
MultiMemoHome: Lessons Learned from Co-designing Home Reminder Systems with Older Users

Marilyn McGee-Lennon

Glasgow Interactive Systems Group
School of Computing Science
University of Glasgow
G12 8QQ, UK
Marilyn. McGee-Lennon@glasgow.ac.uk

Julie Williamson

Glasgow Interactive Systems Group
School of Computing Science
University of Glasgow
G12 8QQ, UK
Julie.Williamson@glasgow.ac.uk

Maria Wolters

Centre for Speech Technology Research
School of Informatics
University of Edinburgh
EH8 9AB, UK
mwolters@inf.ed.ac.uk

Abstract

In this paper we present (i) the motivation for a mixed methods approach to gathering requirements for multimodal personalisable reminder systems for the home, (ii) methods used over a three year period to gather requirements and iteratively design and evaluate with older users both in the lab and in the home and (iii) reflection on the methods and the value they add for studying interactions and user experience in the home.

Author Keywords

Reminders, co-design, home, older adults, methods.

ACM Classification Keywords

H.5.2. Information interfaces and presentation (HCI): User-centered design.

Background and Motivation

MultiMemoHome is a project investigating the design, development and evaluation of reminder systems for the home. Stakeholders were involved from the outset by establishing an expert panel of older users, adults with sensory impairments, and health and social care experts that we engaged with for initial requirements and throughout in the co-design, prototyping and evaluation of our reminder technologies for the home.



Figure 1: Bringing props from home to focus groups



Figure 2: Older users experience different interaction modalities in a design session.

Home reminders systems can support a person in managing their daily lives (to-do lists and upcoming appointments) and enable a person to remain at home when otherwise it may be necessary to move into care (medication and eating reminders for example). Technologies range from speech reminders delivered via telephone, text messages on a mobile phone, visual reminders on the television, and vibrations on an actuator fitted to a pillow to tell a person with dual sensory impairment that someone is at the door [3].

Designing reminders that are effective, appropriate and acceptable to the user was one of our key aims. A further aim was to design systems that provide multiple ways to receive reminders (depending on a person's impairments, capabilities, preferences or the devices available to them in the home) and appropriate ways to set, manage and configure these reminders. Our project was device agnostic and 'care condition' agnostic in that we did not define what type of reminders people might want or which technologies we would deploy our system to. Rather, we engaged with a variety of stakeholders to explore (i) what reminders people need/want in the home context, (ii) how reminders should be delivered (when and how) and (iii) what features of a reminder system older people would find most usable and acceptable in a complex and dynamic personal space such as the home [5, 6].

The following provides an overview of the methods we employed to design and formatively evaluate our ideas, prototypes and final systems with older users (people over 60). We also critically reflect on the methods, the data that each produced and how we used that data to distil useful lessons learned for studying interaction in the home.

Methods for Studying User Experience and Interaction in the Home

There are a variety of methods available for capturing the requirements of an interactive system for the home. These range from surveys and lab based usability studies to technology probes and user experience interviews in the context of the home. Choosing a method (or toolkit of methods) appropriate to your user group and your context can be the difference between getting good data, that can be treated and interpreted to design and evaluate more usable and acceptable technologies, and getting data that is difficult to translate into actionable design or development decisions.

This is particularly important with older users in the context of the home where the individual and the context can be varied and can change over time. In older adults, the range of technology expertise is extremely varied and individuals have different sensory, physical and cognitive capabilities and preferences. There are also aspects of the social and/or physical context that can change (the devices available in a room, and whether or not you are currently sharing your space with other people). This can mean that capturing user experience data can be difficult using traditional lab based or survey based approaches.

Engaging older users in traditional methods of user centred design has been done before. Focus groups and design sessions are frequently used because designers have the opportunity to interact on a more personal level and explain their motivations. Problems with this approach include users having trouble imagining what the technology is capable of doing now or in the near future. This makes eliciting requirements for future home based applications challenging. Methods are



Figure 3: Co-designing interfaces with older users

needed that truly include and engage users, enable them to see and interact with what is possible now and explore what might be possible in the near future.

The following section reviews some of the methods we used to (i) engage users in our project, (ii) elicit requirements, (iii) involve them in co-designing our prototypes and (iv) evaluating our reminder systems in their homes (see [3] for full details of all of these individual studies).

User Stories

We used a 'Stories' section on our website to allow users to post and share accounts of what people forget in and around the home and strategies that people currently employ to help them remember. Example stories included:

"Due to hearing loss occasionally I forget to turn off the taps and I cannot hear the water running. On occasion I have also forgotten to turn off the gas. Sometimes you lose things because you don't hear them drop."

This proved to be a lightweight method for us to gather rich textual narrative accounts. These stories were qualitatively coded to (i) produce our initial requirements, (ii) understand our user group and the context of the home early in the project and (iii) produce scenarios and personas to be used in our design sessions.

Interactive Focus Groups

Focus groups are a well-established way of gathering stakeholders together in small groups, asking structured questions and gathering opinions and reactions to ideas and concepts. Focus groups can be adapted to suit your user group and the subject matter and con-

text. We asked users to bring items from around the home (that helped them remember things) in as props (see Fig 1 for example). Props helped foster discussion and allowed users who didn't know each other to 'tell stories', share experiences and become the experts.

Another key technique we used was *Experience Prototypes*, which included bringing demonstrations of how technologies might work in practice to encourage hands on exploration of the interaction opportunities [1]. We found that the key here was not to bring a fully working system but rather isolated elements (such as the vibration motor and smell cubes shown in Figure 2) to allow participants to experience the different interaction techniques and openly criticize or suggest alternatives. This type of critical reflection is often lacking in focus groups (where it is hard to envisage how something might feel, look, smell) and also in full system evaluations where users are often reluctant to critique a system that appears to be fully developed already.

Co-design

We also conducted a co-design study with six groups (N=25) of older users (age 60+). Rather than focus on ideas and opinions (as often happens in focus groups) users interacted with both paper-based interface prototypes and prototypes running on mobile devices. The aim of the co-design was to determine in a collaborative and inclusive way *what* people might want to configure on a reminder system and *how* they might want the system to support this configuration. This differed slightly from the interactive focus groups in that the emphasis moves from generating requirements and understanding to generating co-produced designs and design decisions in real time during the sessions.



Figure 4: Identifying reminding strategies using home tours

Working prototypes encouraged the participants to engage with the system and to make suggestions as to how the system should look and behave and preferred styles of interaction for setting and receiving reminders. On the other hand, the paper prototypes encouraged honesty, critique and creativity. Participants were clearly happy to criticise features present on the paper prototypes in a way that they might not with a working prototype. Users were also willing to make suggestions regardless of their prior exposure to possible solutions when the paper prototypes were being discussed. A further benefit is that the emerging themes can be coded 'live' during the session with the users and a coding scheme can even be organised collaboratively and validated with the users still present (see Figure 3).

Home Tours

In order to design a reminder system that supports current reminding strategies and that can be integrated easily into people's lifestyles, it was crucial for us to understand how people interacted with technology and reminding in the real home context. We conducted seven Home Tour based interviews with users in their own homes. This involved semi-structured interviews focusing on what people forget and what strategies they use for reminding themselves. The interview approach however was augmented by a user led 'tour' of the home (documented by photography) in order to better understand the home context and environment we were designing for.

Thematic analysis of the interview data, observations, and photos yielded a richer understanding of the tools and techniques used to remember in the home and how these reminding techniques related to the social and physical context. The home tours added an invaluable

opportunity for the participants to demonstrate what strategies worked for different tasks, and what the social and physical context for using each reminder strategy was. In particular physical reminders (where people place objects in a place to facilitate remembering – see Figure 4) were not revealed using any of our other methods. Home tours were also particularly useful for raising issues of privacy and confidentiality, which did not emerge strongly in the other data.

The results from all of these collective requirements and design sessions were used to develop our final reminder system which was deployed on mobile devices in the homes of users for 6 weeks during the summer of 2012. In addition however we have learned a great deal about the methods that work for designing technology for the home. A selection of these lessons learned will be presented in the following section.

Conclusions and Lessons Learned

There are many continuing arguments in HCI over which methods are appropriate when. This can depend on (i) who your user groups are (age, gender, sensory or physical impairments, novice versus experts), (ii) the task or tasks to be performed, (iii) the physical environment and (iv) the social context.

A variety of approaches are emerging as particularly useful in the design of domestic technology. Often, home environments are recreated in a lab setting, and in some cases entire lab homes have been built. Such an approach allows a level of control and when problems with the technology occur the experimenters can intervene straight away, which is important when working with potentially vulnerable populations such as older people. However, this kind of controlled setting fails

Key take home messages:

- Establish a panel of expert users early in project
- Get to really know your participants
- Study both in the lab and in the home if possible
- Use props from home to promote discussion and make the user the expert
- Co-design can increase empowerment and buy-in
- Lo-fidelity prototypes encourage creative thinking
- Hi-fidelity prototypes increase engagement
- Encourage coding and validation of results during design sessions with users present
- Home tours and cultural probes can provide physical and social context insights
- Be transparent in how you report your results

to capture the rich texture of people's individual, personal space, in particular the activities and routines and the presence of other people living in or visiting the home, which can all have a significant effect on the experience of interacting with technology in the home.

Engaging users in Co-design and Interactive Experience Prototyping sessions allows true involvement of users in the process. A full ethnographic immersion into the home can be problematic because the home is a very private space. In cultural probes and Home Tours however, users have full control over the materials seen by the researchers. They record relevant aspects of their home using a variety of media and materials (writing, audio recordings, video, photos, and sketches). These methods allow researchers to gain insights into how people live, what is important to them in the home, and objects and activities of direct relevance to the design exercise. Importantly – the tour aspect empowers the user to be included in the design process.

To conclude we recommend that you establish a toolkit of methods and select those that are appropriate to your user group, context, budget and timescale. We also recommend considering what kind of data you will end up with and what you will do with that data to shed light on your research findings.

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