relevant to the research.

Table 1. Participants' age and circumstances

Procedure

We implemented the study in three stages over 10 weeks. In the *first stage* (weeks 1-2), participants used Enmesh to communicate with their care managers only. The Enmesh application was set up so that each participant was only connected to his/her care manager. This gave participants the opportunity to familiarise themselves with the device and the application, and to learn how to exchange content with someone with whom they were already familiar.

In the *second stage* (weeks 3-6) participants attended the first social event. During this event, the Enmesh network was set up so that all participants were connected to each other. The Enmesh display showed all messages sent to the server; consequently once everyone had joined the network, they could all see each other's sent messages and photographs. Additionally, at this event all iPads were upgraded with an updated user interface, which was refined following findings from the first stage of the study. During this stage of the trial, participants were encouraged to interact with each other using the Enmesh application and were asked to try to post at least one message or photograph per day to the shared display.

The *third stage* of the study took place during the final four weeks of the study. Participants attended a second social event and another task was introduced to encourage participants to look up and share information that was of interest to them. The participants were shown how to use the iPad's Internet browser "Safari" and the Google search engine. Again a new version of Enmesh was installed on all participants' iPads. Towards the end of this stage, participants and the care managers took part

in a final research interview. Participants were also invited to a third social event held at the end of the study.

FINDINGS AND DISCUSSION

In this section we reflect on each of the procedures, described above, that were used to engage older people in the design and evaluation process. For each procedure, we discuss how and why it provided a suitable method for engaging older adults in design research, and identify any limitations that we encountered. To illustrate the suitability of this participatory research process, we also describe some of the important insights about participants' experiences of using the technology that emerged during the study.

Involvement of Care Provider

The research study was introduced to participants as an activity recommended by the care organisation, and it was therefore seen as an extension of their activities as clients of Benetas. According to Massimi and colleagues, this is important for ensuring that older people feel comfortable contributing to the research. In their study, which did not take place within a familiar organisational setting, they found their participants were unsure of what was expected of them. Upon reflection, the authors suggested that: "*By making the study part of a larger regimen of care, or part of ongoing community service, the seniors have a context in which to understand participatory design*" (Massimi et al., 2007, p. 159).

Certainly, this appeared to work well in our study. In addition, the two care managers played a crucial role in facilitating participant interactions and encouraging participants to use the Enmesh application. Both care managers regularly contributed photographs and messages to the Enmesh display. Their contributions were often playful and questioning, encouraging some form of participation from the older participants. One care manager posted a photo of a streetscape with the caption "who can find the hidden cat?" She also posted a photo of a flower that she did not know the name of. Both these examples elicited a number of enthusiastic responses. After some discussion, one participant was able to solve the mystery of the unknown flower:

"Hi [Janet], the flower you took is called a Zygo Cactus. I have them as well." [Enmesh text message – Charlotte]

These conversations helped participants to build confidence in using Enmesh. Without gentle encouragement from familiar people (for example, "*John, you are doing an amazing job! Enjoy!...Gillian*"), it is possible that participants would not have explored the use of the technology to the extent that they did, which would have limited the usefulness of the trial for our purposes.

The care managers were not only familiar, but a real part of participants' natural environment. Participants were

able to talk about the technology in an informal way with their care managers. The message below provides an example of one participant conversing with a care manager and at the same time reflecting on the way the Enmesh application worked:

“Janet, Yes I noticed that occasion when we were both on our ipads at the same time and it is pity when that happens that there is no way of conversing directly with the other party there and then. The only way of responding is to leave a message on the screen and hope that the other person just stumbles on it. One can never be sure that the response is actually received by the person it was intended for. I must ask Jack [developer] if such a facility is possible. See you again on the 24th” [John – Enmesh text message].

This provided us with information that informed the redevelopment of the application. A formal research interview may not have elicited all of participants’ observations and reflections, so it was important that they were able to interact with their care managers and discuss the technology in this more informal context.

Social Events

The morning teas that were held during the trial proved to be very important in enabling participants to meet face-to-face and get to know each other. Participants were able to share their experiences of using the technology. Both care managers noted how the social events encouraged participants to talk about the technology:

“I think it allows the clients to vent their frustration, but also their happiness, they also liked to talk about what they were doing and it is another social outing that is good for them.” [Gillian – care manager – interview].

“It was an opportunity to exchange their misunderstandings and have a laugh about it ‘when you do this or when you do that etc.’ and I think they will probably miss it – I really think they will” [Janet – care manager – interview]

By helping each other, participants felt they all achieved a similar level of competence in using the technology and were encouraged to persist in their learning. A shift could be observed, as participants moved from describing technology that caused problems to engaging in an enjoyable joint activity, as the two next messages show:

“Frowns and confusion are turning to smiles of achievement!” [Janet – care manager – caption on photo from morning tea]

“The whole company is having a real play around.” [John – Enmesh text message]

The three social events provided us not only with an opportunity to gain feedback from participants about the technology and to involve them in the design; they were also valuable for enabling participants to get to know

each other. This had a positive effect on how they used Enmesh to interact. One participant said:

“I think that was quite good [to meet the other people]. It became a person where otherwise it was only a name.” [Charlotte – interview]

In contrast one of the participants who missed the first social event did not feel as though she experienced the social aspects of using the Enmesh application:

“Hi I was unable to get this machine to work for a while but now all is well and I can continue talking to myself!” [Betty – Enmesh text message]

For her sending messages on Enmesh remained an anonymous activity as she hadn’t met the other participants. Previous research has shown the importance of holding face-to-face events to build rapport among older users of communication technologies (Doyle et al., 2010; Garattini et al., 2012). In those studies – which did not involve face-to-face contact – participants suggested that social events would have helped them better utilise the technology to communicate with each other.

Scaffolding

The visits to the homes of participants were important for providing valuable information about participants’ actual handling of the technology. In particular, initial visits during the first stage of the study provided a wealth of information about the difficulties that older people experience when using a relatively easy-to-use technology. These usability problems were more pronounced than we had expected. Below we give a detailed description of the set up with one participant, Betty, which clearly illustrates the difficulties Betty encountered due to the arthritis in her hands. All participants had very similar problems.

The iPad interactions were not so easy for Betty. The main problem was the weight of the iPad. Betty – sitting on a couch holding it in her lap – kept saying: *“it is so heavy”*. She needed both hands to lift up the iPad (she had quite delicate wrists and arthritis in her fingers). While holding the iPad up in a tight grip she was not able to use the functions on the touch screen. Also she held it in a way that the holding fingers would move from the frame into the touch sensitive area of the screen and initiated Enmesh functions involuntarily. The effect was that Betty did not understand why the camera or typing window kept disappearing.

Betty also had problems with using the touch screen due to arthritis in her left index finger. Her finger nail was bent in a way that the touch screen did not react on her repeated attempts to tap on the “cross” control. Therefore the researcher suggested she use the fleshy bit on the side of her thumb.

There were some problems using the iPad keyboard. Betty was not able to type in her first name correctly for

the initial set up. She either missed the letter on the keyboard or several letters would appear at once. It became a little bit better when she was encouraged to hold the iPad at an angle on her lap. After seven to eight attempts the researcher typed it in for her. The care manager also seemed to be surprised by how much trouble the typing caused. Betty was not really able to type at all until the iPad was set up in a solid stand on the kitchen table. The little plastic stand provided with the iPad was a bit too “wobbly and fiddly” for her taste. She preferred the solid one with a velvet look and feel. With this set up, she did not need to hold the iPad at all, so she no longer accidentally touched the screen with her hand. She could now focus on the typing (doing it letter by letter with her right thumb). She did that with a lot of enthusiasm and typed without any mistakes the following message to her care manager who had left by then:

“Janet I have mastered the gentle art of this complicated machine before you but never mind shall teach you in due course” [Betty – Enmesh text message]

The disadvantage of the set-up on the kitchen table was that with the cover she was less encouraged to take photographs. Unless she folded the stand back she could only take pictures of objects that were placed behind the iPad on the kitchen table.

The iPad’s text auto-completion feature was confusing and did not seem to provide any support to her. Therefore this was turned off by the researcher.

In order to get to the Enmesh application participants needed to learn three different types of interactions. First they had to turn it on (using a manual button). This was the easiest and most familiar for Betty and most other participants. Then, to activate the iPad they needed to slide a button along the screen (Betty clung to the button and tried to slide it back and forth without letting go). Once this was successful, the iPad home screen was displayed, showing the Enmesh application button, which participants had to tap. For Betty, this tapping only worked with her thumb again. Tapping sideways with the thumb meant that aiming for the exact spot was quite difficult.

The difficulties that Betty and other participants encountered when first using the iPad provided significant barriers to successfully using the Enmesh application and engaging in the research. It was essential, then, that the researcher provided support during the home visits to ensure each participant felt comfortable using the technology.

Multiple Channels of Communication

Providing multiple channels for participants to contact researchers was useful, as participants appeared to need a lot of reassurance. It was quite common for participants to send questions and comments about the technology

through the Enmesh application. These provided direct feedback about the technology design:

“How do I move cursor?” [Lynne – Enmesh text message]

“I find that it is difficult to delete anything that I think would be better out of the way. ... This device would be better with a delete button. At least that would make sure of the wanted effect.” [John – Enmesh text message]

“Today is the third day I have had it and I am no closer to getting any reliable performance out of this thing than when I first got it. Photos won’t record and there is no way of confirming whether any moves made have been successful. I will have to ring Dr Peterson [researcher] to find out what I am doing wrong. I have wasted many hours trying to get some satisfaction without success” [John – Enmesh text message]

Sometimes, as above, the questions were only stated as comments, but usually these would be picked up by the researchers or by someone else in the network. It was not uncommon for participants to help each other by providing advice in response to questions about the technology. This widened the circle from the researcher as tutor to a peer tutoring group. In rare cases participants would point out mistakes to each other, initiating a conversation about use:

“Interesting messages Emma!! First a Letter ‘A’ then ‘R’. Miss out on something? Not to worry though, my typing is way off too. Don’t see too well that’s why” [John – Enmesh text message]

“John when I make a mistake I am not sure how to fix it” [Emma – Enmesh text message]

The messages that participants sent, as well as their telephone calls to researchers, demonstrated a need for regular reassurance. This suggests it is important to provide older participants with the opportunity to contact researchers whenever they need assistance. Participants were quick to lose confidence if anything went wrong. They sometimes became fearful or confused when the technology behaved in an unexpected way. Betty for example stumbled on to the “air plane” mode in settings and was concerned that this may have endangered planes:

“Interesting to see what you can do with it. Yesterday I thought it was in airplane mode and could cause some damage. You shouldn’t give a fool like me something like this.” [Betty – interview]

This misunderstanding even caused her to turn on the TV to check if any plane crashes were happening caused by her. She rang the researchers and after being reassured that she couldn’t do any damage she settled for an extensive read of the Vogue magazine online.

Progressively Revealing Functions

The staged approach proved very successful in two regards. Firstly, the progressive introduction of functions helped to build up participants' confidence. Secondly, the iterative approach provided us with an opportunity to improve the design of the prototype over the course of the trial. Because we implemented changes to the technology during the study, participants received immediate responses to their feedback. This may have helped to build participants' confidence about being involved in the study, as it provided evidence that their views and experiences were important for the development of the technology. Furthermore, by fine-tuning the prototype during the trial we were able to observe participants using each iteration of the Enmesh application and identify further developments that were needed.

Earlier in the study, participants questioned themselves, revealing a lack of confidence:

"I am not sure if I will be of any use to you." [John - interview]

"I am not very tech savvy ... I don't know anything about technology" [Emma - interview]

"I have deteriorated a lot in the last year - I am not sure if I will be of much help to you" [Lynne - interview]

Participants' reflections on the trial suggested that people in this age group feel they need a significant amount of time to learn new things. The length of time of the study (10 weeks) was just long enough for participants to become familiar with the technology, although some participants suggested that it would have been better if the study had taken place over a longer period. One participant lamented that taking part in the trial would have been much easier when he was younger. Nevertheless, he felt that there were benefits from persevering and learning to use the technology:

"If you had taught me 20 years ago I would have laughed and walked away with it. You wouldn't have to tell me twice. Now I have to train my brain - it is fantastic to learn something new. It is like a little cat or dog - you have to feed it. [...] It is good to keep the connections in the head working. All older people need to keep training. It wakes up my brain cells." [Donald - interview comment]

Similarly, the following comments from John, sent to the Enmesh display, illustrate a gradual increase in confidence:

"I keep losing what I have written and have to start it all over again. This project is not going to be easy." [John - Enmesh text message]

"Message for Janet,,,,,,,,,,,,, Had a call from her [researcher] a little while ago to explain some of my

problems. Very pleased about that because I was getting really fed up with not being able to do things the way that I thought would have been easy. Anyway my confidence has been restored in this Ipad and I will continue to co-operate in the project." [John - Enmesh text message].

"Getting better at recording photos. Have worked out a strategy that seems to work. So far today have managed to get another four into the cascade [display]." [John - Enmesh text message]

These reflections highlight the importance of building participants' confidence and assuring them of their value to the design and evaluation process. This can be achieved through a progressive approach whereby the technology is introduced gradually to participants.

CONCLUSION

In this paper we have reflected on the procedures used to engage older people in the evaluation and development of a prototype communication technology. Our reflections reveal that the multi-faceted approach used was successful in engaging our older participants. The five elements of our approach helped to build participants' confidence in using the technology and provided us with valuable information about the design of the application.

We found that it was important to provide a supportive and friendly environment to encourage older people to contribute to the design and evaluation process. The involvement of the care organisation, the structured social events, and the scaffolding role that researchers played, all contributed to achieving this supportive environment.

Importantly, this study involved not only evaluating the technology in use, but also shaping the social context in which it was used. By incorporating social events into the study design and encouraging participants to communicate with each other, we created the social setting in which the technology was evaluated. In this sense we developed and evaluated a socio-technical system, rather than just a prototype application.

One of the key lessons from this research is that older people need to be convinced that their involvement in the research is valued and important. Participants needed time to develop their self-confidence and learn to appreciate their value as co-designers. They also needed a significant amount of time and reassurance to build their confidence in using the technology. We supported this process by providing scaffolding, progressively introducing functions, and enabling participants to contact us through multiple channels when they required assistance. While these processes were useful, our findings suggest that more support may be needed, and in particular more time to develop confidence.

Building on this insight, the next phase of our research will involve a longitudinal study examining the use of the

Enmesh application over time, funded by an ARC Linkage grant. The prototype has been redeveloped, based on the study findings, and will be used to support communication among groups of older people over a period of 12 months. This longer timeframe will allow participants to develop confidence and increase their engagement in the research, as well as develop patterns of use after novelty effects and difficulties associated with the new technology have been overcome. This will enable us to develop further insights about the value of Enmesh as a social tool for older people.

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